Environmental Management System (EMS)

Version 2.2

Unit 5 Pengarnddu Industrial Estate

Dowlais, Merthyr Tydfil, CF48 2TA

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Document Revisions

Version	Date	Author	Checked / App'd	Revision
2.0	10/11/14	SW	NB	UPDATE FOR PERMIT VARIATION
2.1	15/11/15	SW	NB	MINOR UPDATES FOLLOWING PERMIT ISSUE
2.2	25/07/25	SW	NB	EXTENSIVE CONTENT, FORMAT AND DRAWING UPDATES

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Contents

Environmental Permits	Issue Date
EP1 Environmental Permit (EPR/ZP3899FX)	5th May 2022
EP2 Waste Carrier's License (CBDU015236)	20th March 2025 (Expires 19th March 2028)

Environmental Policy	Last Review Date	Next Review (Latest)
PL1 Environmental Policy	25th July 2025	24th July 2026

Environmental Risk Assessments	Last Review Date	Next Review (Latest)
RA1 Register of Environmental Risk Assessments	25th July 2025	24th July 2026
RA2 Environmental Risk Assessments	25th July 2025	24th July 2026

Environmental Impacts and Controls	Last Review Date	Next Review (Latest)
IC1 Environmental Impacts and Controls	25th July 2025	24th July 2026

Management Plans	Last Review Date	Next Review (Latest)
MP1 Environmental Management System Plan	25th July 2025	24th July 2026
MP2 Accident/Pollution Incident Plan	25th July 2025	24th July 2026
MP3 Odour Management Plan	25th July 2025	24th July 2026
MP4 Fire Prevention and Mitigation Plan	25th July 2025	24th July 2026
MP5 Aggregate Quality Protocol - Factory Control System	25th July 2025	24th July 2026
MP6 Asbestos Management Plan	25th July 2025	24th July 2026
MP7 Sampling Plan	25th July 2025	24th July 2026

Procedures	Last Review Date	Next Review (Latest)
PR1 - Accident/Pollution Incident Procedure	25th July 2025	24th July 2026
PR2 - Emergency Incident Procedure - Fire & Explosion	25th July 2025	24th July 2026
PR3 - Emergency Incident Procedure - Spillage	25th July 2025	24th July 2026
PR4 - Accident/Pollution Incident Response Procedure - Flood	25th July 2025	24th July 2026
PR5 - Accident/Pollution Incident Response Procedure - Utility Failure	25th July 2025	24th July 2026
PR6 - Accident/Pollution Incident Response Procedure - Odour	25th July 2025	24th July 2026
PR7 - Accident/Pollution Incident Response Procedure - Fugitive Emissions	25th July 2025	24th July 2026
PR8 - Emergency Incident Procedure - Discovery of suspicious items	25th July 2025	24th July 2026
PR9 - Waste Acceptance Procedure	25th July 2025	24th July 2026
PR10 - Procedure for Assessment and Implementation of Training Needs, Competence and Awareness	25th July 2025	24th July 2026
PR11 - Maintenance Procedure	25th July 2025	24th July 2026

PR12 - Procedure for Recording of Staff Responsibilities	25th July 2025	24th July 2026
PR13 - Procedure for Recording and Reporting of Environmental Incidents	25th July 2025	24th July 2026
PR14 - Complaints Procedure	25th July 2025	24th July 2026
PR15 - Corrective and Preventative Action Procedure	25th July 2025	24th July 2026
PR16 - Maintenance of Surface Water Drainage System	25th July 2025	24th July 2026

Forms and Records	Last Review Date	Next Review (Latest)
FR1 Site Inspection Records	25th July 2025	24th July 2026
FR2 Complaints Record	25th July 2025	24th July 2026
FR3 External Odour Complaint Investigation Record	25th July 2025	24th July 2026
FR4 Internal Odour Investigation Record	25th July 2025	24th July 2026
FR5A Maintenance Checklist - Infrastructure & Equipment	25th July 2025	24th July 2026
FR5B Maintenance Checklist - Plant and Vehicles	25th July 2025	24th July 2026
FR6 Maintenance Record	25th July 2025	24th July 2026
FR7 Training Checklist(Employee Competency Matrix)	25th July 2025	24th July 2026
FR8 Training Record	25th July 2025	24th July 2026
FR9 Roles and Responsibilities	25th July 2025	24th July 2026
FR10 Environmental Accident (and Incident) Record	25th July 2025	24th July 2026
FR11 Corrective Action Request	25th July 2025	24th July 2026

Site Rules	Last Review Date	Next Review (Latest)
SR1 Site Rules	25th July 2025	24th July 2026

Drawings	Last Review Date	Next Review (Latest)
10915 – 000 - A Permitted Area Plan 10915 – 000 - B Location Plan 10915 – 000 - C Site (Block) Plan 10915 – 000 - D Drainage Plan 10915 – 000 - E Storage Plan 10915 – 000 - F Satellite Image 10915 – 000 - G Receptor Plan 10915 – 000 - H Process Flowchart 10915 – 000 - I Emergency Access Plan 10915 – 000 - J Emergency Plan 10915 – 000 - K Receptor Plan (Fire Response)	25th July 2025	24th July 2026

Help and Guidance	Last Review Date	Next Review (Latest)
HG1 Further Help	25th July 2025	24th July 2026
HG2 Protecting the Environment	25th July 2025	24th July 2026

Other Documents	Last Review Date	Next Review (Latest)
OD1 Site Condition Report	25th July 2025	24th July 2026

OD2 Guidance Note 16 - Fire Prevention & Mitigation Plan Guidance –Waste Management (Version 2.0), Natural Resources Wales, August 2017	N/A	N/A
OD3 WASTE 28 - Reducing Fire Risk at Waste Management Sites (Issue 3), Waste Industry Safety and Health (WISH) Forum, March 2020	N/A	N/A

Section Contents

Environmental Permits
EP1 Environmental Permit (EPR/ZP3899FX)
EP2 Waste Carrier's License (CBDU015236)

EP1 Environmental Permit

Notice of variation with introductory note

Environmental Permitting (England & Wales) Regulations 2016

Merthyr Borough Recycling Centre Limited

Merthyr Borough Recycling Centre Ltd
Unit 5
Pengarnddu Industrial Estate
Merthyr Tydfil
CF48 2TA

Variation application number
EPR/ZP3899FX/V005

Permit number
EPR/ZP3899FX

Merthyr Borough Recycling Centre Ltd
Permit number EPR/ZP3899FX

Introductory note

This introductory note does not form a part of the notice

The following notice gives notice of the variation of an environmental permit.

This is an operator-initiated variation to make the following changes:

- Add the following waste codes: 18 01 04, 19 10 04, 20 02 03, 17 01 06*, 17 02 04*, 17 03 01*, 17 05 03*, 17 05 07*, 17 09 03*, 19 12 06* and 20 01 37*.
- Include a hazardous waste treatment; treatment of hazardous waste to be limited to shredding of hazardous waste wood only.

Relevant storage and treatment capacity thresholds have been included in the notice to reflect the legal waste facility operational limits; above which, the site would be operating as an Industrial Emissions Directive installation. (See Table S1.1 for relevant limits.)

The schedules specify the changes made to the original permit.

The status log of a permit sets out the permitting history, including any changes to the permit reference number.

Status log of the permit		
Description	**Date**	**Comments**
Waste Disposal License No. 910120 Issued	09/04/91	Original permit issued to Mr Paul Brogden.
Variation issued	01/03/99	Waste site returns conditions added via a regulator-initiated change.
Variation issued EAWML 30044 (formerly Waste Disposal License No. 910120)	27/03/02	Complete license review via a regulator-initiated change.
Transfer issued	06/12/04	Full transfer of permit to Merthyr Borough Recycling Centre Limited.
Variation issued	31/10/05	Complete license review via a regular-initiated change.
Variation issued	01/06/06	Regulator-initiated change to amend waste movements condition.
Variation issued EPR/ZP3899FX/V004 (formerly EAWML 30044)	20/10/15	Variation determined to increase throughput, add additional waste activities, extend the site boundary and consolidate the permit.
Application EPR/ZP3899FX/V005	Duly made 01/04/21	Application to add waste codes, add drying of waste to the activities on site and add treatment of hazardous waste wood.
Additional information received in response to a Schedule 5 notice sent on 27/08/2021	16/09/21	Consisting of updated: - Environmental Permit Application Report - Site plan - Waste Treatment Procedure - Waste Pre acceptance Procedure - Fire Prevention and Mitigation Plan
	21/10/21	- Confirming daily tonnage limits for treatment of waste wood - Updated Waste Storage and Handling Procedure document
Additional information received in response to a second Schedule 5 notice sent on 08/10/21	21/10/21	Consisting of updated: - Fire Prevention and Mitigation Plan - Waste Storage and Handling Procedure document
Additional information received in response to a third Schedule 5 notice sent on 04/11/21	18/11/21	Consisting of updated: - Fire Prevention and Mitigation Plan Site plan - Waste acceptance procedure
		- Fire Prevention and Mitigation Plan

Additional information received in response to informal request for information sent on 29/11/21	08/12/21	Confirmation of removal of fire walls and justification
Variation determined EPR/ZP3899FX	05/05/22	Varied permit issued to add waste codes and add treatment of hazardous waste wood, with a partial refusal for the proposed drying activities.

End of introductory note

Notice of variation

Environmental Permitting (England and Wales) Regulations 2016

The Natural Resources Body for Wales ("Natural Resources Wales") in exercise of its powers under regulation 20 of the Environmental Permitting (England and Wales) Regulations 2016 varies

Permit number

EPR/ZP3899FX

issued to:

Merthyr Borough Recycling Centre Limited ("the operator")

whose registered office is

Ty Lwyfan

Graig Y Bedw, New Tredegar

Gwent

NP24 6NS

company registration number 05211749

to operate a regulated facility at

Merthyr Borough Recycling Centre Ltd

Unit 5

Pengarnddu Industrial Estate

Merthyr Tydfil

CF48 2TA

to the extent set out in the schedules.

The notice shall take effect from 05/05/2022.

Name	Date
Huw Davies	**05/05/2022**

Authorised on behalf of Natural Resources Wales

Schedule 1 – conditions to be deleted

None

Schedule 2 – conditions to be amended

The following conditions are amended as a result of the application made by the operator:

Table S1.1 as referred to by condition 2.1.1 is amended as outlined below.

Table S1.1 activities		
	Description of activities for waste operations	**Limits of activities**
A1 Hazardous & non-hazardous household, commercial and industrial waste transfer station with treatment and asbestos storage	**R3**: Recycling/reclamation of organic substances which are not used as solvents **R4**: Recycling/reclamation of metals and metal compounds **R5**: Recycling/reclamation of other inorganic compounds **R13**: Storage of waste pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced) **D15:** Storage pending any of the operations numbered D1 to D14 (excluding temporary storage, pending collection, on the site where it is produced) **D9:** Physico-chemical treatment not specified elsewhere in this Annex which results in final compounds or mixtures which are discarded by means of any of the operations numbered D 1 to D 12 (e.g. evaporation, drying, calcination, etc.)	All hazardous and non-hazardous waste must be stored and treated on an impermeable surface with sealed drainage. Following treatment, specified wastes – non-hazardous wood (treated and untreated) and hard plastics may be stored on hardstanding. All inert waste may be stored and treated on either hardstanding or on an impermeable surface with sealed drainage. Treatment operations shall be limited to manual and/or mechanical: – sorting – separation and segregation – cutting – pulverising – chipping – screening – baling – bulking – wrapping – repackaging – shredding – blending or mixing – crushing or compaction of waste into different components for disposal (no more than 50 tonnes per day for non-hazardous waste, no more than 10 tonnes for hazardous waste) or recovery. Hazardous waste treatment will be limited to bulking up and shredding of hazardous waste wood only.

		There shall be no treatment of: – waste electronic and electrical equipment – waste batteries and/or accumulators – asbestos waste other than bulking up for onward transfer. Asbestos and asbestos containing waste shall be double bagged and stored within clearly identified, segregated, secure, lockable containers on an impermeable surface with sealed drainage. The maximum quantity of hazardous waste that can be stored at the site in total for recovery or disposal, (excluding end of life vehicles and/or waste electrical and electronic equipment stored pending manual dismantling, repair or refurbishment), shall not exceed 50 tonnes at any one time. The maximum quantity of waste slags and/or ashes that can be treated, in total, at the site for recovery or a mix of recovery and disposal shall not exceed 75 tonnes per day. The maximum quantity of waste slags and/or ashes that can be treated, in total, at the site for disposal shall not exceed 50 tonnes per day. Waste types as specified in Table 2.1
A2 End-of-Life (ELV) storage, depollution & dismantling	**R13**: Storage of waste pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced) **R4**: Recycling/reclamation of metals and metal compounds **R5**: Recycling/reclamation of other inorganic compounds **D15**: Storage pending any of the operations numbered D01 to D14 (excluding temporary storage pending collection on the site where it is produced).	All hazardous and non-hazardous waste must be stored and treated on an impermeable surface with sealed drainage. Storage of lead acid batteries must be in containers with an impermeable, acid resistant base and a cover to prevent ingress of water. Treatment operations shall be limited to manual: – depollution of waste motor vehicles – sorting – separation – grading – shearing – baling – bulking – compacting – granulating and – cutting of waste into different components for recovery and/or disposal.

		There shall be no treatment of: – waste batteries and/or accumulators – breakpads containing asbestos – hazardous waste other than bulking up for onward transfer. Depollution will take place in a building on an impermeable surface with sealed drainage. Depolluted vehicles may be stored on hardstanding or an impermeable surface with sealed drainage. Waste types as specified in Table 2.2
A3 Inert and excavation waste transfer station with treatment	**R13**: Storage of waste pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced) **R3**: Recycling/reclamation of organic substances which are not used as solvents **R5**: Recycling/reclamation of other inorganic compounds	All non-hazardous waste must be stored and treated on an impermeable surface with sealed drainage. All inert waste may be stored and treated on either hardstanding or on an impermeable surface with sealed drainage. Treatment operations shall be limited to manual and/or mechanical: – sorting – separation and segregation – washing – screening – crushing – blending and – bulking of waste for recovery as a soil, soil substitute or aggregate for recovery only. Waste types as specified in Table 2.3
A4 Dewatering of street sweepings/gully suckings	**R13**: Storage of waste pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced) **R3**: Recycling/reclamation of organic substances which are not used as solvents **R4**: Recycling/reclamation of metals and metal compounds **R5**: Recycling/reclamation of other inorganic compounds	All non-hazardous waste must be stored and treated on an impermeable surface with sealed drainage. Treatment operations shall be limited to the dewatering of street sweepings/gully suckings only by: – sorting – separation – dewatering – segregation and – screening of waste into different components for recovery/disposal. The maximum quantity of non-hazardous waste that can be treated, in total, at the site for disposal shall not exceed 50 tonnes per day. There shall be no biological treatment of street sweepings/gully suckings.

	D9: Physico-chemical treatment not specified elsewhere in this Annex which results in final compounds or mixtures which are discarded by means of any of the operations numbered D 1 to D 12 (e.g. evaporation, drying, calcination, etc.) **D15**: Storage pending any of the operations numbered D01 to D14 (excluding temporary storage pending collection on the site where it is produced).	Waste types as specified in Table 2.4
	Discharge of integral site drainage (process effluent) from the emission points indicated on the drainage plan reference 10915-000-D as incorporated in Table S1.2 of this permit.	Drainage to sewer firstly via silt settlement and storage tanks and then through an interceptor will consist solely of: - clean, rainfall dependant drainage from areas of the site not used in connection with the storage and/or treatment of waste. - run-off from the impermeable surface from areas of the site used to store and/or treat waste including the process effluent from the dewatering activity. No visible oil or grease shall be present in the discharge. There shall be no discharge from the buildings on site used to store and/or treat waste.

Table S1.2 as referred to by condition 2.3.1 is amended as outlined below.

Table S1.2 Operating techniques		
Description	**Parts**	**Date Received**
Technical Guidance Document 'How to Comply with your Environmental Permit"	All relevant sections	N/A
Sector Guidance Note IPPC S5.06: Guidance for the Recovery and Disposal of Hazardous and Non Hazardous Waste	All relevant sections	N/A
Fire prevention and mitigation plan guidance - Waste Management	All relevant sections	N/A
Fire prevention and mitigation plan relevant to all aspects of the operation	All relevant sections	In line with IPC 1
Application	Drainage Plan – Drawing No. 10915-000-D	22/01/15
	Section 5.3.1 of the Working Plan V2.0 (Nov 2014) – Outside Storage	
Additional information received via email request sent 14/07/15	Odour management plan v1.0	21/07/15
Additional information received via email request sent 25/06/15	Clarification on proposed activities section of email.	13/07/15
Additional information received via email containing DRAFTv1 following telephone conversation on 22/09/15	Process checks for storing specified wastes and depolluted vehicles on hardstanding.	05/10/15
Response to Schedule 5 Notice dated 27/08/2021	Environmental Permit Application Report V4. Section: - 6. Proposed Additional Waste Activities, (6.1-6.18 and 6.20-6.23 only)	16/09/21
	EMS: Appendix C Procedures & Forms - Waste Pre-acceptance V1	16/09/21
Additional information received in response to Schedule 5 Notice dated 08/10/21 and 04/11/21	EMS: Appendix C Procedures & Forms – Waste Storage & Handling V2. Sections: - Hazardous Waste Storage	18/11/21

- Letter LT05 1719, response to Schedule 5 Notice dated 8th October 2021 question 4 Environmental Management System [acceptance and storage of asbestos]	18/11/21
Appendix 1: Fire Prevention & Mitigation Plan, V5. Sections: - Table 3: Combustible waste storage area details, areas J, Q, and R.	18/11/21

Table S2.1 as referred to by condition 2.3.2 is amended as outlined below

Table S2.1 Permitted waste types and quantities for hazardous & non-hazardous household, commercial and industrial waste transfer station with treatment and asbestos storage with treatment and asbestos storage	
Maximum quantity	The maximum quantity of waste to be accepted at the whole site shall not exceed 252,000 tonnes per year.
Exclusions	Wastes having any of the following characteristics shall not be accepted: • wastes consisting solely or mainly of dusts or powders • wastes which are odour producing or likely to be odorous
01	**WASTES RESULTING FROM EXPLORATION, MINING, QUARRYING, AND PHYSICAL AND CHEMICAL TREATMENT OF MINERALS**
01 01	**wastes from mineral excavation**
01 01 01	wastes from mineral metalliferous excavation
01 01 02	wastes from mineral non-metalliferous excavation
01 03	**wastes from physical and chemical processing of metalliferous minerals**
01 03 06	tailings other than those mentioned in 01 03 04 and 01 03 05
01 03 09	red mud from alumina production other than the wastes mentioned in 01 03 10
01 04	**wastes from physical and chemical processing of non-metalliferous minerals**
01 04 08	waste gravel and crushed rocks other than those mentioned in 01 04 07
01 04 09	waste sand and clays
01 04 11	wastes from potash and rock salt processing other than those mentioned in 01 04 07
01 04 12	tailings and other wastes from washing and cleaning of minerals other than those mentioned in 01 04 07 and 01 04 11
01 04 13	wastes from stone cutting and sawing other than those mentioned in 01 04 07
02	**WASTES FROM AGRICULTURE, HORTICULTURE, AQUACULTURE, FORESTRY, HUNTING AND FISHING, FOOD PREPARATION AND PROCESSING**
02 01	**wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing**
02 01 03	plant-tissue waste
02 01 04	waste plastics (except packaging)
02 01 07	wastes from forestry
02 01 10	waste metal
02 02	**wastes from the preparation and processing of meat, fish and other foods of animal origin**
02 02 03	materials unsuitable for consumption or processing
02 03	**wastes from fruit, vegetables, cereals, edible oils, cocoa, coffee, tea and tobacco preparation and processing; conserve production; yeast and yeast extract production, molasses preparation and fermentation**
02 03 04	materials unsuitable for consumption or processing
02 04	**wastes from sugar processing**
02 04 01	soil from cleaning and washing beet
02 04 02	off-specification calcium carbonate
02 05	**wastes from the dairy products industry**
02 05 01	materials unsuitable for consumption or processing
02 06	**wastes from the baking and confectionery industry**
02 06 01	materials unsuitable for consumption or processing
02 06 02	wastes from preserving agents
02 07	**wastes from the production of alcoholic and non-alcoholic beverages (except coffee, tea and cocoa)**
02 07 01	wastes from washing, cleaning and mechanical reduction of raw materials
02 07 02	wastes from spirits distillation
02 07 04	materials unsuitable for consumption or processing
03	**WASTES FROM WOOD PROCESSING AND THE PRODUCTION OF PANELS AND FURNITURE, PULP, PAPER AND CARDBOARD**

Table S2.1 Permitted waste types and quantities for hazardous & non-hazardous household, commercial and industrial waste transfer station with treatment and asbestos storage with treatment and asbestos storage	
Maximum quantity	The maximum quantity of waste to be accepted at the whole site shall not exceed 252,000 tonnes per year.
Exclusions	Wastes having any of the following characteristics shall not be accepted: • wastes consisting solely or mainly of dusts or powders • wastes which are odour producing or likely to be odorous
03 01	**wastes from wood processing and the production of panels and furniture**
03 01 01	waste bark and cork
03 01 05	sawdust, shavings, cuttings, wood, particle board and veneer other than those mentioned in 03 01 04
03 03	**wastes from pulp, paper and cardboard production and processing**
03 03 01	waste bark and wood
03 03 07	mechanically separated rejects from pulping of waste paper and cardboard
03 03 08	wastes from sorting of paper and cardboard destined for recycling
03 03 10	fibre rejects, fibre-, filler- and coating-sludges from mechanical separation
04	**WASTES FROM THE LEATHER, FUR AND TEXTILE INDUSTRIES**
04 01	**wastes from the leather and fur industry**
04 01 08	waste tanned leather (blue sheetings, shavings, cuttings, buffing dust) containing chromium
04 01 09	wastes from dressing and finishing
04 02	**wastes from the textile industry**
04 02 21	wastes from unprocessed textile fibres
04 02 22	wastes from processed textile fibres
06	**WASTES FROM INORGANIC CHEMICAL PROCESSES**
06 09	**wastes from the MSFU of phosphorous chemicals and phosphorous chemical processes**
06 09 02	phosphorous slag
06 09 04	calcium-based reaction wastes other than those mentioned in 06 09 03
06 11	**wastes from the manufacture of inorganic pigments and opacificiers**
06 11 01	calcium-based reaction wastes from titanium dioxide production
07	**WASTES FROM ORGANIC CHEMICAL PROCESSES**
07 02	**wastes from the MFSU of plastics, synthetic rubber and man-made fibres**
07 02 13	waste plastic
08	**WASTES FROM THE MANUFACTURE, FORMULATION, SUPPLY AND USE (MFSU) OF COATINGS (PAINTS, VARNISHES AND VITREOUS ENAMELS), ADHESIVES, SEALANTS AND PRINTING INKS**
08 01	**wastes from MFSU and removal of paint and varnish**
08 01 18	wastes from paint or varnish removal other than those mentioned in 08 01 17
09	**WASTES FROM THE PHOTOGRAPHIC INDUSTRY**
09 01	**wastes from the photographic industry**
09 01 07	photographic film and paper containing silver or silver compounds
09 01 08	photographic film and paper free of silver or silver compounds
09 01 10	single-use cameras without batteries
09 01 12	single-use cameras containing batteries other than those mentioned in 09 01 11
10	**WASTES FROM THERMAL PROCESSES**
10 01	**wastes from power stations and other combustion plants (except 19)**
10 01 01	bottom ash, slag and boiler dust (excluding boiler dust mentioned in 10 01 04)
10 01 05	calcium-based reaction wastes from flue-gas desulphurisation in solid form
10 01 07	calcium-based reaction wastes from flue-gas desulphurisation in sludge form
10 01 15	bottom ash, slag and boiler dust from co-incineration other than those mentioned in 10 01 14
10 01 19	wastes from gas cleaning other than those mentioned in 10 01 05, 10 01 07 and 10 01 18
10 01 24	sands from fluidised beds

Table S2.1 Permitted waste types and quantities for hazardous & non-hazardous household, commercial and industrial waste transfer station with treatment and asbestos storage with treatment and asbestos storage	
Maximum quantity	The maximum quantity of waste to be accepted at the whole site shall not exceed 252,000 tonnes per year.
Exclusions	Wastes having any of the following characteristics shall not be accepted: • wastes consisting solely or mainly of dusts or powders • wastes which are odour producing or likely to be odorous

10 02	**wastes from the iron and steel industry**
10 02 01	wastes from the processing of slag
10 02 02	unprocessed slag
10 02 08	solid wastes from gas treatment other than those mentioned in 10 02 07
10 02 10	mill scales
10 02 14	sludges and filter cakes from gas treatment other than those mentioned in 10 02 13
10 02 15	other sludges and filter cakes
10 03	**wastes from aluminium thermal metallurgy**
10 03 02	anode scraps
10 03 05	waste alumina
10 03 16	skimmings other than those mentioned in 10 03 15
10 03 18	carbon-containing wastes from anode manufacture other than those mentioned in 10 03 17
10 03 24	solid wastes from gas treatment other than those mentioned in 10 03 23
10 03 26	sludges and filter cakes from gas treatment other than those mentioned in 10 03 25
10 03 28	wastes from cooling-water treatment other than those mentioned in 10 03 27
10 03 30	wastes from treatment of salt slags and black drosses other than those mentioned in 10 03 29
10 04	**wastes from lead thermal metallurgy**
10 04 10	wastes from cooling-water treatment other than those mentioned in 10 04 09
10 05	**wastes from zinc thermal metallurgy**
10 05 01	slags from primary and secondary production
10 05 09	wastes from cooling-water treatment other than those mentioned in 10 05 08
10 05 11	dross and skimmings other than those mentioned in 10 05 10
10 06	**wastes from copper thermal metallurgy**
10 06 01	slags from primary and secondary production
10 06 02	dross and skimmings from primary and secondary production
10 06 10	wastes from cooling-water treatment other than those mentioned in 10 06 09
10 07	**wastes from silver, gold and platinum thermal metallurgy**
10 07 01	slags from primary and secondary production
10 07 02	dross and skimmings from primary and secondary production
10 07 03	solid wastes from gas treatment
10 07 05	sludges and filter cakes from gas treatment
10 07 08	wastes from cooling-water treatment other than those mentioned in 10 07 07
10 08	**wastes from other non-ferrous thermal metallurgy**
10 08 09	other slags
10 08 11	dross and skimmings other than those mentioned in 10 08 10
10 08 13	carbon-containing wastes from anode manufacture other than those mentioned in 10 08 12
10 08 14	anode scrap
10 08 18	sludges and filter cakes from flue-gas treatment other than those mentioned in 10 08 17
10 08 20	wastes from cooling-water treatment other than those mentioned in 10 08 19
10 09	**wastes from casting of ferrous pieces**
10 09 03	furnace slag
10 09 06	casting cores and moulds which have not undergone pouring other than those mentioned in 10 09 05
10 09 08	casting cores and moulds which have undergone pouring other than those mentioned in 10 09 07

Table S2.1 Permitted waste types and quantities for hazardous & non-hazardous household, commercial and industrial waste transfer station with treatment and asbestos storage with treatment and asbestos storage	
Maximum quantity	The maximum quantity of waste to be accepted at the whole site shall not exceed 252,000 tonnes per year.
Exclusions	Wastes having any of the following characteristics shall not be accepted: • wastes consisting solely or mainly of dusts or powders • wastes which are odour producing or likely to be odorous
10 09 14	waste binders other than those mentioned in 10 09 13
10 09 16	waste crack-indicating agent other than those mentioned in 10 09 15
10 10	**wastes from casting of non-ferrous pieces**
10 10 03	furnace slag
10 10 06	casting cores and moulds which have not undergone pouring, other than those mentioned in 10 10 05
10 10 08	casting cores and moulds which have undergone pouring, other than those mentioned in 10 10 07
10 10 14	waste binders other than those mentioned in 10 10 13
10 10 16	waste crack-indicating agent other than those mentioned in 10 10 15
10 11	**wastes from manufacture of glass and glass products**
10 11 03	waste glass-based fibrous materials
10 11 10	waste preparation mixture before thermal processing, other than those mentioned in 10 11 09
10 11 12	waste glass other than those mentioned in 10 11 11
10 11 16	solid wastes from flue-gas treatment other than those mentioned in 10 11 15
10 11 18	sludges and filter cakes from flue-gas treatment other than those mentioned in 10 11 17
10 12	**wastes from manufacture of ceramic goods, bricks, tiles and construction products**
10 12 01	waste preparation mixture before thermal processing
10 12 05	sludges and filter cakes from gas treatment
10 12 06	discarded moulds
10 12 08	waste ceramics, bricks, tiles and construction products (after thermal processing)
10 12 10	solid wastes from gas treatment other than those mentioned in 10 12 09
10 12 12	wastes from glazing other than those mentioned in 10 12 11
10 13	**wastes from manufacture of cement, lime and plaster and articles and products made from them**
10 13 01	waste preparation mixture before thermal processing
10 13 04	wastes from calcination and hydration of lime
10 13 07	sludges and filter cakes from gas treatment
10 13 10	wastes from asbestos-cement manufacture other than those mentioned in 10 13 09
10 13 11	wastes from cement-based composite materials other than those mentioned in 10 13 09 and 10 13 10
10 13 13	solid wastes from gas treatment other than those mentioned in 10 13 12
10 13 14	waste concrete and concrete sludge
11	**WASTES FROM CHEMICAL SURFACE TREATMENT AND COATING OF METALS AND OTHER MATERIALS; NON-FERROUS HYDRO-METALLURGY**
11 01	**wastes from chemical surface treatment and coating of metals and other materials (for example galvanic processes, zinc coating processes, pickling processes, etching, phosphating, alkaline degreasing, anodising)**
11 01 10	sludges and filter cakes other than those mentioned in 11 01 09
11 01 14	degreasing wastes other than those mentioned in 11 01 13
11 02	**wastes from non-ferrous hydrometallurgical processes**
11 02 03	wastes from the production of anodes for aqueous electrolytical processes
11 02 06	wastes from copper hydrometallurgical processes other than those mentioned in 11 02 05
11 05	**wastes from hot galvanising processes**
11 05 01	hard zinc
11 05 02	zinc ash

Table S2.1 Permitted waste types and quantities for hazardous & non-hazardous household, commercial and industrial waste transfer station with treatment and asbestos storage with treatment and asbestos storage	
Maximum quantity	The maximum quantity of waste to be accepted at the whole site shall not exceed 252,000 tonnes per year.
Exclusions	Wastes having any of the following characteristics shall not be accepted: • wastes consisting solely or mainly of dusts or powders • wastes which are odour producing or likely to be odorous

12	**WASTES FROM SHAPING AND PHYSICAL AND MECHANICAL SURFACE TREATMENT OF METALS AND PLASTICS**
12 01	**wastes from shaping and physical and mechanical surface treatment of metals and plastics**
12 01 01	ferrous metal filings and turnings
12 01 03	non-ferrous metal filings and turnings
12 01 04	non-ferrous metal dust and particles
12 01 05	plastics shavings and turnings
12 01 13	welding wastes
12 01 17	waste blasting material other than those mentioned in 12 01 16
12 01 21	spent grinding bodies and grinding materials other than those mentioned in 12 01 20
15	**WASTE PACKAGING, ABSORBENTS, WIPING CLOTHS, FILTER MATERIALS AND PROTECTIVE CLOTHING NOT OTHERWISE SPECIFIED**
15 01	**packaging (including separately collected municipal packaging waste)**
15 01 01	paper and cardboard packaging
15 01 02	plastic packaging
15 01 03	wooden packaging
15 01 04	metallic packaging
15 01 05	composite packaging
15 01 06	mixed packaging
15 01 07	glass packaging
15 01 09	textile packaging
15 02	**absorbents, filter materials, wiping cloths and protective clothing**
15 02 03	absorbents, filter materials, wiping cloths and protective clothing other than those mentioned in 15 02 02
16	**WASTES NOT OTHERWISE SPECIFIED IN THE LIST**
16 01	**end-of-life vehicles from different means of transport (including off-road machinery) and wastes from dismantling of end-of-life vehicles and vehicle maintenance (except 13, 14, 16 06 and 16 08)**
16 01 03	end-of-life tyres
16 01 17	ferrous metal
16 01 18	non-ferrous metal
16 01 19	plastic
16 02	**wastes from electrical and electronic equipment**
16 02 11*	discarded equipment containing chlorofluorocarbons, HCFC, HFC
16 02 13*	discarded equipment containing hazardous components other than those mentioned in 16 02 09 to 16 02 12
16 02 14	discarded equipment other than those mentioned in 16 02 09 to 16 02 13
16 02 16	components removed from discarded equipment other than those mentioned in 16 02 15
16 03	**off-specification batches and unused products**
16 03 04	inorganic wastes other than those mentioned in 16 03 03
16 03 06	organic wastes other than those mentioned in 16 03 05
16 06	**batteries and accumulators**
16 06 04	alkaline batteries (except 16 06 03)
16 06 05	other batteries and accumulators
16 11	**waste linings and refractories**

Table S2.1 Permitted waste types and quantities for hazardous & non-hazardous household, commercial and industrial waste transfer station with treatment and asbestos storage with treatment and asbestos storage	
Maximum quantity	The maximum quantity of waste to be accepted at the whole site shall not exceed 252,000 tonnes per year.
Exclusions	Wastes having any of the following characteristics shall not be accepted: • wastes consisting solely or mainly of dusts or powders • wastes which are odour producing or likely to be odorous
16 11 02	carbon-based linings and refractories from metallurgical processes other than those mentioned in 16 11 01
16 11 04	other linings and refractories from metallurgical processes other than those mentioned in 16 11 03
16 11 06	linings and refractories from non-metallurgical processes other than those mentioned in 16 11 05
17	**CONSTRUCTION AND DEMOLITION WASTES (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)**
17 01	**concrete, bricks, tiles and ceramics**
17 01 01	concrete
17 01 02	bricks
17 01 03	tiles and ceramics
17 01 06*	mixtures of, or separate fractions of concrete, bricks, tiles and ceramics containing hazardous substances (consisting of asbestos containing materials only)
17 01 07	mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06
17 02	**wood, glass and plastic**
17 02 01	wood
17 02 02	glass
17 02 03	plastic
17 02 04*	glass, plastic and wood containing or contaminated with hazardous substances
17 03	**bituminous mixtures, coal tar and tarred products**
17 03 01*	bituminous mixtures containing coal tar
17 03 02	bituminous mixtures other than those mentioned in 17 03 01
17 04	**metals (including their alloys)**
17 04 01	copper, bronze, brass
17 04 02	aluminium
17 04 03	lead
17 04 04	zinc
17 04 05	iron and steel
17 04 06	tin
17 04 07	mixed metals
17 04 11	cables other than those mentioned in 17 04 10
17 05	**soil (including excavated soil from contaminated sites), stones and dredging spoil**
17 05 03*	soil and stones containing hazardous substances (consisting of asbestos containing materials only)
17 05 04	soil and stones other than those mentioned in 17 05 03
17 05 07*	track ballast containing hazardous substances
17 05 08	track ballast other than those mentioned in 17 05 07
17 06	**insulation materials and asbestos-containing construction materials**
17 06 01*	insulation materials containing asbestos
17 06 04	insulation materials other than those mentioned in 17 06 01 and 17 06 03
17 06 05*	construction materials containing asbestos
17 08	**gypsum-based construction material**
17 08 02	gypsum-based construction materials other than those mentioned in 17 08 01
17 09	**other construction and demolition wastes**

Table S2.1 Permitted waste types and quantities for hazardous & non-hazardous household, commercial and industrial waste transfer station with treatment and asbestos storage with treatment and asbestos storage	
Maximum quantity	The maximum quantity of waste to be accepted at the whole site shall not exceed 252,000 tonnes per year.
Exclusions	Wastes having any of the following characteristics shall not be accepted: • wastes consisting solely or mainly of dusts or powders • wastes which are odour producing or likely to be odorous
17 09 03*	other construction and demolition wastes (including mixed wastes) containing hazardous substances
17 09 04	mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03
18	**WASTES FROM HUMAN OR ANIMAL HEALTH CARE AND/OR RELATED RESEARCH (except kitchen and restaurant wastes not arising from immediate health care)**
18 01	**wastes from natal care, diagnosis, treatment or prevention of disease in humans**
18 01 04	wastes whose collection and disposal is not subject to special requirements in order to prevent infection (for example dressings, plaster casts, linen, disposable clothing, diapers)
19	**WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE**
19 01	**wastes from incineration or pyrolysis of waste**
19 01 02	ferrous materials removed from bottom ash
19 01 12	bottom ash and slag other than those mentioned in 19 01 11
19 01 18	pyrolysis wastes other than those mentioned in 19 01 17
19 01 19	sands from fluidised beds
19 02	**wastes from physico/chemical treatments of waste (including dechromatation, decyanidation, neutralisation)**
19 02 03	premixed wastes composed only of non-hazardous wastes
19 02 10	combustible wastes other than those mentioned in 19 02 08 and 19 02 09
19 04	**vitrified waste and wastes from vitrification**
19 04 01	vitrified waste
19 05	**wastes from aerobic treatment of solid wastes**
19 05 01	non-composted fraction of municipal and similar wastes
19 05 02	non-composted fraction of animal and vegetable waste
19 05 03	off-specification compost
19 10	**wastes from shredding of metal-containing wastes**
19 10 04	fluff-light fraction and dust other than those mentioned in 19 10 03
19 12	**wastes from the mechanical treatment of waste (for example sorting, crushing, compacting, pelletising) not otherwise specified**
19 12 01	paper and cardboard
19 12 02	ferrous metal
19 12 03	non-ferrous metal
19 12 04	plastic and rubber
19 12 05	glass
19 12 06*	wood containing hazardous substances
19 12 07	wood other than that mentioned in 19 12 06
19 12 08	textiles
19 12 09	minerals (for example sand, stones)
19 12 10	combustible waste (refuse derived fuel)
19 12 12	other wastes (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 19 12 11
19 13	**wastes from soil and groundwater remediation**
19 13 02	solid wastes from soil remediation other than those mentioned in 19 13 01
20	**MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS**

Table S2.1 Permitted waste types and quantities for hazardous & non-hazardous household, commercial and industrial waste transfer station with treatment and asbestos storage with treatment and asbestos storage	
Maximum quantity	The maximum quantity of waste to be accepted at the whole site shall not exceed 252,000 tonnes per year.
Exclusions	Wastes having any of the following characteristics shall not be accepted: • wastes consisting solely or mainly of dusts or powders • wastes which are odour producing or likely to be odorous
20 01	**separately collected fractions (except 15 01)**
20 01 01	paper and cardboard
20 01 02	glass
20 01 08	biodegradable kitchen and canteen waste
20 01 10	clothes
20 01 11	textiles
20 01 23*	discarded equipment containing chlorofluorocarbons
20 01 34	batteries and accumulators other than those mentioned in 20 01 33
20 01 35*	discarded electrical and electronic equipment other than those mentioned in 20 01 21 and 20 01 23 containing hazardous components
20 01 36	discarded electrical and electronic equipment other than those mentioned in 20 01 21, 20 01 23 and 20 01 35
20 01 37*	wood containing hazardous substances
20 01 38	wood other than that mentioned in 20 01 37
20 01 39	plastics
20 01 40	metals
20 01 41	wastes from chimney sweeping
20 02	**garden and park wastes (including cemetery waste)**
20 02 01	biodegradable waste
20 02 02	soil and stones
20 02 03	other non-biodegradable wastes
20 03	**other municipal wastes**
20 03 01	mixed municipal waste
20 03 02	waste from markets
20 03 03	street-cleaning residues
20 03 07	bulky waste

Schedule 3 – conditions to be added

The following conditions are added as a result of the application made by the operator

2.5 Improvement programme

2.5.1 The operator shall complete the improvements specified in schedule 1 table S1.3 by the date specified in that table unless otherwise agreed in writing by Natural Resources Wales.

2.5.2 Except in the case of an improvement which consists only of a submission to Natural Resources Wales, the operator shall notify Natural Resources Wales within 14 days of completion of each improvement.

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
IPC1	The operator shall submit a written Fire prevention and mitigation plan to Natural Resources Wales. The Fire prevention and mitigation plan must be produced in line with the standards set out in Fire prevention and mitigation plan guidance – Waste. To address all parts not assessed and incorporated as part of variation application EPR/ZP3899FX/V005.	3 months after permit issue of EPR/ZP3899FX/V005 or otherwise agreed in writing with Natural Resources Wales

3.5 Fire

3.5.1 The operator shall manage and operate the activities in accordance with a written fire prevention plan using the current, relevant fire prevention and mitigation plan guidance.

3.5.2 The operator shall:

(a) if notified by Natural Resources Wales that the activities could cause a fire risk, submit to Natural Resources Wales a fire prevention and mitigation plan which identifies and minimises the risks of fire;

(b) Operate the activity in accordance with the fire prevention and mitigation plan, from the date of submission, unless otherwise agreed in writing by Natural Resources Wales.

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Permit with introductory note

The Environmental Permitting (England & Wales) Regulations 2010

Merthyr Borough Recycling Centre Limited

Merthyr Borough Recycling Centre Ltd
Unit 5
Pengarnddu Business Park
Dowlais
Merthyr Tydfil
CF48 2YE

Permit number

EPR/ZP3899FX

Merthyr Borough Recycling Centre Ltd
Permit number EPR/ZP3899FX

Introductory note

This introductory note does not form a part of the permit

The main features of the permit are as follows.

This Tier 3 bespoke permit allows:

- a hazardous and non-hazardous household, commercial and industrial waste transfer station with treatment and storage of asbestos waste;
- ELV storage, depollution & dismantling;
- inert & excavation waste transfer station with treatment; and
- dewatering of street sweepings/gully suckings.

The maximum quantity of waste accepted shall not exceed 252,500 tonnes per year.

The main activities on site include the following:

Hazardous & Non-hazardous WTS with treatment & asbestos storage

Both hazardous and non-hazardous wastes are permitted. Hazardous wastes may be bulked up and stored for onward transport only, no further treatment of hazardous waste is permitted. Non-hazardous wastes may be treated by other manual and/or mechanical means into different components for disposal and/or recovery. Mixed non-hazardous waste will be further treated by means of manual and/or mechanical segregation and baled for onward disposal and/or recovery. Untreated and treated wood will be further processed by chipping and screening to produce wood chip for onward recovery /disposal. The recovery of wood for animal bedding must be Grade A as per the industry standard.

ELV storage, depollution & dismantling

The acceptance of end of life vehicles for manual/mechanical depollution and dismantling into different components is for recovery only. Other wastes permitted are hazardous oils and liquids (including fuel, screenwash, coolant, anti-freeze, lead acid batteries and brake-pads containing asbestos only.)

Inert & excavation WTS with treatment

The operator is permitted to accept non-hazardous inert and excavation waste to produce soil, soil substitutes and aggregates for use in construction. Hazardous wastes are not permitted. Aggregates will be produced in line with WRAP's Aggregate Protocol and the manufacture of waste soils will be blended with primary scalpings 6F from the aggregate protocol process along with imported soil, soil improvers and composts to produce a range of soils.

Dewatering of street sweepings/gully suckings

The treatment of street sweepings and/or gully suckings will take place on an impermeable surface with sealed drainage. Treatment includes the dewatering of street sweepings/gully suckings by mechanical and/or gravity/self-draining means to produce a compost like output (CLO). There shall be no biological treatment of street sweepings and/or gully suckings. Hazardous wastes are not permitted. De-watering has been considered under the Industrial Emissions Directive as the activity is occurring for recovery and/or disposal. As such, a daily treatment capacity limit for this activity has been set in Table S1.1 of the permit.

Relevant storage and treatment capacity thresholds have been included in the permit to reflect the legal waste facility operational limits; above which, the site would be operating as an Industrial Emissions Directive installation. (See Table S1.1 for relevant limits.)

This permit does not allow any point source emission into surface waters or groundwater except:

- clean, rainfall dependant drainage from areas of the site not used in connection with the storage and/or treatment of waste, and
- integral discharge(s) from the permitted activity (outside areas of the site used in connection with the storage and/or treatment of waste) in accordance with the limits set out in Table S1.1.

There are to be no emissions to surface and/or groundwater from the buildings on site.

All emissions from the activity which are not controlled via actual emission limits, are controlled through the 'emission of substances not controlled by emission limits condition' and any all relevant process requirements set out in Tables S1.1 and S1.2.

The burning of any wastes, either in the open, inside buildings or in any form of incinerator is not permitted.

Status log of the permit		
Description	**Date**	**Comments**
Waste Disposal Licence issued No. 910120	09/04/91	Original permit issued to Mr Paul Brogden.
Modification determined	01/03/99	Waste site returns conditions added via a regulator initiated change.
Modification determined EAWML 30044 (formerly Waste Disposal Licence No. 910120)	27/03/02	Complete licence review via a regulator initiated change.
Transfer determined	06/12/04	Full transfer of permit to Merthyr Borough Recycling Centre Limited.
Modification determined	31/10/05	Complete licence review via a regulator initiated change
Modification determined	01/06/06	Regulator initiated change to amend waste movements condition.

Status log of the permit		
Description	**Date**	**Comments**
Variation application EPR/ZP3899FX/V004 (formerly EAWML 30044)	Duly Made 21/07/15	Operator led normal variation application to increase throughput, add additional waste activities, extend the site boundary and consolidate permit.
Additional information received via email request sent 14/07/15	21/07/15	Odour management plan v1.0
Additional information received via email request sent 25/06/15	13/07/15	Clarification on proposed activities section of email
Additional information received via email contained in DRAFTv1 following telephone conversation on 22/09/15	05/10/15	Process checks for storing specified wastes and depolluted vehicles on hardstanding.
Variation determined EPR/ZP3899FX	20/10/15	Varied permit to increase throughput, add additional waste activities, extend the site boundary and consolidate permit issued.

End of introductory note

Permit

The Environmental Permitting (England and Wales) Regulations 2010

Permit number
EPR/ZP3899FZ

The Natural Resources Body for Wales ("Natural Resources Wales") authorises, under regulation 13 of the Environmental Permitting (England and Wales) Regulations 2010

Merthyr Borough Recycling Centre Limited ("the operator"),

whose registered office is

Ty Lwyfan
Graig Y Bedw
New Tredegar
Gwent
NP24 6NS

company registration number 05211749

to operate waste operations at

Merthyr Borough Recycling Centre Ltd
Unit 5
Pengarnddu Business Park
Dowlais
Merthyr Tydfil
CF48 2TA

to the extent authorised by and subject to the conditions of this permit.

Name	Date
Holly Noble	**20/10/15**

Authorised on behalf of Natural Resources Wales

Conditions

Management

1.1 General management

1.1.1 The operator shall manage and operate the activities:

(a) in accordance with a written management system that identifies and minimises risks of pollution, including those arising from operations, maintenance, accidents, incidents, non-conformances, closure and those drawn to the attention of the operator as a result of complaints; and

(b) using sufficient competent persons and resources.

1.1.2 Records demonstrating compliance with condition 1.1.1 shall be maintained.

1.1.3 Any person having duties that are or may be affected by the matters set out in this permit shall have convenient access to a copy of it kept at or near the place where those duties are carried out.

1.1.4 The operator shall comply with the requirements of an approved competence scheme.

1.2 Avoidance, recovery and disposal of wastes produced by the activities

1.2.1 The operator shall take appropriate measures to ensure that:

(a) the waste hierarchy referred to in Article 4 of the Waste Framework Directive is applied to the generation of waste by the activities; and

(b) any waste generated by the activities is treated in accordance with the waste hierarchy referred to in Article 4 of the Waste Framework Directive; and

(c) where disposal is necessary, this is undertaken in a manner which minimises its impact on the environment.

1.2.2 The operator shall review and record at least every four years whether changes to those measures should be made and take any further appropriate measures identified by a review.

2 Operations

2.1 Permitted activities

2.1.1 The operator is only authorised to carry out the activities specified in schedule 1 table S1.1 (the "activities").

2.2 The site

2.2.1 The activities shall not extend beyond the site, being the land shown edged in green on the site plan at schedule 7 to this permit.

2.3 Operating techniques

2.3.1 (a) The activities shall, subject to the conditions of this permit, be operated using the techniques and in the manner described in the documentation specified in schedule 1, table S1.2, unless otherwise agreed in writing by Natural Resources Wales.

(b) If notified by Natural Resources Wales that the activities are giving rise to pollution, the operator shall submit to Natural Resources Wales for approval within the period specified, a revision of any plan or other documentation ("plan") specified in schedule 1, table S1.2 or otherwise required under this permit which identifies and minimises the risks of pollution relevant to that plan , and shall implement the approved revised plan in place of the original from the date of approval, unless otherwise agreed in writing by Natural Resources Wales.

2.3.2 Waste shall only be accepted if:

(a) it is of a type and quantity listed in schedule 2 table(s) S2.1, S2.2. 2.3 and 2.4[etc.]; and

(b) it conforms to the description in the documentation supplied by the producer and holder.

2.4 Technical requirements

Vehicle depollution and dismantling

2.4.1 The storage (including temporary storage) and treatment of waste motor vehicles shall meet the requirements of article 6(1) of the End-of-Life Vehicles Directive.

WEEE treatment

2.4.2 The storage (including temporary storage) and treatment of WEEE shall be carried out in accordance with the technical requirements of Annex III of the WEEE Directive.

Hazardous waste storage and treatment

2.4.3 Hazardous waste shall not be mixed, either with a different category of hazardous waste or with other waste, substances or materials, unless it is authorised by schedule 1 table S1.1 and appropriate measures are taken.

3 Emissions and monitoring

3.1 Emissions of substances not controlled by emission limits

3.1.1 Emissions of substances not controlled by emission limits (excluding odour) shall not cause pollution. The operator shall not be taken to have breached this condition if appropriate measures, including, but not limited to, those specified in any approved emissions management plan, have been taken to prevent or where that is not practicable, to minimise, those emissions.

3.1.2 The operator shall:

(a) if notified by Natural Resources Wales that the activities are giving rise to pollution, submit to Natural Resources Wales for approval within the period specified, an emissions management plan which identifies and minimises the risks of pollution from emissions of substances not controlled by emission limits;

(b) implement the approved emissions management plan, from the date of approval, unless otherwise agreed in writing by Natural Resources Wales.

3.1.3 All liquids in containers, whose emission to water or land could cause pollution, shall be provided with secondary containment, unless the operator has used other appropriate measures to prevent or where that is not practicable, to minimise, leakage and spillage from the primary container.

3.2 Odour

3.2.1 Emissions from the activities shall be free from odour at levels likely to cause pollution outside the site, as perceived by an authorised officer of Natural Resources Wales, unless the operator has used appropriate measures, including, but not limited to, those specified in any approved odour management plan, to prevent or where that is not practicable to minimise the odour.

3.3 Noise and vibration

3.3.1 Emissions from the activities shall be free from noise and vibration at levels likely to cause pollution outside the site, as perceived by an authorised officer of Natural Resources Wales, unless the operator has used appropriate measures, including, but not limited to, those specified in any approved noise and vibration management plan to prevent or where that is not practicable to minimise the noise and vibration.

3.3.2 The operator shall:

(a) if notified by Natural Resources Wales that the activities are giving rise to pollution outside the site due to noise and vibration, submit to Natural Resources Wales for approval within the period specified, a noise and vibration management plan which identifies and minimises the risks of pollution from noise and vibration;

(b) implement the approved noise and vibration management plan, from the date of approval, unless otherwise agreed in writing by Natural Resources Wales.

3.4 Pests

3.4.1 The activities shall not give rise to the presence of pests which are likely to cause pollution, hazard or annoyance outside the boundary of the site. The operator shall not be taken to have breached this condition if appropriate measures, including, but not limited to, those specified in any approved pests management plan, have been taken to prevent or where that is not practicable, to minimise the presence of pests on the site.

3.4.2 The operator shall:

(a) if notified by Natural Resources Wales, submit to Natural Resources Wales for approval within the period specified, a pests management plan which identifies and minimises risks of pollution, hazard or annoyance from pests;

(b) implement the pests management plan, from the date of approval, unless otherwise agreed in writing by Natural resources Wales.

4 Information

4.1 Records

4.1.1 All records required to be made by this permit shall:

(a) be legible;

(b) be made as soon as reasonably practicable;

(c) if amended, be amended in such a way that the original and any subsequent amendments remain legible, or are capable of retrieval; and

(d) be retained, unless otherwise agreed in writing by Natural Resources Wales, for at least 6 years from the date when the records were made, or in the case of the following records until permit surrender:

(i) off-site environmental effects; and

(ii) matters which affect the condition of the land and groundwater.

4.1.2 The operator shall keep on site all records, plans and the management system required to be maintained by this permit, unless otherwise agreed in writing by Natural Resources Wales.

4.2 Reporting

4.2.1 The operator shall send all reports and notifications required by the permit to Natural Resources Wales using the contact details supplied in writing by Natural Resources Wales.

4.2.2 Within one month of the end of each quarter, the operator shall submit to Natural Resources Wales using the form made available for the purpose, the information specified on the form relating to the site and the waste accepted and removed from it during the previous quarter.

4.3 Notifications

4.3.1 Natural Resources Wales shall be notified without delay following the detection of:

(a) any malfunction, breakdown or failure of equipment or techniques, accident, or emission of a substance not controlled by an emission limit which has caused, is causing or may cause significant pollution;

(b) the breach of a limit specified in the permit; or

(c) any significant adverse environmental effects.

4.3.2 Any information provided under condition 4.3.1 shall be confirmed by sending the information listed in schedule 5 to this permit within the time period specified in that schedule.

4.3.3 Where Natural Resources Wales has requested in writing that it shall be notified when the operator is to undertake monitoring and/or spot sampling, the operator shall inform Natural Resources Wales when the relevant monitoring and/or spot sampling is to take place. The operator shall provide this information to Natural Resources Wales at least 14 days before the date the monitoring is to be undertaken.

4.3.4 Natural Resources Wales shall be notified within 14 days of the occurrence of the following matters, except where such disclosure is prohibited by Stock Exchange rules:

Where the operator is a registered company:

(a) any change in the operator's trading name, registered name or registered office address; and

(b) any steps taken with a view to the operator going into administration, entering into a company voluntary arrangement or being wound up.

Where the operator is a corporate body other than a registered company:

(a) any change in the operator's name or address; and

(b) any steps taken with a view to the dissolution of the operator.

In any other case:

(a) the death of any of the named operators (where the operator consists of more than one named individual);

(b) any change in the operator's name(s) or address(es); and

(c) any steps taken with a view to the operator, or any one of them, going into bankruptcy, entering into a composition or arrangement with creditors, or, in the case of them being in a partnership, dissolving the partnership.

4.3.5 Where the operator proposes to make a change in the nature or functioning, or an extension of the activities, which may have consequences for the environment and the change is not otherwise the subject of an application for approval under the Regulations or this permit:

(a) Natural Resources Wales shall be notified at least 14 days before making the change; and

(b) the notification shall contain a description of the proposed change in operation.

4.4 Interpretation

4.4.1 In this permit the expressions listed in schedule 6 shall have the meaning given in that schedule.

4.4.2 In this permit references to reports and notifications mean written reports and notifications, except where reference is made to notification being made "without delay", in which case it may be provided by telephone.

Schedule 1 - Operations

Table S1.1 activities		
	Description of activities for waste operations	**Limits of activities**
A1 Hazardous & non-hazardous household, commercial and industrial waste transfer station with treatment and asbestos storage	**R3**: Recycling/reclamation of organic substances which are not used as solvents **R4**: Recycling/reclamation of metals and metal compounds **R5**: Recycling/reclamation of other inorganic compounds **R13**: Storage of waste pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced) **D15:** Storage pending any of the operations numbered D1 to D14 (excluding temporary storage, pending collection, on the site where it is produced) **D9:** Physico-chemical treatment not specified elsewhere in this Annex which results in final compounds or mixtures which are discarded by means of any of the operations numbered D 1 to D 12 (e.g. evaporation, drying, calcination, etc.)	All hazardous and non-hazardous waste must be stored and treated on an impermeable surface with sealed drainage. Following treatement, specified wastes – wood (treated and untreated) and hard plastics may be stored on hardstanding. All inert waste may be stored and treated on either hardstanding or on an impermeable surface with sealed drainage. Treatment operations shall be limited to manual and/or mechanical: – sorting – separation and segregation – cutting – pulverising – chipping – screening – baling – bulking – wrapping – repackaging – shredding – blending or mixing – crushing or compaction of non-hazardous waste into different components for disposal (no more than 50 tonnes per day) or recovery. There shall be no treatment of: – waste electronic and electrical equipment – waste batteries and/or accumulators – asbestos waste – hazardous waste other than bulking up for onward transfer. Asbestos waste shall be double bagged and stored within clearly identified, segregated, secure, lockable containers on an impermeable surface with sealed drainage. The maximum quantity of hazardous waste that can be stored at the site in total for recovery or disposal, (excluding end of life vechicles and/or waste electrical and electronic equipment stored pending manual dismantling, repair or refurbishment), shall not exceed 50 tonnes at any one time.

		The maximum quantity of waste slags and/or ashes that can be treated, in total, at the site for recovery or a mix of recovery and disposal shall not exceed 75 tonnes per day. The maximum quantity of waste slags and/or ashes that can be treated, in total, at the site for disposal shall not exceed 50 tonnes per day. Waste types as specified in Table 2.1
A2 End-of-Life (ELV) storage, depollution & dismantling	**R13**: Storage of waste pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced) **R4**: Recycling/reclamation of metals and metal compounds **R5**: Recycling/reclamation of other inorganic compounds **D15**: Storage pending any of the operations numbered D01 to D14 (excluding temporary storage pending collection on the site where it is produced).	All hazardous and non-hazardous waste must be stored and treated on an impermeable surface with sealed drainage. Storage of lead acid batteries must be in containers with an impermeable, acid resistant base and a cover to prevent ingress of water. Treatment operations shall be limited to manual: – depollution of waste motor vehicles – sorting – separation – grading – shearing – baling – bulking – compacting – granulating and – cutting of waste into different components for recovery and/or disposal. There shall be no treatment of: – waste batteries and/or accumulators – breakpads containing asbestos – hazardous waste other than bulking up for onward transfer. Depollution will take place in a building on an impermeable surface with sealed drainage. Depolluted vehicles may be stored on hardstanding or an impermeable surface with sealed drainage. Waste types as specified in Table 2.2
A3 Inert and excavation waste transfer station with treatment	**R13**: Storage of waste pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced)	All non-hazardous waste must be stored and treated on an impermeable surface with sealed drainage. All inert waste may be stored and treated on either hardstanding or on an impermeable surface with sealed drainage.

	R3: Recycling/reclamation of organic substances which are not used as solvents **R5**: Recycling/reclamation of other inorganic compounds	Treatment operations shall be limited to manual and/or mechanical: – sorting – separation and segregation – washing – screening – crushing – blending and – bulking of waste for recovery as a soil, soil substitute or aggregate for recovery only. Waste types as specified in Table 2.3
A4 Dewatering of street sweepings/gully suckings	**R13**: Storage of waste pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced) **R3**: Recycling/reclamation of organic substances which are not used as solvents **R4**: Recycling/reclamation of metals and metal compounds **R5**: Recycling/reclamation of other inorganic compounds **D9:** Physico-chemical treatment not specified elsewhere in this Annex which results in final compounds or mixtures which are discarded by means of any of the operations numbered D 1 to D 12 (e.g. evaporation, drying, calcination, etc.) **D15**: Storage pending any of the operations numbered D01 to D14 (excluding temporary storage pending collection on the site where it is produced).	All non-hazardous waste must be stored and treated on an impermeable surface with sealed drainage. Treatment operations shall be limited to the dewatering of street sweepings/gully suckings only by: – sorting – separation – dewatering – segregation and – screening of waste into different components for recovery/disposal. The maximum quantity of non-hazardous waste that can be treated, in total, at the site for disposal shall not exceed 50 tonnes per day. There shall be no biological treatment of street sweepings/gully suckings. Waste types as specified in Table 2.4
	Discharge of integral site drainage (process effluent) from the emission points indicated on the drainage plan reference 10915-000-D as incorporated in Table S1.2 of this permit.	Drainage to sewer firstly via silt settlement and storage tanks and then through an interceptor will consist solely of: - clean, rainfall dependant drainage from areas of the site not used in connection with the storage and/or treatment of waste. - run-off from the impermeable surface from areas of the site used to store and/or treat waste including the process effluent from the dewatering activity. No visible oil or grease shall be present in the discharge.

	There shall be no discharge from the buildings on site used to store and/or treat waste.

Table S1.2 Operating techniques

Description	Parts	Date Received
Technical Guidance Document: 'How to comply with your environmental permit'	All relevant sections	N/A
Sector Guidance Note IPPC S5.06: Guidance for the Recovery and Disposal of Hazardous and Non Hazardous Waste	All relevant sections	N/A
Application	Drainage Plan- Drawing No. 10915-000-D	22/01/15
	Section 5.3.1 of the Working Plan V2.0 (Nov 2014) – Outside Storage	
Additional information received via email request sent 14/07/15	Odour management plan v1.0	21/07/15
Additional information received via email request sent 25/06/15	Clarification on proposed activities section of email.	13/07/15
Additional information received vai email containing DRAFTv1 following telephone conversation on 22/09/15	Process checks for storing specified wastes and depolluted vehicles on hardstanding.	05/10/15

Schedule 2 - Waste types, raw materials and fuels

Table S2.1 Permitted waste types and quantities for hazardous & non-hazardous household, commercial and industrial waste transfer station with treatment and asbestos storage with treatment and asbestos storage	
Maximum quantity	The maximum quantity of waste to be accepted at the whole site shall not exceed 252,000 tonnes per year.
Exclusions	Wastes having any of the following characteristics shall not be accepted: • hazardous wastes • wastes consisting solely or mainly of dusts or powders • wastes which are odour producing or likely to be odorous
01	**WASTES RESULTING FROM EXPLORATION, MINING, QUARRYING, AND PHYSICAL AND CHEMICAL TREATMENT OF MINERALS**
01 01	**wastes from mineral excavation**
01 01 01	wastes from mineral metalliferous excavation
01 01 02	wastes from mineral non-metalliferous excavation
01 03	**wastes from physical and chemical processing of metalliferous minerals**
01 03 06	tailings other than those mentioned in 01 03 04 and 01 03 05
01 03 09	red mud from alumina production other than the wastes mentioned in 01 03 10
01 04	**wastes from physical and chemical processing of non-metalliferous minerals**
01 04 08	waste gravel and crushed rocks other than those mentioned in 01 04 07
01 04 09	waste sand and clays
01 04 11	wastes from potash and rock salt processing other than those mentioned in 01 04 07
01 04 12	tailings and other wastes from washing and cleaning of minerals other than those mentioned in 01 04 07 and 01 04 11
01 04 13	wastes from stone cutting and sawing other than those mentioned in 01 04 07
02	**WASTES FROM AGRICULTURE, HORTICULTURE, AQUACULTURE, FORESTRY, HUNTING AND FISHING, FOOD PREPARATION AND PROCESSING**
02 01	**wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing**
02 01 03	plant-tissue waste
02 01 04	waste plastics (except packaging)
02 01 07	wastes from forestry
02 01 10	waste metal
02 02	**wastes from the preparation and processing of meat, fish and other foods of animal origin**
02 02 03	materials unsuitable for consumption or processing
02 03	**wastes from fruit, vegetables, cereals, edible oils, cocoa, coffee, tea and tobacco preparation and processing; conserve production; yeast and yeast extract production, molasses preparation and fermentation**
02 03 04	materials unsuitable for consumption or processing
02 04	**wastes from sugar processing**
02 04 01	soil from cleaning and washing beet
02 04 02	off-specification calcium carbonate
02 05	**wastes from the dairy products industry**
02 05 01	materials unsuitable for consumption or processing
02 06	**wastes from the baking and confectionery industry**
02 06 01	materials unsuitable for consumption or processing
02 06 02	wastes from preserving agents
02 07	**wastes from the production of alcoholic and non-alcoholic beverages (except coffee, tea and cocoa)**
02 07 01	wastes from washing, cleaning and mechanical reduction of raw materials
02 07 02	wastes from spirits distillation
02 07 04	materials unsuitable for consumption or processing
03	**WASTES FROM WOOD PROCESSING AND THE PRODUCTION OF PANELS AND FURNITURE, PULP, PAPER AND CARDBOARD**

Table S2.1 Permitted waste types and quantities for hazardous & non-hazardous household, commercial and industrial waste transfer station with treatment and asbestos storage with treatment and asbestos storage	
Maximum quantity	The maximum quantity of waste to be accepted at the whole site shall not exceed 252,000 tonnes per year.
Exclusions	Wastes having any of the following characteristics shall not be accepted: • hazardous wastes • wastes consisting solely or mainly of dusts or powders • wastes which are odour producing or likely to be odorous
03 01	**wastes from wood processing and the production of panels and furniture**
03 01 01	waste bark and cork
03 01 05	sawdust, shavings, cuttings, wood, particle board and veneer other than those mentioned in 03 01 04
03 03	**wastes from pulp, paper and cardboard production and processing**
03 03 01	waste bark and wood
03 03 07	mechanically separated rejects from pulping of waste paper and cardboard
03 03 08	wastes from sorting of paper and cardboard destined for recycling
03 03 10	fibre rejects, fibre-, filler- and coating-sludges from mechanical separation
04	**WASTES FROM THE LEATHER, FUR AND TEXTILE INDUSTRIES**
04 01	**wastes from the leather and fur industry**
04 01 08	waste tanned leather (blue sheetings, shavings, cuttings, buffing dust) containing chromium
04 01 09	wastes from dressing and finishing
04 02	**wastes from the textile industry**
04 02 21	wastes from unprocessed textile fibres
04 02 22	wastes from processed textile fibres
06	**WASTES FROM INORGANIC CHEMICAL PROCESSES**
06 09	**wastes from the MSFU of phosphorous chemicals and phosphorous chemical processes**
06 09 02	phosphorous slag
06 09 04	calcium-based reaction wastes other than those mentioned in 06 09 03
06 11	**wastes from the manufacture of inorganic pigments and opacificiers**
06 11 01	calcium-based reaction wastes from titanium dioxide production
07	**WASTES FROM ORGANIC CHEMICAL PROCESSES**
07 02	**wastes from the MFSU of plastics, synthetic rubber and man-made fibres**
07 02 13	waste plastic
08	**WASTES FROM THE MANUFACTURE, FORMULATION, SUPPLY AND USE (MFSU) OF COATINGS (PAINTS, VARNISHES AND VITREOUS ENAMELS), ADHESIVES, SEALANTS AND PRINTING INKS**
08 01	**wastes from MFSU and removal of paint and varnish**
08 01 18	wastes from paint or varnish removal other than those mentioned in 08 01 17
09	**WASTES FROM THE PHOTOGRAPHIC INDUSTRY**
09 01	**wastes from the photographic industry**
09 01 07	photographic film and paper containing silver or silver compounds
09 01 08	photographic film and paper free of silver or silver compounds
09 01 10	single-use cameras without batteries
09 01 12	single-use cameras containing batteries other than those mentioned in 09 01 11
10	**WASTES FROM THERMAL PROCESSES**
10 01	**wastes from power stations and other combustion plants (except 19)**
10 01 01	bottom ash, slag and boiler dust (excluding boiler dust mentioned in 10 01 04)
10 01 05	calcium-based reaction wastes from flue-gas desulphurisation in solid form
10 01 07	calcium-based reaction wastes from flue-gas desulphurisation in sludge form
10 01 15	bottom ash, slag and boiler dust from co-incineration other than those mentioned in 10 01 14
10 01 19	wastes from gas cleaning other than those mentioned in 10 01 05, 10 01 07 and 10 01 18
10 01 24	sands from fluidised beds

Table S2.1 Permitted waste types and quantities for hazardous & non-hazardous household, commercial and industrial waste transfer station with treatment and asbestos storage with treatment and asbestos storage	
Maximum quantity	The maximum quantity of waste to be accepted at the whole site shall not exceed 252,000 tonnes per year.
Exclusions	Wastes having any of the following characteristics shall not be accepted: • hazardous wastes • wastes consisting solely or mainly of dusts or powders • wastes which are odour producing or likely to be odorous
10 02	**wastes from the iron and steel industry**
10 02 01	wastes from the processing of slag
10 02 02	unprocessed slag
10 02 08	solid wastes from gas treatment other than those mentioned in 10 02 07
10 02 10	mill scales
10 02 14	sludges and filter cakes from gas treatment other than those mentioned in 10 02 13
10 02 15	other sludges and filter cakes
10 03	**wastes from aluminium thermal metallurgy**
10 03 02	anode scraps
10 03 05	waste alumina
10 03 16	skimmings other than those mentioned in 10 03 15
10 03 18	carbon-containing wastes from anode manufacture other than those mentioned in 10 03 17
10 03 24	solid wastes from gas treatment other than those mentioned in 10 03 23
10 03 26	sludges and filter cakes from gas treatment other than those mentioned in 10 03 25
10 03 28	wastes from cooling-water treatment other than those mentioned in 10 03 27
10 03 30	wastes from treatment of salt slags and black drosses other than those mentioned in 10 03 29
10 04	**wastes from lead thermal metallurgy**
10 04 10	wastes from cooling-water treatment other than those mentioned in 10 04 09
10 05	**wastes from zinc thermal metallurgy**
10 05 01	slags from primary and secondary production
10 05 09	wastes from cooling-water treatment other than those mentioned in 10 05 08
10 05 11	dross and skimmings other than those mentioned in 10 05 10
10 06	**wastes from copper thermal metallurgy**
10 06 01	slags from primary and secondary production
10 06 02	dross and skimmings from primary and secondary production
10 06 10	wastes from cooling-water treatment other than those mentioned in 10 06 09
10 07	**wastes from silver, gold and platinum thermal metallurgy**
10 07 01	slags from primary and secondary production
10 07 02	dross and skimmings from primary and secondary production
10 07 03	solid wastes from gas treatment
10 07 05	sludges and filter cakes from gas treatment
10 07 08	wastes from cooling-water treatment other than those mentioned in 10 07 07
10 08	**wastes from other non-ferrous thermal metallurgy**
10 08 09	other slags
10 08 11	dross and skimmings other than those mentioned in 10 08 10
10 08 13	carbon-containing wastes from anode manufacture other than those mentioned in 10 08 12
10 08 14	anode scrap
10 08 18	sludges and filter cakes from flue-gas treatment other than those mentioned in 10 08 17
10 08 20	wastes from cooling-water treatment other than those mentioned in 10 08 19
10 09	**wastes from casting of ferrous pieces**
10 09 03	furnace slag
10 09 06	casting cores and moulds which have not undergone pouring other than those mentioned in 10 09 05
10 09 08	casting cores and moulds which have undergone pouring other than those mentioned in 10 09 07

Table S2.1 Permitted waste types and quantities for hazardous & non-hazardous household, commercial and industrial waste transfer station with treatment and asbestos storage with treatment and asbestos storage	
Maximum quantity	The maximum quantity of waste to be accepted at the whole site shall not exceed 252,000 tonnes per year.
Exclusions	Wastes having any of the following characteristics shall not be accepted: • hazardous wastes • wastes consisting solely or mainly of dusts or powders • wastes which are odour producing or likely to be odorous
10 09 14	waste binders other than those mentioned in 10 09 13
10 09 16	waste crack-indicating agent other than those mentioned in 10 09 15
10 10	**wastes from casting of non-ferrous pieces**
10 10 03	furnace slag
10 10 06	casting cores and moulds which have not undergone pouring, other than those mentioned in 10 10 05
10 10 08	casting cores and moulds which have undergone pouring, other than those mentioned in 10 10 07
10 10 14	waste binders other than those mentioned in 10 10 13
10 10 16	waste crack-indicating agent other than those mentioned in 10 10 15
10 11	**wastes from manufacture of glass and glass products**
10 11 03	waste glass-based fibrous materials
10 11 10	waste preparation mixture before thermal processing, other than those mentioned in 10 11 09
10 11 12	waste glass other than those mentioned in 10 11 11
10 11 16	solid wastes from flue-gas treatment other than those mentioned in 10 11 15
10 11 18	sludges and filter cakes from flue-gas treatment other than those mentioned in 10 11 17
10 12	**wastes from manufacture of ceramic goods, bricks, tiles and construction products**
10 12 01	waste preparation mixture before thermal processing
10 12 05	sludges and filter cakes from gas treatment
10 12 06	discarded moulds
10 12 08	waste ceramics, bricks, tiles and construction products (after thermal processing)
10 12 10	solid wastes from gas treatment other than those mentioned in 10 12 09
10 12 12	wastes from glazing other than those mentioned in 10 12 11
10 13	**wastes from manufacture of cement, lime and plaster and articles and products made from them**
10 13 01	waste preparation mixture before thermal processing
10 13 04	wastes from calcination and hydration of lime
10 13 07	sludges and filter cakes from gas treatment
10 13 10	wastes from asbestos-cement manufacture other than those mentioned in 10 13 09
10 13 11	wastes from cement-based composite materials other than those mentioned in 10 13 09 and 10 13 10
10 13 13	solid wastes from gas treatment other than those mentioned in 10 13 12
10 13 14	waste concrete and concrete sludge
11	**WASTES FROM CHEMICAL SURFACE TREATMENT AND COATING OF METALS AND OTHER MATERIALS; NON-FERROUS HYDRO-METALLURGY**
11 01	**wastes from chemical surface treatment and coating of metals and other materials (for example galvanic processes, zinc coating processes, pickling processes, etching, phosphating, alkaline degreasing, anodising)**
11 01 10	sludges and filter cakes other than those mentioned in 11 01 09
11 01 14	degreasing wastes other than those mentioned in 11 01 13
11 02	**wastes from non-ferrous hydrometallurgical processes**
11 02 03	wastes from the production of anodes for aqueous electrolytical processes
11 02 06	wastes from copper hydrometallurgical processes other than those mentioned in 11 02 05
11 05	**wastes from hot galvanising processes**
11 05 01	hard zinc
11 05 02	zinc ash

Table S2.1 Permitted waste types and quantities for hazardous & non-hazardous household, commercial and industrial waste transfer station with treatment and asbestos storage with treatment and asbestos storage	
Maximum quantity	The maximum quantity of waste to be accepted at the whole site shall not exceed 252,000 tonnes per year.
Exclusions	Wastes having any of the following characteristics shall not be accepted: • hazardous wastes • wastes consisting solely or mainly of dusts or powders • wastes which are odour producing or likely to be odorous
12	**WASTES FROM SHAPING AND PHYSICAL AND MECHANICAL SURFACE TREATMENT OF METALS AND PLASTICS**
12 01	**wastes from shaping and physical and mechanical surface treatment of metals and plastics**
12 01 01	ferrous metal filings and turnings
12 01 03	non-ferrous metal filings and turnings
12 01 04	non-ferrous metal dust and particles
12 01 05	plastics shavings and turnings
12 01 13	welding wastes
12 01 17	waste blasting material other than those mentioned in 12 01 16
12 01 21	spent grinding bodies and grinding materials other than those mentioned in 12 01 20
15	**WASTE PACKAGING, ABSORBENTS, WIPING CLOTHS, FILTER MATERIALS AND PROTECTIVE CLOTHING NOT OTHERWISE SPECIFIED**
15 01	**packaging (including separately collected municipal packaging waste)**
15 01 01	paper and cardboard packaging
15 01 02	plastic packaging
15 01 03	wooden packaging
15 01 04	metallic packaging
15 01 05	composite packaging
15 01 06	mixed packaging
15 01 07	glass packaging
15 01 09	textile packaging
15 02	**absorbents, filter materials, wiping cloths and protective clothing**
15 02 03	absorbents, filter materials, wiping cloths and protective clothing other than those mentioned in 15 02 02
16	**WASTES NOT OTHERWISE SPECIFIED IN THE LIST**
16 01	**end-of-life vehicles from different means of transport (including off-road machinery) and wastes from dismantling of end-of-life vehicles and vehicle maintenance (except 13, 14, 16 06 and 16 08)**
16 01 03	end-of-life tyres
16 01 17	ferrous metal
16 01 18	non-ferrous metal
16 01 19	plastic
16 02	**wastes from electrical and electronic equipment**
16 02 11*	discarded equipment containing chlorofluorocarbons, HCFC, HFC
16 02 13*	discarded equipment containing hazardous components other than those mentioned in 16 02 09 to 16 02 12
16 02 14	discarded equipment other than those mentioned in 16 02 09 to 16 02 13
16 02 16	components removed from discarded equipment other than those mentioned in 16 02 15
16 03	**off-specification batches and unused products**
16 03 04	inorganic wastes other than those mentioned in 16 03 03
16 03 06	organic wastes other than those mentioned in 16 03 05
16 06	**batteries and accumulators**
16 06 04	alkaline batteries (except 16 06 03)
16 06 05	other batteries and accumulators
16 11	**waste linings and refractories**

Table S2.1 Permitted waste types and quantities for hazardous & non-hazardous household, commercial and industrial waste transfer station with treatment and asbestos storage with treatment and asbestos storage	
Maximum quantity	The maximum quantity of waste to be accepted at the whole site shall not exceed 252,000 tonnes per year.
Exclusions	Wastes having any of the following characteristics shall not be accepted: • hazardous wastes • wastes consisting solely or mainly of dusts or powders • wastes which are odour producing or likely to be odorous
16 11 02	carbon-based linings and refractories from metallurgical processes other than those mentioned in 16 11 01
16 11 04	other linings and refractories from metallurgical processes other than those mentioned in 16 11 03
16 11 06	linings and refractories from non-metallurgical processes other than those mentioned in 16 11 05
17	**CONSTRUCTION AND DEMOLITION WASTES (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)**
17 01	**concrete, bricks, tiles and ceramics**
17 01 01	concrete
17 01 02	bricks
17 01 03	tiles and ceramics
17 01 07	mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06
17 02	**wood, glass and plastic**
17 02 01	wood
17 02 02	glass
17 02 03	plastic
17 03	**bituminous mixtures, coal tar and tarred products**
17 03 02	bituminous mixtures other than those mentioned in 17 03 01
17 04	**metals (including their alloys)**
17 04 01	copper, bronze, brass
17 04 02	aluminium
17 04 03	lead
17 04 04	zinc
17 04 05	iron and steel
17 04 06	tin
17 04 07	mixed metals
17 04 11	cables other than those mentioned in 17 04 10
17 05	**soil (including excavated soil from contaminated sites), stones and dredging spoil**
17 05 04	soil and stones other than those mentioned in 17 05 03
17 05 08	track ballast other than those mentioned in 17 05 07
17 06	**insulation materials and asbestos-containing construction materials**
17 06 01*	insulation materials containing asbestos
17 06 04	insulation materials other than those mentioned in 17 06 01 and 17 06 03
17 06 05*	construction materials containing asbestos
17 08	**gypsum-based construction material**
17 08 02	gypsum-based construction materials other than those mentioned in 17 08 01
17 09	**other construction and demolition wastes**
17 09 04	mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03
19	**WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE**
19 01	**wastes from incineration or pyrolysis of waste**
19 01 02	ferrous materials removed from bottom ash

Table S2.1 Permitted waste types and quantities for hazardous & non-hazardous household, commercial and industrial waste transfer station with treatment and asbestos storage with treatment and asbestos storage	
Maximum quantity	The maximum quantity of waste to be accepted at the whole site shall not exceed 252,000 tonnes per year.
Exclusions	Wastes having any of the following characteristics shall not be accepted: • hazardous wastes • wastes consisting solely or mainly of dusts or powders • wastes which are odour producing or likely to be odorous
19 01 12	bottom ash and slag other than those mentioned in 19 01 11
19 01 18	pyrolysis wastes other than those mentioned in 19 01 17
19 01 19	sands from fluidised beds
19 02	**wastes from physico/chemical treatments of waste (including dechromatation, decyanidation, neutralisation)**
19 02 03	premixed wastes composed only of non-hazardous wastes
19 02 10	combustible wastes other than those mentioned in 19 02 08 and 19 02 09
19 04	**vitrified waste and wastes from vitrification**
19 04 01	vitrified waste
19 05	**wastes from aerobic treatment of solid wastes**
19 05 01	non-composted fraction of municipal and similar wastes
19 05 02	non-composted fraction of animal and vegetable waste
19 05 03	off-specification compost
19 12	**wastes from the mechanical treatment of waste (for example sorting, crushing, compacting, pelletising) not otherwise specified**
19 12 01	paper and cardboard
19 12 02	ferrous metal
19 12 03	non-ferrous metal
19 12 04	plastic and rubber
19 12 05	glass
19 12 07	wood other than that mentioned in 19 12 06
19 12 08	textiles
19 12 09	minerals (for example sand, stones)
19 12 10	combustible waste (refuse derived fuel)
19 12 12	other wastes (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 19 12 11
19 13	**wastes from soil and groundwater remediation**
19 13 02	solid wastes from soil remediation other than those mentioned in 19 13 01
20	**MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS**
20 01	**separately collected fractions (except 15 01)**
20 01 01	paper and cardboard
20 01 02	glass
20 01 08	biodegradable kitchen and canteen waste
20 01 10	clothes
20 01 11	textiles
20 01 23*	discarded equipment containing chlorofluorocarbons
20 01 34	batteries and accumulators other than those mentioned in 20 01 33
20 01 35*	discarded electrical and electronic equipment other than those mentioned in 20 01 21 and 20 01 23 containing hazardous components
20 01 36	discarded electrical and electronic equipment other than those mentioned in 20 01 21, 20 01 23 and 20 01 35
20 01 38	wood other than that mentioned in 20 01 37
20 01 39	plastics
20 01 40	metals
20 01 41	wastes from chimney sweeping

Table S2.1 Permitted waste types and quantities for hazardous & non-hazardous household, commercial and industrial waste transfer station with treatment and asbestos storage with treatment and asbestos storage	
Maximum quantity	The maximum quantity of waste to be accepted at the whole site shall not exceed 252,000 tonnes per year.
Exclusions	Wastes having any of the following characteristics shall not be accepted: • hazardous wastes • wastes consisting solely or mainly of dusts or powders • wastes which are odour producing or likely to be odorous
20 02	**garden and park wastes (including cemetery waste)**
20 02 01	biodegradable waste
20 02 02	soil and stones
20 03	**other municipal wastes**
20 03 01	mixed municipal waste
20 03 02	waste from markets
20 03 03	street-cleaning residues
20 03 07	bulky waste

Table S2.2 Permitted waste types and quantities for End-of-Life (ELV) storage, depollution & dismantling	
Maximum quantity	The maximum quantity of waste to be accepted at the whole site shall not exceed 252,000 tonnes per year.
Exclusions	Wastes having any of the following characteristics shall not be accepted: • hazardous wastes • wastes consisting solely or mainly of dusts or powders • wastes which are odour producing or likely to be odorous
16	**WASTES NOT OTHERWISE SPECIFIED IN THE LIST**
16 01	**end-of-life vehicles from different means of transport (including off-road machinery) and wastes from dismantling of end-of-life vehicles and vehicle maintenance (except 13, 14, 16 06 and 16 08)**
16 01 03	end-of-life tyres
16 01 04*	end-of-life vehicles
16 01 06	end-of-life vehicles, containing neither liquids nor other hazardous components
16 01 07*	oil filters
16 01 11*	brake pads containing asbestos
16 01 12	brake pads other than those mentioned in 16 01 11
16 06	**batteries and accumulators**
16 06 01*	lead batteries
16 06 05	other batteries and accumulators

Table S2.3 Permitted waste types and quantities for the inert & excavation waste transfer station with treatment	
Maximum quantity	The maximum quantity of waste to be accepted at the whole site shall not exceed 252,500 tonnes per year.
Exclusions	Wastes having any of the following characteristics shall not be accepted: • hazardous wastes • wastes consisting solely or mainly of dusts or powders • wastes which are odour producing or likely to be odorous
01	**WASTES RESULTING FROM EXPLORATION, MINING, QUARRYING, AND PHYSICAL AND CHEMICAL TREATMENT OF MINERALS**
01 04	**wastes from physical and chemical processing of non-metalliferous minerals**
01 04 08	waste gravel and crushed rocks other than those mentioned in 01 04 07
01 04 09	waste sand and clays
01 04 12	tailings and other wastes from washing and cleaning of minerals other than those mentioned in 01 04 07 and 01 04 11
01 04 13	wastes from stone cutting and sawing other than those mentioned in 01 04 07
02	**WASTES FROM AGRICULTURE, HORTICULTURE, AQUACULTURE, FORESTRY, HUNTING AND FISHING, FOOD PREPARATION AND PROCESSING**
02 01	**wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing**
02 01 07	wastes from forestry
02 04	**wastes from sugar processing**
02 04 01	soil from cleaning and washing beet
08	**WASTES FROM THE MANUFACTURE, FORMULATION, SUPPLY AND USE (MFSU) OF COATINGS (PAINTS, VARNISHES AND VITREOUS ENAMELS), ADHESIVES, SEALANTS AND PRINTING INKS**
08 01	wastes from MFSU and removal of paint and varnish
08 01 18	wastes from paint or varnish removal other than those mentioned in 08 01 17
12	**WASTES FROM SHAPING AND PHYSICAL AND MECHANICAL SURFACE TREATMENT OF METALS AND PLASTICS**
12 01	wastes from shaping and physical and mechanical surface treatment of metals and plastics
12 01 17	waste blasting material other than those mentioned in 12 01 16
17	**CONSTRUCTION AND DEMOLITION WASTES (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)**
17 01	**concrete, bricks, tiles and ceramics**
17 01 01	concrete
17 01 02	bricks
17 01 03	tiles and ceramics
17 01 07	mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06
17 02	**wood, glass and plastic**
17 02 01	wood (restricted to untreated wood only)
17 02 02	glass
17 03	**bituminous mixtures, coal tar and tarred products**
17 03 02	bituminous mixtures other than those mentioned in 17 03 01
17 05	**soil (including excavated soil from contaminated sites), stones and dredging spoil**
17 05 04	soil and stones other than those mentioned in 17 05 03
17 05 06	dredging spoil other than those mentioned in 17 05 05
17 05 08	track ballast other than those mentioned in 17 05 07
19	**WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE**
19 12	**wastes from the mechanical treatment of waste (for example sorting, crushing, compacting, pelletising) not otherwise specified**
19 12 07	wood other than that mentioned in 19 12 06 (restriction: untreated wood only)
19 12 09	minerals (for example sand, stones)

Table S2.3 Permitted waste types and quantities for the inert & excavation waste transfer station with treatment	
Maximum quantity	The maximum quantity of waste to be accepted at the whole site shall not exceed 252,500 tonnes per year.
Exclusions	Wastes having any of the following characteristics shall not be accepted: • hazardous wastes • wastes consisting solely or mainly of dusts or powders • wastes which are odour producing or likely to be odorous
19 12 12	other wastes (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 19 12 11
19 13	**wastes from soil and groundwater remediation**
19 13 02	solid wastes from soil remediation other than those mentioned in 19 13 01
20	**MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS**
20 02	**garden and park wastes (including cemetery waste)**
20 02 02	soil and stones

Table S2.4 Permitted waste types and quantities for road sweepings and gully waste processing	
Maximum quantity	The maximum quantity of waste to be accepted at the whole site shall not exceed 252,000 tonnes per year.
Exclusions	Wastes having any of the following characteristics shall not be accepted: • hazardous wastes • wastes consisting solely or mainly of dusts or powders • wastes which are odour producing or likely to be odorous
20	**MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS**
20 03	**other municipal wastes**
20 03 03	street-cleaning residues

Schedule 3 – Emissions and monitoring

There are no emission limits or associated monitoring requirements.

Schedule 4 - Reporting

There is no reporting under this schedule.

Schedule 5 - Notification

These pages outline the information that the operator must provide.

Units of measurement used in information supplied under Part A and B requirements shall be appropriate to the circumstances of the emission. Where appropriate, a comparison should be made of actual emissions and authorised emission limits.

If any information is considered commercially confidential, it should be separated from non-confidential information, supplied on a separate sheet and accompanied by an application for commercial confidentiality under the provisions of the EP Regulations.

Part A

Permit Number	
Name of operator	
Location of Facility	
Time and date of the detection	

(a) Notification requirements for any malfunction, breakdown or failure of equipment or techniques, accident, or emission of a substance not controlled by an emission limit which has caused, is causing or may cause significant pollution	
To be notified within 24 hours of detection	
Date and time of the event	
Reference or description of the location of the event	
Description of where any release into the environment took place	
Substances(s) potentially released	
Best estimate of the quantity or rate of release of substances	
Measures taken, or intended to be taken, to stop any emission	
Description of the failure or accident.	

(b) Notification requirements for the breach of a limit	
To be notified within 24 hours of detection unless otherwise specified below	
Emission point reference/ source	
Parameter(s)	
Limit	
Measured value and uncertainty	
Date and time of monitoring	
Measures taken, or intended to be taken, to stop the emission	

Time periods for notification following detection of a breach of a limit	
Parameter	**Notification period**

(c) Notification requirements for the detection of any significant adverse environmental effect	
To be notified within 24 hours of detection	
Description of where the effect on the environment was detected	
Substances(s) detected	
Concentrations of substances detected	
Date of monitoring/sampling	

Part B - to be submitted as soon as practicable

Any more accurate information on the matters for notification under Part A.	
Measures taken, or intended to be taken, to prevent a recurrence of the incident	
Measures taken, or intended to be taken, to rectify, limit or prevent any pollution of the environment which has been or may be caused by the emission	
The dates of any unauthorised emissions from the facility in the preceding 24 months.	

Name*	
Post	
Signature	
Date	

* authorised to sign on behalf of the operator

Schedule 6 - Interpretation

"accident" means an accident that may result in pollution.

"Annex I" means Annex I to Directive 2008/98/EC of the European Parliament and of the Council on waste.

"Annex II" means Annex II to Directive 2008/98/EC of the European Parliament and of the Council on waste.

"application" means the application for this permit, together with any additional information supplied by the operator as part of the application and any response to a notice served under Schedule 5 to the EP Regulations.

"authorised officer" means any person authorised by Natural Resources Wales under section 108(1) of The Environment Act 1995 to exercise, in accordance with the terms of any such authorisation, any power specified in section 108(4) of that Act.

"best available treatment, recovery and recycling techniques" shall have the meaning given to it in the document published jointly by the Department for Environment, Food and Rural Affairs, the Welsh Assembly Government and the Scottish Executive on 27th November 2006, entitled "Guidance on Best Available Treatment, Recovery and Recycling Techniques (BATRRT) and Treatment of Waste Electrical and Electronic Equipment (WEEE).

"building" means a construction that has the objective of providing sheltering cover and minimising emissions of noise, particulate matter, odour and litter.

"D" means a disposal operation provided for in Annex I to Directive 2008/98/EC of the European Parliament and of the Council on waste.

"emissions of substances not controlled by emission limits" means emissions of substances to air, water or land from the activities, either from the emission points specified in schedule 3 or from other localised or diffuse sources, which are not controlled by an emission limit..

"End-of-Life Vehicles Directive" means Directive 2000/53/EC of the European Parliament and Council of 18 September 2000 on end-of-life vehicles.

"EP Regulations" means The Environmental Permitting (England and Wales) Regulations SI 2010 No.675 and words and expressions used in this permit which are also used in the Regulations have the same meanings as in those Regulations.

"groundwater" means all water, which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil.

"hazardous property" has the meaning in Annex lll of the Waste Framework Directive

"hazardous substance" means a substance classified as hazardous as a consequence of fulfilling the criteria laid down in parts 2 to 5 of Annex I to Regulation (EC) No 1272/2008

"hazardous waste" has the meaning given in the Hazardous Waste (Wales) Regulations 2005 (as amended)

"pests" means Birds, Vermin and Insects.

"quarter" means a calendar year quarter commencing on 1 January, 1 April, 1 July or 1 October.

"R" means a recovery operation provided for in Annex II to Directive 2008/98/EC of the European Parliament and of the Council on waste.

"waste code" means the six digit code referable to a type of waste in accordance with the List of Wastes (England)Regulations 2005, or List of Wastes (Wales) Regulations 2005, as appropriate, and in relation to hazardous waste, includes the asterisk.

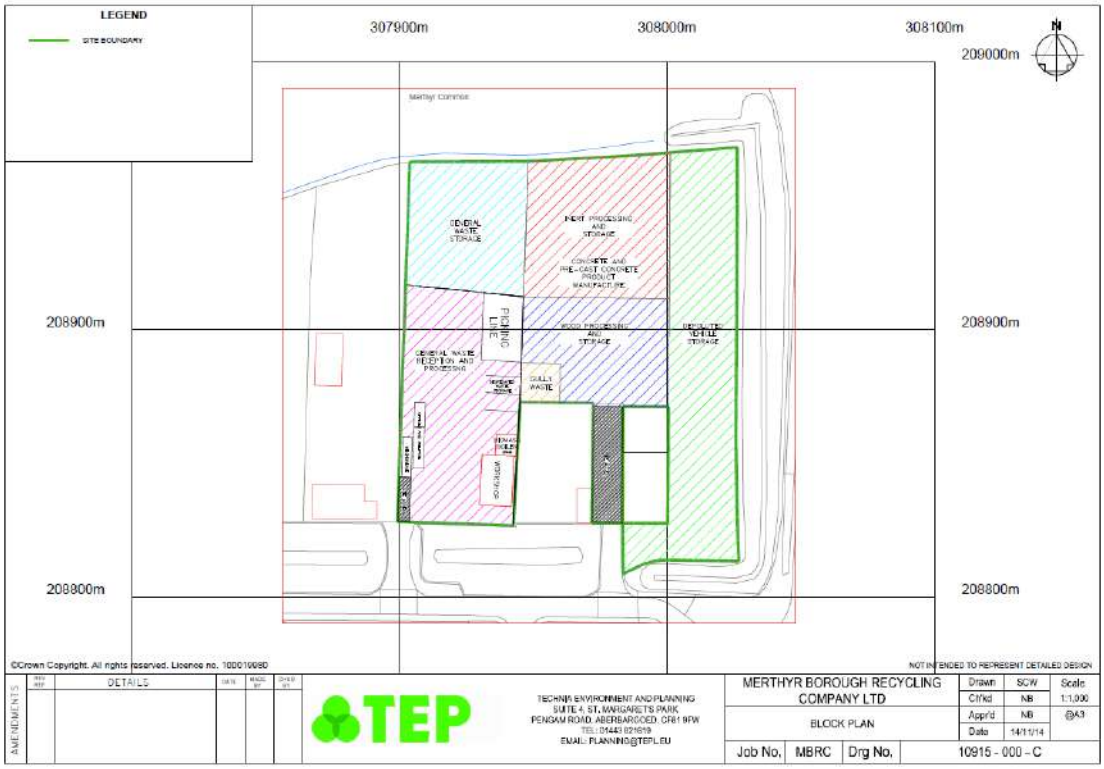
"Waste Framework Directive" or "WFD" means Waste Framework Directive 2008/98/EC of the European Parliament and of the Council on waste.

"WEEE" means waste electrical and electronic equipment.

"WEEE Directive" means Directive 2012/19/EU of the European Parliament and of the Council of 4th July 2012 on waste electrical and electronic equipment (WEEE).

"year" means calendar year ending 31 December.

Schedule 7 - Site plan



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END OF PERMIT

EP2 Waste Carrier's Licence

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Waste carriers, brokers and dealers public register

Field to Search: Business Registered Name

Show 10 entries

Search: Merthyr Borough

Registration Number	Business Registered Name	Address	Post Code	Registration Tier	Operator Type	Company Registration Number	Expiry Date
CBDU015236	Merthyr Borough Recycling Center	Unit 5 Penygarnddu Industrial Estate Merthyr Tydfil Merthyr Tydfil	CF48 2TA	Upper	Broker / Carrier / Dealer		19/03/2028

Showing 1 to 1 of 1 entries (filtered from 17,378 total entries)

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Last updated 29 Jul 2025

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Section Contents

Environmental Policy

PL1 Environmental Policy

PL1 Environmental Policy

ENVIRONMENTAL POLICY

We are committed to providing a quality service in a manner that ensures a safe and healthy workplace for our employees and all other stakeholders and minimises our potential impact on the environment. We will operate in compliance with all relevant environmental legislation and we will strive to use pollution prevention and environmental best practices in all we do.

We will:

- Integrate the consideration of environmental concerns and impacts into all of our decision making and activities.
- Promote environmental awareness among any employees and encourage them to work in an environmentally responsible manner.
- Train, educate and inform ant employees about environmental issues that may affect their work.
- Reduce waste through re-use and recycling and by purchasing recycled, recyclable or re-furbished products and materials where these alternatives are available, economical and suitable.
- Promote efficient use of raw materials and resources throughout our facility including water, electricity, raw materials and other resources, particularly those that are non-renewable.
- To minimise, reuse and recycle waste where possible.
- Avoid unnecessary use of hazardous materials and products, seek substitutions when feasible, and take all reasonable steps to protect human health and the environment when such materials must be used, stored and disposed of.
- Purchase and use environmentally responsible products accordingly.
- Where requires by legislation or where significant health, safety or environmental hazards exist, develop and maintain appropriate emergency and spill response programmes.
- Communicate our environmental commitment to clients, customers and the public and encourage them to support it.
- Strive to continually improve our environmental performance and minimise the social impact and damage of activities by periodically reviewing our environmental policy in light of our current and planned future activities.

N. Brannan.

SIGNED: .....

DATE: 03/09/24

POSITION: Director

Section Contents

Environmental Risk Assessments
RA1 Register of Environmental Risk Assessments
RA2 Environmental Risk Assessments

RA1 Register of Environmental Risk Assessments

No.	Risk Assessment	Review Date
SRA01	Site Risk Assessment for 2014 Permit Variation	10/10/2014
SRA02	Site Risk Assessment for 2022 Permit Variation	19/01/2021

RA2 Environmental Risk Assessments

Contents Page

Environmental Risk Assessment

Merthyr Borough Recycling Centre Limited

Unit 5,
Pengarnddu Business Park,
Dowlais,
Merthyr Tydfil,
CF48 2TA.

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Document Control Table

Project Reference	19/017d	
Project Title	Environmental Permit Variation Application	
Document Title	Appendix 3: Environmental Risk Assessment	
Document Issue No.	1	
Document Issue Date	20 January 2021	
Client	Merthyr Borough Recycling Centre Limited	
Report Produced by/Date	Harry Clifton	15 January 2021
Report Checked by/ Date	Tracey Westbury	19 January 2021

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Drawings

Drawing No. 10915 – 000 – A Location Plan

Drawing No. 19/017d 001 Sensitive Receptors Plan

1. Introduction

Brief

1.1. Westbury Environmental Limited have produced this Environmental Risk Assessment Report to support an Environmental Permit variation application for a waste operation on behalf of Merthyr Borough Recycling Centre Limited for the site at Unit 5, Pengarnddu Business Park, Dowlais, Merthyr Tydfil, CF48 2TA (Site).

1.2. The variation application seeks to make the following changes to the Environmental Permit Ref. EPR/ZP3899FX:

- Add drying of waste to the list of treatment activities in Activity Ref. A1, A2, A3, A4 in Table S1.1,
- Add the following non-hazardous List of Waste codes to Table S2.1:
  - 18 01 04 – 'wastes whose collection and disposal is not subject to special requirements in order to prevent infection (for example dressings, plaster casts, linen, disposable clothing, diapers)'.
  - 19 10 04 – 'fluff-light fraction and dust other than those mentioned in 19 10 03'
  - 20 02 03 – 'other non-biodegradable wastes'.
- Add the following hazardous List of Waste codes to Table S2.1:
  - 17 01 06* – 'mixtures of, or separate fractions of concrete, bricks, tiles and ceramics containing asbestos containing materials only'.
  - 17 02 04* – 'glass, plastic and wood containing or contaminated with hazardous substances'.
  - 17 03 01* – 'bituminous mixtures containing coal tar'.
  - 17 05 03* – 'soil and stones containing asbestos containing materials only'.
  - 17 05 07* – 'track ballast containing hazardous substances'.
  - 17 09 03* – 'other construction and demolition wastes containing hazardous substances'.
  - 19 12 06* – 'wood containing hazardous substances'.
  - 20 01 37* – 'wood containing hazardous substances'.
- Add hazardous waste treatment at a capacity of less than 10 tonnes per day to Activity Ref. A1 in Table S1.1. The treatment of hazardous waste will include shredding and drying of waste wood only.

1.3. An assessment of the potential risks to the environment from the additional activities proposed in the permit variation application is required by Natural Resource Wales's application form Part C2.

Scope

1.4. The Site is currently permitted for:

- a hazardous and non-hazardous household, commercial and industrial waste transfer station with treatment and storage of asbestos waste,
- end-of-life vehicles storage, depollution & dismantling,
- inert & excavation waste transfer station with treatment, and
- dewatering of street sweepings / gully suckings.

1.5. This Environmental Risk Assessment Report considers the risk associated with the proposed changes included in the permit variation application.

1.6. This report describes the site setting, identifies the nearby sensitive receptors and assesses the risk of the proposed operations to the local environment.

2. Site Location and Environmental Setting

Location

2.1. The Site is located within an industrial estate situated approximately 4km north east of Merthyr Tydfil town centre.

2.2. The permitted area extends to approximately 1.6 hectares, see Drawing No. 10915 – 000 – A Location Plan.

Receptors

2.3. Sensitive receptors in close vicinity to the Site are identified on the Drawing No. 19/017d 001 Sensitive Receptors Plan. A radius of 1km from the Site is included on the Sensitive Receptor Plan.

2.4. Table 1 shows the approximate distance and orientation (from the Site) of nearby sensitive receptors located within a 1km radius of the Site.

Table 1: Sensitive Receptors

No	Receptor	Type of receptor	Bearing from Site	Approx. Separation Distance (m)
1	Abba Scrap Metals Limited	Scrapyard – metal recycling operations	West	~0
2	Field Drain	Surface water course	North West	5
3	Kepak Group Limited	Installation – food preparation facility	East	30
4	Green Frog Dowlais	Power Station	West	40
5	Merthyr Common	Common land – used for hiking, agriculture.	North	50
6	Tenneco Walker UK Ltd	Manufacturer	South	80
7	Merthyr Salvage Ltd	Construction materials supplier	West	150
8	Heads Of The Valley Salvage	Scrapyard – metal recycling operations	South East	260
9	K & M Robins Garage	Vehicle repair shop	South	290
10	Comfortzone Merthyr	Furniture shop	South	290
11	Pond	Surface water feature	West	300
12	Dowlais Top Retail Park	Retail park	South West	310
13	CEMEX Concrete Plant	Concrete production facility	South	340
14	Jepson's Pond	Surface water feature	North East	450
15	Nearest residential dwelling	Residential dwelling	South West	550
16	Blaen-Morlais Farm	Farm	North West	650
17	Residential dwellings in Dowlais	Residential dwelling	South	700
18	Reservoir	Surface water feature	South West	720
19	Pitwellt Pond	Surface water feature	North	750

20	Dowlais Rugby Club	Recreational area	South West	830
21	Residential dwellings in Pant	Residential dwelling	West	900
22	Pant playing fields	Recreational area	West	970

2.5. The Site is bounded by Abba (a scrapyard) to the west, Kepak / St Merryn Food Group (an industrial butchers) to the east, Merthyr Common to the north and an access road for the industrial estate to the south.

2.6. The Site is located within Flood Zone A (Natural Resources Wales. Development Advice Map). There is a very low risk of flooding from rivers, the sea, surface water and reservoirs reported for the Site (Natural Resources Wales. Long-term Flood Risk Map).

2.7. There are no surface water courses located on the Site.

2.8. The Site is not located within a Groundwater Source Protection Zone.

2.9. The Site is located on a Secondary A designated bedrock aquifer and a Secondary (undifferentiated) designated superficial deposit aquifer.

Nature and Heritage Conservation Sites

2.10. The approximate distance and orientation (from the Site) of nature and heritage conservation sites located within 5km of the Site is given below:

- Cwm Taf Fechan Woodlands Site of Special Scientific Interest (SSSI) is located approximately 2.5km north west of the Site,
- Brecon Beacons National Park is located approximately 2.2km north west of the Site,
- Parc Bryn Bach Local Nature Reserve (LNR) is located approximately 4.2km east of the Site,

2.11. The potential impact of the proposed changes included in the permit variation application on the mentioned nature and heritage conservation sites is assessed in Table 3 Environmental Risk Assessment.

Baseline Environment

2.12. The predominant wind direction blows towards receptors to the northeast of the Site which includes Merthyr Common and Jepson's Pond (see Table 1: Sensitive Receptors).

3. Environmental Risk Assessment

Risk Estimation

3.1. Table 2 below shows the matrix for estimating the magnitude of risk of a potential hazard from considering both the probability and consequence of a hazard occurring. The magnitude of risk determines what level of management is required in order to reduce the environmental impact and the probability of the risk occurring.

Table 2: Estimating the Magnitude of Risk

Magnitude of Risk		Consequence			
		High	**Medium**	**Low**	**Negligible**
Probability	**High**	Very high	High	Medium/Low	Very low
	Medium	High	Medium	Low	Very low
	Low	High/Medium	Medium/Low	Low	Very low
	Negligible	High/Medium/Low	Medium/Low	Low	Negligible

3.2. Although Table 2 is a gross simplification that cannot represent the true complexity of risk assessment, it has been used as a guide in preparing this risk assessment report.

3.3. A risk assessment of the potential hazards associated with the proposed operation's that may cause harm to the environment has been completed using the method shown in Table 2, see Table 3 Environmental Risk Assessment.

Key Considerations

3.4. The following aspects have been taken into account when completing this Environmental Risk Assessment:

Data and Information

- Receptor
- Source / Hazard
- Harm
- Pathway

Judgement

- Probability of Exposure
- Consequences
- Magnitude of Risk

Action

- Justification for Magnitude
- Risk Management
- Residual Risk

Table 3: Environmental Risk Assessment

Data and Information				Judgement				Action (By Permitting)	
Receptor	**Source**	**Harm**	**Pathway**	**Probability of Exposure**	**Consequence**	**Magnitude of Risk**	**Justification for Magnitude**	**Risk Management**	**Residual Risk**
Local human population – Residential dwellings located within the vicinity of the Site. The nearest residential dwelling is located approximately 550m south west of the Site. Workers at nearby businesses. Merthyr Common located approximately 50m north of the Site Brecon Beacons National Park located approximately 2.2km north west of the Site Cwm Taf Fechan Woodlands SSSI located	Releases of dusts and micro-organisms (bioaerosols)	Harm to human health - respiratory irritation and illness	Air transport then inhalation	Medium	Medium	Medium	It is considered that the proposed changes to accept and treat additional specified waste codes, and the drying of waste will not increase the risk of dust emissions at the Site. The proposed permitted waste types do not include dusts, powders or loose fibres and have a low potential to produce bioaerosols. Movement of waste has the potential to emit dust. There is potential for increased dust generation from permitted activities during prolonged dry periods. It is considered that due to the size of the dust particles, the majority of dust is likely to be deposited within 50m of	A number of mitigation measures will be implemented to reduce the risk of dust nuisance. Vehicles entering and exiting the site will be sheeted in order to reduce the likelihood of dust emissions. Strict waste acceptance procedures will also be in place to ensure that excessively dusty loads are not accepted on Site. Water sprays will be used to minimise dust emissions from the movement of the waste. Dust mitigation measures will be implemented on Site through procedures contained within the Environmental Management System (EMS).	Low

approximately 2.5km north west of the Site Parc Bryn Bach LNR located approximately 4.2km east of the Site							the source. Receptors located within 50m of the Site include Abba Scrap Metals Limited, a field drain, Kepak Group Limited and Green Frog Dowlais. The nearest residential dwelling is located approximately 550m south west (upwind) of the Site. The predominant wind is from the south west. It is considered very unlikely that potential dust emissions would impact designated areas of conservation due to their distance and bearing from the Site.		
		Nuisance - dust on cars, clothing etc.	Air transport then deposition	Medium	Medium	Medium	As above.	As above.	Low

	Waste, Litter and mud on local roads.	Nuisance, loss of amenity, road traffic incidents.	Air transport then deposition, Vehicles entering and leaving the site.	Medium	Medium	Medium	Local residents are often sensitive to litter, mud on roads. The proposed permitted waste types have a low potential to produce litter. It is considered that the proposed changes to the permit will not increase the risk of mud and litter generated by the Site.	Any litter found will be collected and disposed of regularly to keep the Site tidy. Strict waste acceptance criteria will be applied within the Site's EMS to ensure incoming loads of waste that have a high litter content are rejected. A road sweeper shall be deployed if there is significant mud and debris on the industrial estate road.	Low
	Odour	Nuisance, loss of amenity	Air transport then inhalation	Medium	Medium	Medium	The addition of the drying of waste activity has the potential to cause odour but the waste types involved in this activity will not be putrescible in nature. Local residents often sensitive to odour, however it is considered that the proposed changes to the operations will not increase the risk of odour.	Waste imported onto the Site will be checked to ensure that it does not contain malodourous materials. The drying of waste is carried out within an enclosed building to minimise the risk of odour emissions from this activity.	Low
	Noise and vibration	Nuisance, loss of amenity, loss of sleep	Noise through the air and vibration through the ground	Low	Medium	Medium	Local residents often sensitive to noise and vibration. There are no large areas of human	All plant and equipment will be maintained in accordance with the manufacturers' recommendations to minimise noise generation.	Low

							population in close proximity to the Site. It is considered that the proposed changes will not increase the level of noise emissions from the Site. The only proposed additional waste treatment activity is drying which is not considered to be a noisy operation. There are no additional waste treatment activities proposed in the permit application. Screening, crushing, shredding and handling of waste is already undertaken on the site.		
Local human population – Residential dwellings located within the vicinity of the Site. The nearest residential dwelling is located approximately 550m south west of the Site. Workers at nearby businesses.	Scavenging animals and scavenging birds	Harm to human health - from waste carried off site and faeces. Nuisance and loss of amenity	Air transport and over land	Low	Medium	Low	It is considered that the proposed changes to the permit will not present an increased risk of scavenging animals and birds as the waste is not putrescible in nature.	Implementation of strict waste acceptance procedures will ensure that materials that could attract scavenging animals are not accepted on to the site. Housekeeping will minimise the risk from scavenging animals.	Low
	Pests (e.g. flies)	Harm to human health, nuisance, loss of amenity	Air transport and over land	Low	Medium	Low	As above.	As above.	Low

	Flooding of site	Run off produced from the Site	Flood waters	Low	Medium	Low	The proposed permitted waste types are not considered to increase the risk of run-off from the Site. Any waste washed off Site will add to the volume of the local post-flood clean-up workload, rather than the hazard. It is considered unlikely that the Site would flood, due to the Site not being located within a flood risk area.	The implementation of the EMS identifies and minimises risks of pollution, including those arising from operations, maintenance, accidents, incidents, non-conformances. These risks are outlined in the appropriate spill response procedures and the flood management procedures. Any liquids shall be provided with secondary containment.	Low
Local human population and / or livestock after gaining unauthorised access to the Site	All on-site hazards: wastes, machinery and vehicles	Bodily injury Respiratory illness i.e. lung cancer and mesothelioma	Direct physical contact with machinery or asbestos	Low	Medium	Medium	It is considered that the proposed changes to the permit will not increase the risk from unauthorised access by the local population or livestock. The buildings, equipment and machinery located on the site are secured outside of operation / manned hours.	The site is managed and operated in accordance with a EMS which includes site security measures to prevent unauthorized access. The site is constantly manned during operational hours. Access to the site is via a pair of 2.0m high steel palisade fence type gates with a 2.0m security fence enclosing the site boundary on four sides.	Low

Local human population – Residential dwellings located within the vicinity of the Site. The nearest residential dwelling is located approximately 550m south west of the Site. Workers at nearby businesses. Merthyr Common located approximately 50m north of the Site Brecon Beacons National Park located approximately 2.2km north west of the Site Cwm Taf Fechan Woodlands SSSI located approximately 2.5km north west of the Site Parc Bryn Bach LNR located approximately 4.2km east of the Site	Arson and / or vandalism causing the release of polluting materials to air (smoke or fumes), water or land.	Respiratory irritation, illness and nuisance to the local population. Injury to staff, firefighters or arsonists / vandals. Pollution of water or land.	Air transport of smoke. Spillages and contaminated firewater by direct run-off from site and via surface water drains and ditches	Low	Medium	Low	The existing activities include the storage and treatment of combustible waste types. It is not considered that the proposed additional waste operations and permitted waste types will increase the risk from arson / vandalism at the site.	A Fire Prevention & Mitigation Plan has been produced to provide details on preventing and suppressing fires with regard to the waste operations. Procedures contained within the EMS identify and minimise the risks of pollution, including those arising from operations, maintenance, accidents, incidents, non-conformances (including fire and spillages). The EMS contains procedures with regards to the risks from arson / vandalism i.e. site security procedures. .	Low
	Accidental fire causing the release of polluting materials to air (smoke or fumes), water or land.	Respiratory irritation, illness and nuisance to the local population. Injury to staff or firefighters. Pollution of water or land.	As above.	Medium	Medium	Medium	As above The drying of waste may potentially increase the risk of an accidental fire at the Site. The drying activities will temporarily increase the heat within waste piles, thus increasing the risk of self-combustion. It is not considered that the proposed additional waste operations and permitted waste types	As above Drying operations take place within a building and is usually completed within 24 hours. The drying bays within the building are not sealed i.e. the walls are not joined to the ceiling and the bays are fitted with double doors which close, but do not seal.	Low

							will increase the risk from fire at the Site.		
All surface waters close to and downstream of Site – the nearest surface water course is a field drain located approximately 5m north west of the site. The nearest surface water feature is a pond located approximately 300m west of the site.	Spillage of liquids, leachate from waste, contaminated run-off from waste e.g. containing suspended solids.	Acute effects: oxygen depletion, fish kill and algal blooms. Chronic effects: deterioration of water quality.	Direct run-off from site across ground surface, via surface water drains, ditches etc. Indirect run-off via the soil layer.	Low	Medium	Low	It is considered that there will be no increased risk to surface water courses within the vicinity of the site from the proposed changes included in the permit variation. There are no point source discharges to surface water proposed. There is a low potential for contaminated run-off from the site as hazardous and non-hazardous waste types will be stored and treated on impermeable surfacing with a sealed drainage system. The impermeable surfacing of the waste treatment and storage areas is laid to falls with a sealed drainage system i.e. an underground drainage tank.	Operations included on Site do not involve the processing of wet wastes nor any liquid treatment which may produce contaminated run off. All liquids (e.g. fuels) are provided with secondary containment. Tanks present on the site are maintained in accordance with manufacturer's instructions and inspected in a scheduled maintenance plan. Any spillages dealt with in accordance with the Spillage Procedure that is included in the EMS.	Low

Abstraction from watercourse downstream of facility (for agricultural or potable use)	As above	Acute effects, closure of abstraction intakes	Direct run-off from site across ground surface, via surface water drains, ditches, etc. then abstraction	Low	Medium	Low	As above.	As above.	Very low
Groundwater	As above.	Chronic effects: contamination of groundwater, requiring treatment of water or closure of borehole	Transport through soil / groundwater then extraction at borehole.	Low	Medium	Low	It is considered that the proposed changes included in the permit variation application will not significantly increase the risk to groundwater. There are no point source discharges to ground or groundwater proposed. The site is not located within a groundwater source protection zone.	All hazardous and non-hazardous waste types are stored and treated on impermeable surfacing with a sealed drainage system. The activities are located over 50 m from any spring or well, or from any borehole used to supply water for domestic or food production purposes or used for the supply of water for human consumption. All liquids (e.g. fuels) are provided with secondary containment. Tanks present on the site are maintained in accordance with manufacturer's instructions and inspected in a scheduled maintenance plan. Any spillages dealt with in accordance with the Spillage Procedure that is included in the EMS.	Low

Local human population	Contaminated waters used for recreational purposes	Harm to human health – skin damage or gastro-intestinal illness	Direct contact or ingestion	Low	Medium	Low	It is considered that there is no increased risk of the contamination of waters used for recreational purposes from the proposed changes included in the permit variation. There are no surface waters used for recreational purposes within close vicinity of the site.	There are no point source discharges to surface water from the site. All liquids (e.g. fuels) are provided with secondary containment. Tanks present on the site are maintained in accordance with manufacturer's instructions and inspected in a scheduled maintenance plan. Any spillages dealt with in accordance with the Spillage Procedure that is included in the EMS.	Very low
Protected sites Brecon Beacons National Park located approximately 2.2km north west of the Site Cwm Taf Fechan Woodlands SSSI located approximately 2.5km north west of the Site Parc Bryn Bach LNR located approximately 4.2km east of the Site	Any	Harm to protected sites through toxic contamination, nutrient enrichment, smothering, disturbance, predation etc.	Any	Low	Medium	Low	It is considered that the proposed changes included in the permit variation will not increase the risk to protected sites. The nearest protected site is located 2.2km north west of the Site.	Implementation of strict waste acceptance procedures will ensure that materials that could attract scavenging animals are not accepted on to the site. Housekeeping will minimise the risk from scavenging animals.	Low

4. Conclusions

4.1. This Environmental Risk Assessment assesses the risks posed to the environment from the proposed waste operations, including dust, litter, mud, odour, noise, scavenging animals, pests/vermin, flooding, contamination of surface/ground water and fire.

4.2. This Environmental Risk Assessment was produced to identify the potential increases in risk posed by the proposed changes in the permit variation application. It is considered that there will be a potential small increase in the risk to the local environment and human health (e.g. increased fire risk) from the proposed changes, however robust risk management measures are implemented to ensure this risk is minimised.

4.3. The drying of waste may increase the risk of a fire occurring on the Site. A Fire Prevention & Mitigation Plan has been produced in accordance with Natural Resources Wales Fire Prevention & Mitigation Plan Guidance – Waste Management, see Permit Application Report Appendix 1. This plan provides details on the measures implemented for preventing and suppressing potential fires from the waste operations carried out on the Site.

4.4. Drying operations take place within a building where waste is typically dried for a maximum of 24 hours. The drying bays within the building are not sealed i.e. the walls are not joined to the ceiling and the bays are fitted with double doors which close, but do not seal. It is considered that the risk of self-heating from the drying of waste and consequently the risk of fire will be minimised due to the short period of time (approx. 24 hours) that waste is stored in the drying bays for.

4.5. It is considered there is negligible increased risk posed by the proposed changes to the permit for the following sources / hazards and therefore the existing mitigation measures will be sufficient:

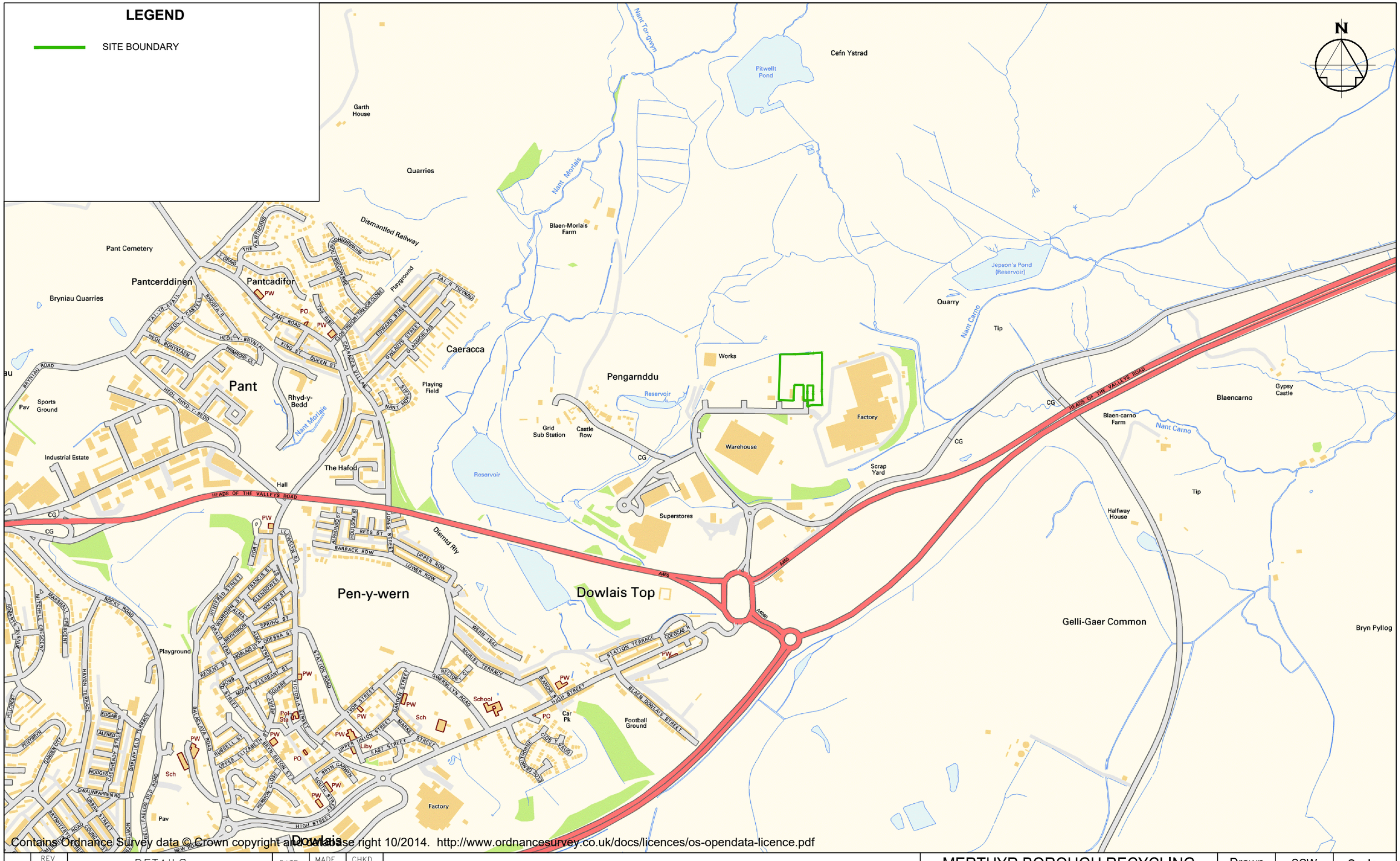
- Dust
- Litter
- Mud
- Odour
- Noise
- Scavenging animals
- Pests / vermin
- Flooding
- Unauthorised access / arson / vandalism
- Contamination of surface water / groundwater

4.6. The Site's EMS will be reviewed to ensure all the risk management actions identified in this Environmental Risk Assessment are implemented on Site.

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LEGEND

SITE BOUNDARY



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AMENDMENTS	REV REF	DETAILS	DATE	MADE BY	CHKD BY

TECHNIA ENVIRONMENT AND PLANNING
SUITE 4, ST. MARGARET'S PARK
PENGAM ROAD, ABERBARGOED, CF81 9FW
TEL: 01443 821619
EMAIL: PLANNING@TEPL.EU

MERTHYR BOROUGH RECYCLING COMPANY LTD				
		Drawn	SCW	Scale
		Ch'kd	NB	1:10,000
LOCATION PLAN		Appr'd	NB	@A3
		Date	29/09/14	
Job No.	MBRC	Drg No.	10915 - 000 - A	

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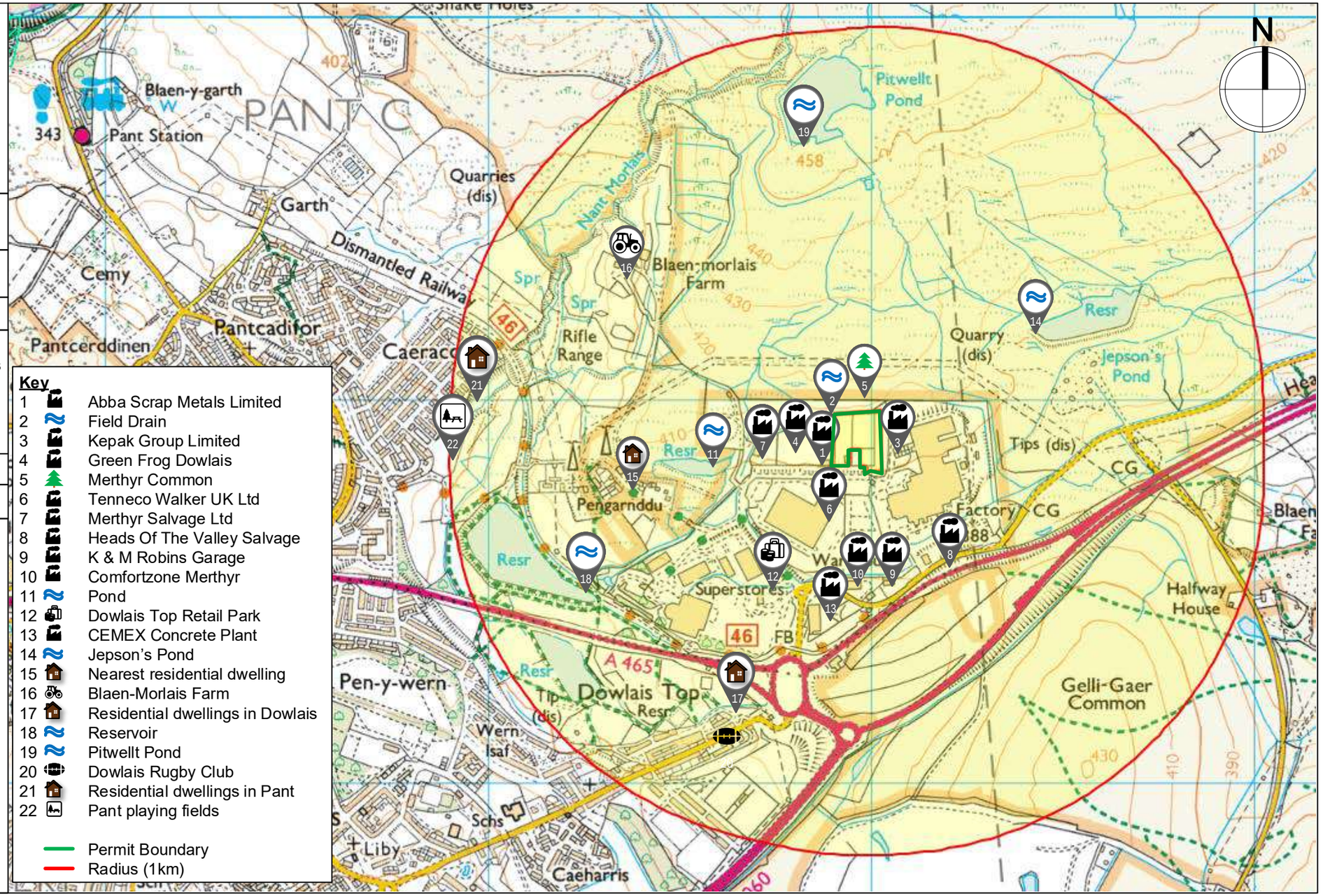
merthyr borough recycling centre

Client	**Merthyr Borough Recycling Centre Limited**
Title	Sensitive Receptors Plan
Drawing No.	19/017d 001
Site	Unit 5, Pengarnddu Business Park, Dowlais, Merthyr Tydfil, CF48 2TA.
Date	04/06/2020
Scale	1:12,000

WESTBURY ENVIRONMENTAL

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Section Contents

Environmental Impacts and Controls

IC1 Environmental Impacts and Controls

IC1 Environmental Impacts Plan and Controls

IC1 Environmental Impacts Plan and Controls

Table 1

Site Activity: **A1 Hazardous & non-hazardous household, commercial and industrial waste transfer station with treatment and asbestos storage**
A2 End-of-Life (ELV) storage, depollution & dismantling
A3 Inert and excavation waste transfer station with treatment
A4 Dewatering of street sweepings/gully suckings
Discharge of integral site drainage (process effluent)

The key pieces of environmental legislation affecting this sector are:

*(Add as many as apply to your site activities - **you should ensure that this list is kept up to date for your site and covers all applicable legislation**)*

- The Waste (England and Wales) Regulations 2011 (as amended by The Waste (England and Wales) (Amendment) Regulations 2012).
- Environmental Protection Act 1990
- Environmental Permitting (England and Wales) Regulations 2010 (SI 2010 No 675) (as amended by Explanatory Memorandum to Environmental Permitting (England and Wales) Regulations 2010, Environmental Permitting (England and Wales) (Amendment) Regulations 2010 (SI 2010 No 676), Environmental Permitting (England and Wales) (Amendment) (No. 2) Regulations 2010 (SI 2010 No 2172), Environmental Permitting (England and Wales) (Amendment) Regulations 2011 (SI 2011 No 2043), Environmental Permitting (England and Wales) (Amendment) (No 2) Regulations 2011 (SI 2011 No 2933), Environmental Permitting (England and Wales) (Amendment) Regulations 2013 (SI2013 No 390)
- Clean Neighbourhoods and Environment Act 2005
- Groundwater regulations 1998, SI 2746
- Water Resources Act 1991, as amended
- Hazardous Waste (England and Wales) Regulations 2005 as amended by Hazardous Waste (England and Wales) (Amendment) Regulations 2009)
- Control of Pollution (Oil Storage) (England) Regulations 2001, SI 2954
- Ozone-Depleting Substances Regulations 2015 (SI 2015/168)

Processes / Activities / Equipment at your site:
(insert H or M or L where applies)

List all the processes / activities / equipment at your site in these columns.

Then put an (H) high impact, or (M) medium impact, or (L) low impact in the box next to the process / activity / equipment if it can result in an environmental impact listed below under normal or abnormal operation.

- Emissions to Air (including dust) - **A**
- Energy Usage (e.g. electricity, gas, oil) - **E**
- Emissions to Water - **W**
- Waste Disposal - **D**
- Land Contamination - **L**
- Nuisance (i.e. noise or odour) **- N**
- Resource Consumption (e.g. water, chemicals, not energy) - **R**

Process / Activity/Equipment	A	E	W	D	L	N	R
Waste Acceptance/Tipping	M	L	M	L	L	M	L
Sorting (Non-haz.)	L	L	M	L	L	M	L
Separation, segregation (Non-haz.)	L	L	M	L	L	M	L
Cutting (Non-haz.)	M	M	L	L	L	M	L
Pulverising (Non-haz.)	M	M	L	L	L	M	L
Chipping (Non-haz.)	M	M	L	L	L	M	L
Screening (Non-haz.)	M	M	L	L	L	H	L
Baling (Non-haz.)	L	M	L	L	L	M	L
Bulking (Non-haz.)	L	L	L	L	L	M	L
Bulking (Haz.)	L	L	L	L	L	M	L
Wrapping (Non-haz.)	L	M	L	L	L	M	L
Repackaging (Non-haz.)	L	L	L	L	L	M	L
Shredding (Non-haz. wood)	H	M	L	L	L	H	L
Shredding (Haz. wood)	H	M	L	L	L	H	L
Blending or mixing (Non-haz.)	L	L	L	L	L	M	L
Crushing or compaction (Non-haz.)	L	M	L	L	L	M	L
Baling (Non-hazardous)	L	M	L	L	L	M	L
Storage (Non-haz.)	L	L	L	L	M	M	L
Sorting (Inert)	L	L	L	L	L	M	L
Separation, segregation (Inert)	L	L	L	L	L	M	L
Washing (Inert)	L	M	H	L	L	M	M
Screening (Inert)	M	M	L	L	L	H	L
Crushing (Inert)	H	M	L	L	L	H	L
Blending (Inert)	M	L	L	L	L	M	L
Bulking (Inert)	L	L	L	L	L	M	L

Process / Activity/Equipment	A	E	W	D	L	N	R
Sorting (Non-haz. street sweepings)	L	L	L	L	L	M	L
Separation (Non-haz. street sweepings)	L	L	L	L	L	M	L
Dewatering (Non-haz. street sweepings)	L	L	H	L	M	L	L
Segregation (Non-haz. street sweepings)	L	L	L	L	L	M	L
Screening (Non-haz. street sweepings)	M	M	L	L	L	H	L
Storage (Undepolluted ELV)	L	L	H	L	H	M	L
Depollution (Undepolluted ELV)	M	L	H	L	H	M	L
Sorting (Depolluted ELV)	L	L	L	L	L	L	L
Separation (Depolluted ELV)	L	L	L	L	L	L	L
Grading (Depolluted ELV)	L	L	L	L	L	L	L
Shearing (Depolluted ELV)	L	M	L	L	L	M	L
Baling (Depolluted ELV)	L	M	L	L	L	M	L
Bulking (Depolluted ELV)	L	L	L	L	L	L	L
Compacting (Depolluted ELV)	L	M	L	L	L	M	L
Granulating (Depolluted ELV)	M	M	L	L	L	M	L
Cutting (Depolluted ELV)	M	M	L	L	L	M	L
End disposal (Non-haz.)	L	L	L	M	M	L	L
End disposal (Haz.)	L	L	H	H	H	L	L
End disposal (Inert)	L	L	L	L	L	L	L
End disposal (Depolluted ELV)	L	L	L	M	M	L	L
Vehicle and plant usage	M	M	M	L	L	M	M
Site drainage	L	L	M	L	L	L	L
General business operations	L	M	L	M	L	L	M

For each Process / Activity / Equipment identified in the Table 1 above complete the following tables if there is an environmental impact [at least High (H) or Medium (M)] under normal or abnormal operation

Table 2A. Emissions to Air [A] ***(continue on separate sheet as required))***

Process / Activity / Equipment on Site	Potential Impact	Is impact controlled by equipment?	Is equipment included on maintenance checklist?	Is impact controlled by a procedure?	Person using the procedure received training?	Comments
Dust from waste acceptance/tipping, sorting, screening, shredding, crushing, cutting, granulating, pulverising, chipping, blending, depollution, vehicle movements	Potential for local air quality issues from nuisance dust (and a cause for complaints). Fugitive emission from machinery/waste movements.	Yes Surfaced areas and various dust suppression systems (water sprays, bowser)	Yes Refer to maintenance checklist (**FR5A** and **FR5B**)	Yes Accident/ Pollution Incident Procedure (**PR1**) Accident/ Pollution Incident Procedure - Fugitive Emissions (**PR7**)	Yes Refer to Training Matrix (**FR7**) and Training Records (**FR8**)	Under normal operating conditions dust generation should be minimised by checks on incoming waste (Waste Acceptance Procedure (**PR9**) controls the presence of dust generating materials), the use of surfaced areas, dust suppression systems on processing equipment and dust suppression systems used elsewhere within the site including a mist system within the WTS Building. Concrete and hardstand areas minimise the generation of dust from vehicle movements. Water spray systems to reduce dust generated by crushers, screens and shredders. Water sprays and mobile bowsers used to damp-down unsurfaced roadways and deposit for recovery areas when required. Operations ceased in high winds when nearby receptors could be

						affected by nuisance dust.
Air emissions from vehicle usage	Emissions of greenhouse gases	Yes	Yes	No	N/A	Manufacturer's standard equipment to meet EU engine emission controls. Vehicles maintained to ensure efficiency. Staff trained to consider impact of journeys, reducing mileage by journey planning, etc.

Table 2B. Energy Usage [E] ***(continue on separate sheet as required))***

Process / Activity / Equipment on Site	Potential Impact	Is impact controlled by equipment?	Is equipment included on maintenance checklist?	Is impact controlled by a procedure?	Person using the procedure received training?	Comments
Electricity/fuel usage for screening, shredding, cutting, pulverising, chipping, crushing, compacting, baling, wrapping, washing, shearing, granulating.	The impacts associated with electricity/fuel production are well documented (e.g. air emissions from fossil fuels).	No	Not Applicable	No	N/A	Energy usage minimised by selecting low energy equipment where possible.
Fuel consumption by vehicles and plant	Use of finite natural resources. Greenhouse gas emissions from consumption of fossil fuels.	Yes	Yes	No	N/A	Engine emissions controlled by manufacturer to EU standards. Vehicles maintained to ensure efficiency. Journey planning for collections/ deliveries.
Energy consumption by general operations e.g. electricity usage in offices, business travel, etc.	The impacts associated with electricity production are well documented (e.g. air emissions from fossil fuels). Use of finite natural resources. Greenhouse gas emissions from consumption of fossil fuels.	Yes - in part	Yes – in part **PR11**	No	N/A	Energy usage minimised by selecting low energy equipment where possible. Engine emissions controlled by manufacturer to EU standards. Vehicles maintained to ensure efficiency. Staff trained to consider impact of journeys, reducing mileage by journey planning, car sharing, etc.

Table 2C. Emissions to Water [W] ***(continue on separate sheet as required))***

Process / Activity / Equipment on Site	Potential Impact	Is impact controlled by equipment?	Is equipment included on maintenance checklist?	Is impact controlled by a procedure?	Person using the procedure received training?	Comments
Leaks and spills from: Tipping of incoming wastes Sorting/processing of wastes Depollution of ELVs Biodegradable wastes (leachate) Storage of waste Vehicle and plant usage Fuel and oil storage	Without mitigation measures in place leaks and spills from waste treatment and fuel/oil storage systems would contaminate surface water run-off with non-hazardous or hazardous liquids such as fuel, oils, leachate, etc. These would have potential to cause pollution of groundwater or surface waters and to contaminate land.	Yes - Containment systems (surfaced areas and drainage), spill kits, interceptors	Yes Refer to maintenance checklist (**FR5A** and **FR5B**)	Yes **PR1** - Accident/ Pollution Incident Procedure **PR3** - Accident/ Pollution Incident Procedure - Spillage	Yes Refer to Training Matrix (**FR7**) and Training Records (**FR8**)	Under normal operating conditions run-off from non-hazardous waste tipping, storage and treatment areas, vehicle storage and refuelling areas, should be contained within the site's surfaced areas and associated drainage systems. Waste Acceptance Procedure (**PR9**) to inspect incoming waste for liquid wastes. Tipping/Treatment/Storage of hazardous and non-hazardous wastes on impermeable surface with sealed drainage discharging to sewer via a silt trap and class 1 full retention interceptor. Following treatment, specified wastes – non-hazardous wood (treated and untreated) and hard plastics may be stored on hardstanding. All inert waste may be stored and treated on either hardstanding or on an impermeable surface with sealed drainage. Quarantine containers and tanks are bunded to mitigate against leaks and are checked as part of the daily

						inspection. Storage/refuelling of vehicles in specific areas. Fuel and oil storage containers/tanks are bunded to mitigate against leaks and are checked as part of the daily inspection. Vehicle inspections and maintenance procedures in place. Spill kits available throughout the site. Accident/ Pollution Incident Procedures manage impacts from leaks and spills.
Failure of containment: Site drainage	If the site's drainage system failed (e.g. sealed sumps overfilled, accidental damage, etc.) the escape of water contaminated with non-hazardous or hazardous liquids such as fuel, oils, leachate, etc. would have potential to cause pollution of groundwater or surface waters and to contaminate land.	No - failure of equipment results in impact	Yes Refer to maintenance checklist (**FR5A** and **FR5B**)	Yes **PR11** - Maintenance Procedure	Yes Refer to Training Matrix (**FR7**) and Training Records (**FR8**)	Daily inspection of site drainage to confirm free from blockages. Maintenance procedure ensures continued effectiveness of drainage systems. Accidental contamination is considered in Accident / Incident Management Plan.

Table 2D. Waste Disposal [D] ***(continue on separate sheet as required))***

Process / Activity / Equipment on Site	Potential Impact	Is impact controlled by equipment?	Is equipment included on maintenance checklist?	Is impact controlled by a procedure?	Person using the procedure received training?	Comments
Disposal of hazardous waste Disposal of hazardous waste (contamination) from sorting	Uncontrolled/illegal disposal leading to environmental pollution.	No	No	No	N/A	Hazardous waste controls/storage in accordance with EMS Plan for Quarantined wastes. Chemicals, waste oils, fuels, etc. all handled in accordance with Hazardous Waste Legislation. Need to meet legal Duty of Care requirements. Disposal to licensed waste facilities only. Consignment notes. Checks in place before transfer of waste. Waste hierarchy followed. Recovery chosen before landfill wherever possible.
Disposal of general non-recyclable waste from sorting (or general office activities)	Non-recyclable waste disposal has associated impacts e.g. ecotoxicity, global warming and nuisance e.g. odour.	No	Not applicable	No	N/A	Waste controls/storage in accordance with EMS Plan. Need to meet legal Duty of Care requirements. Disposal to licensed waste facilities only. Checks in place before transfer of waste. Waste hierarchy followed. Recovery chosen before landfill wherever possible. Skips and bins are labelled and staff

						are trained in the importance of separating and recycling as much of the waste on site as possible.

Table 2E. Nuisance (e.g. Noise, Odour) [N] ***(continue on separate sheet as required))***

Process / Activity / Equipment on Site	Potential Impact	Is impact controlled by equipment?	Is equipment included on maintenance checklist?	Is impact controlled by a procedure?	Person using the procedure received training?	Comments
Noise from: tipping, waste handling, processing (crushing, screening and shredding) Plant and vehicle usage	Part III of the Environmental Protection Act 1990, noise can be classified as a statutory nuisance.	Yes	Yes Refer to maintenance checklist (**FR5A** and **FR5B**)	Yes - **PR1/PR11**	Yes Refer to Training Matrix (**FR7**) and Training Records (**FR8**)	Management of site in accordance with EMS Plan. Few non-industrial receptors within zone of podetial impact. Industrial receptors also noise generating.
Odour from waste storage or site operations e.g. refuelling, etc.	Part III of the Environmental Protection Act 1990, odour can be classified as a statutory nuisance.	No	Not applicable	Yes - **PR1/PR6**	Refer to Training Matrix (**FR7**) and Training Records (**FR8**)	Odour from anaerobic decomposition of biodegradable wastes. Source emission rates relatively low due to largely C&D waste handled. Odour causing waste limited in quantity and generally contamination in mixed waste skips. Adequate ventilation used to disperse odour. Odour Management Plan in place to control odour.
Litter from storage/processing	Air blown litter can cause a nuisance to nearby receptors.	Yes	Not applicable	Yes - **PR1/PR7**	Refer to Training Matrix (**FR7**) and Training Records (**FR8**)	Wastes not generally prone to becoming airborne/litter forming (largely C&D). Light wastes can be mobilised, particularly during shredding outside. Shredding avoided during high wind conditions.

						Site inspection and litter picking on a daily basis.
Odour from general site waste	Section III of the Environmental Protection Act 1990, odour can be classified as a statutory nuisance.	No	Not applicable	Yes - **PR1/PR6**	Refer to Training Matrix (**FR7**) and Training Records (**FR8**)	Management of site in accordance with EMS Plan. Odour causing waste limited in quantity and generated from offices/staff welfare. Staff informed of importance of maintaining cleanliness of welfare area during induction training. General measures taken to reduce odour: good housekeeping, regular disposal of waste, etc.

Table 2F. Resource Consumption (not energy) [R] ***(continue on separate sheet as required))***

Process / Activity / Equipment on Site	Potential Impact	Is impact controlled by equipment?	Is equipment included on maintenance checklist?	Is impact controlled by a procedure?	Person using the procedure received training?	Comments
Use of chemicals	Harm to human health or escape to the local environment.	No	No	No	N/A	Management of hazardous substances according to COSHH and Hazardous Waste Regulations. Induction training, operating procedures and toolbox talks used to inform staff.
Use of water	Inefficient use results in natural resource depletion.	No	No	No	N/A	Staff informed of importance of resource efficiency during induction training and toolbox talks. General measures taken to reduce water usage e.g. turning taps off when not in use, reduced flush toilets, etc.
Use of fuel (vehicles and plant)	Inefficient use results in fossil fuel depletion and air emissions (see 2A).	No	No	No	N/A	Staff informed of importance of resource efficiency during induction training and toolbox talks. Vehicles maintained to ensure efficiency. Staff trained to consider impact of journeys, reducing mileage by journey planning, etc. Plant/vehicles replaced with more efficient equipment wherever practical.

Table 2G. Land Contamination (e.g. storage of hazardous substances) [L] *(continue on separate sheet as required))*						
Process / Activity / Equipment on Site	**Potential Impact**	**Is impact controlled by equipment?**	**Is equipment included on maintenance checklist?**	**Is impact controlled by a procedure?**	**Person using the procedure received training?**	**Comments**
Storage or spills of hazardous substances e.g. fuel, oil, batteries, etc.	Substances can cause harm to the ecotoxicity of the soil, and could leak into surface water or groundwater.	Yes	Yes Refer to maintenance checklist (**FR5A** and **FR5B**)	Yes - **PR1/PR3/ PR9**	Yes Refer to Training Matrix (**FR7**) and Training Records (**FR8**)	Hazardous material stored in a bunded, impermeable area. Waste stored in appropriate containers and on correct surfaces in accordance with EMS Plan. Drip trays and other containment used. Spill kits available.
Inappropriate disposal of waste	Substances can cause harm to the ecotoxicity of the soil, and could leak into surface water or groundwater.	No	N/A	Yes - **PR10**	Yes Refer to Training Matrix (**FR7**) and Training Records (**FR8**)	Staff trained regarding Duty of Care. Outlet licenses checked before use for recovery or disposal of waste.

Table 3. General Waste Management *(continue on separate sheet as required))*					
Waste Produced at Site *(with EWC, if known)*	**Where does the waste go?**	**Can it go to recovery / recycling?**	**Is it being stored correctly on site?**	**Are Duty of Care requirements being met?**	**Comments**
Untreated Wood (15 01 03, 17 02 01)	Various	Recycling	Refer to daily site inspection sheets	Yes– Checked on 28/03/25	
Treated Wood (19 12 07)	Various	Recovery			
Metal (20 01 40)	Various	Recycling			
Metal (19 12 02, 19 12 03)	Various	Recycling			
Cardboard and Paper (20 01 01)	Various	Recycling			
Cardboard and Paper (19 12 01)	Various	Recycling			
Plastic (20 01 39)	Various	Recycling			
Plastic (19 12 04)	Various	Recycling			
Glass (15 01 07, 20 01 02)	Various	Recycling			
Glass (17 02 02)	Various	Recycling			
Green waste (20 02 01)	Various	Recycling			
Plasterboard (17 08 02)	Various	Recycling			
Residual waste (19 12 12)	Various	Recycling/Recovery			
Process Fines (19 12 12)	Biffa Trecatti	Disposal			Used for daily cover.
Mixtures of concrete, bricks, tiles and ceramics (17 01 07)	Various	Recycling			
Fridges (16 02 11)	Various	Recycling			
Tyres (16 01 03)	Various	Recycling			
Processed Aggregates	Various	Recovery (on-site)	Yes– Checked on 30/09/24		Processed in accordance with Aggregates Quality Protocol. See Factory Control System **MP5**

Table 4. List of Procedures ***(list procedures identified in Table 2A to 2G above, and any other procedures you have in addition)***

(continue on separate sheet as required))

Procedure Name	What process / activity / equipment does it relate to?	Where is the procedure kept?	Version Number	When was the procedure last reviewed?	Comments
PR1 Accident/Pollution Incident Procedure	Accident/Pollution Incidents arising from any activity	Site office –filing cabinet	1.0	25th July 2025	
PR2 Emergency Incident Procedure - Fire & Explosion	Fire or explosion arising from any activity	Site office –filing cabinet	1.0	25th July 2025	
PR3 Emergency Incident Procedure - Spillage	Spillage arising from any activity	Site office –filing cabinet	1.0	25th July 2025	
PR4 Accident/Pollution Incident Response Procedure - Flood	Flood incident	Site office –filing cabinet	1.0	25th July 2025	
PR5 Accident/Pollution Incident Response Procedure - Utility Failure	Utility failure	Site office –filing cabinet	1.0	25th July 2025	
PR6 - Accident/Pollution Incident Response Procedure - Odour	Odour arising from any activity	Site office –filing cabinet	1.0	25th July 2025	
PR7 Accident/Pollution Incident Response Procedure - Fugitive Emissions	Emissions arising from any activity	Site office –filing cabinet	1.0	25th July 2025	
PR8 Emergency Incident Procedure - Discovery of suspicious items	Discovery of suspicious item during inspection and acceptance, or site inspections	Site office –filing cabinet	1.0	25th July 2025	
PR9 Waste Acceptance Procedure	Acceptance of waste at the facility	Site office –filing cabinet	1.0	25th July 2025	
PR10 Procedure for Assessment and Implementation of Training Needs, Competence and Awareness	Assessment of staff training needs and provision of training.	Site office –filing cabinet	1.0	25th July 2025	
PR11 Maintenance Procedure	All sire infrastructure including that used for processing and site	Site office –filing cabinet	1.0	25th July 2025	

	drainage.				
PR12 Procedure for Recording of Staff Responsibilities	Recording of staff responsibilities	Site office –filing cabinet	1.0	25th July 2025	
PR13 Procedure for Recording and Reporting of Environmental Incidents	Recording and reporting of environmental incidents	Site office –filing cabinet	1.0	25th July 2025	
PR14 Complaints Procedure	Recording, responsibilities and actions for dealing with complaints	Site office –filing cabinet	1.0	25th July 2025	
PR15 Corrective and Preventative Action Procedure	Recording, responsibilities and actions for dealing with complaints	Site office –filing cabinet	1.0	25th July 2025	
PR16 - Inspection of Discharges and Maintenance of Surface Water System	Responsibilities and actions for ensuring the effective operation of the site's drainage systems	Site office –filing cabinet	1.0	25th July 2025	

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MP1 Environmental Management System Plan
MP2 Accident/Pollution Incident Plan
MP3 Odour Management Plan
MP4 Fire Prevention and Mitigation Plan
MP5 Aggregate Quality Protocol - Factory Control System
MP6 Asbestos Management Plan
MP7 Sampling Plan

MP1 Environmental Management System Plan

MP1 Environmental Management System Plan

Environmental Permit EPR/ZP3899FX

Unit 5 Pengarnddu Industrial Estate
Dowlais, Merthyr Tydfil, CF48 2TA

Document Revisions

Version	Date	Author	Checked / App'd	Revision
DRAFT	06/11/14	SW	NB	FOR APPROVAL
2.0	07/11/14	SW	NB	RELEASED FOR APPLICATION TO VARY PERMIT
2.1	15/11/15	SW	NB	MINOR UPDATES FOLLOWING PERMIT ISSUE
2.2	25/07/25	SW	NB	EXTENSIVE CONTENT, FORMAT AND DRAWING UPDATES

Disclaimer

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Every skill and care has been taken in completing this work within the terms of the contract commissioning our services and taking into account the resources assigned to the commission in agreement with the client. Similarly, every skill and care has been taken to ensure the accuracy of the information within this document. Drawings and descriptions within this document are not intended to represent detailed design unless otherwise stated and should not be used for construction.

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1 INTRODUCTION

This Environmental Management System Plan has been prepared by Merthyr Borough Recycling Centre Limited as an integral part of their Environmental Management System for managing recycling activities at their facility at Unit 5 Pengarnddu Industrial Estate, Dowlais, Merthyr Tydfil, CF48 2TA.

The Environmental Management System fulfils the requirements of the site's Environmental Permit by "*providing a written management system that identifies and minimises risks of pollution, including those arising from operations, maintenance, accidents, incidents, non-conformances, closure and those drawn to the attention of the operator as a result of complaints*". It describes the processes and operations undertaken at the facility, how they are managed and controlled to meet the requirements of the Environmental Permit and any associated best practices and guidance. In addition it provides systems and procedures to enable the company to operate in accordance with its Environmental Policy (**PL1**).

1.1 Overview

The site currently operates under a Tier 3 Bespoke Environmental Permit number EPR/ZP3899FX.

Activities regulated under the bespoke environmental permit are:

- Hazardous & non-hazardous household, commercial and industrial waste transfer station with treatment and asbestos storage;
- End-of-Life (ELV) storage, depollution & dismantling;
- Inert and excavation waste transfer station with treatment; and
- Dewatering of street sweepings/gully suckings.

The site has a maximum annual throughput of 252,000 tonnes per annum. This is nominally broken down as consisting of 167,500 tonnes of non-hazardous waste, 10,000 tonnes per annum of hazardous waste and 75,000 tonnes of inert waste.

Currently, End-of-Life (ELV) storage, depollution & dismantling, and the Dewatering of street sweepings/gully suckings is not carried out on site. This EMS Plan and the accompanying EMS documents make limited reference to these activities where considered necessary. These documents should be reviewed and updated prior to the commencement of either of these activities.

This plan presents the general engineering details of the site, along with proposed working arrangements, infrastructure, environmental controls, monitoring and site management procedures. Where critical activities have been identified, the company has reviewed the processes and procedures that are in place with a view to meeting, and preferably exceeding any statutory obligations placed on them. Where current measures are deemed insufficient, the company will identify additional controls such as the introduction of documented procedures and work instructions, further training programmes and infrastructure improvements.

Reference is made throughout this document to processes and procedures within the EMS and in particular to a Corrective Action Response (CAR) Procedure (**PR15**) which details how the company will deal with any deficiencies identified during a scheduled or unscheduled system audit/check or justified customer/resident/staff complaint.

Within this EMS Plan, text highlighted in **Bold Blue** refers to documents that form part of the EMS.

This Management System Plan is considered a 'live' document and as such has been presented in a way which can be easily amended by adding to, or removing superseded information. Each change to the plan will be subject to Natural Resources Wales' approval.

1.2 Compliance with Permit Requirements

Table 1 summarises the key requirements of the site's Environmental Permits and the sections of this EMS Plan or associated documents and procedures that, when effectively implemented, will enable the site to comply with these requirements.

Permit Condition	Description	System Reference or Evidence of Compliance
1.1.1	General management	(a) Environmental Management System (b) EMS Plan 6.1.2/6.1.3/6.1.4 and TCM Attendance
1.1.2	Records demonstrating compliance	Site Diary Archived Forms **FR1-FR15** Compliance Audits (Internal/External)
1.1.3	Permit copy	Copy on Staff Notice Board and in Weighbridge Office
1.1.4	Competence scheme	EMS Plan 6.1.2/6.1.3/6.1.4 and copies of TCM qualifications
1.2.1	Waste hierarchy	EMS Plan 1.2.1
1.2.2	Review	EMS Plan 1.3
2.1.1	Permitted activities	EMS Plan 4 Compliance Audits (Internal/External)
2.2.1	The Site	Drawing **10915 - 000 - C** Daily site inspections and archived Forms **FR1** Compliance Audits (Internal/External)
2.3.1	Operating techniques	EMS Plan 8, 9 and 10 **MP5** Aggregates Factory Production Control System **MP6** Asbestos Management Plan **MP7** Sampling Plan
2.3.2	Waste acceptance	EMS Plan 8.3
2.4.1	Technical requirements - Vehicle depollution and dismantling	EMS Plan 8.8.1
2.4.2	Technical requirements - WEEE treatment	EMS Plan 8.8.2
2.4.3	Technical requirements - Hazardous waste storage and treatment	EMS Plan 8.8.3
2.5.1/2.5.2	Improvement Programme	EMS Plan 9.1.3.2 **MP4** Fire Prevention and Mitigation Plan
3.1.1/3.1.2/ 3.1.3	Emissions	EMS Plan 9.1.3.3, 9.1.3.5, 9.1.3.7, 9.1.3.8, 9.1.3.9, 9.1.3.10
3.2.1	Odour	EMS Plan 9.1.3.4 **MP3** Odour Management Plan
3.3.1/3.3.2	Noise and Vibration	EMS Plan 9.1.3.6
3.4.1/3.4.2	Pests	EMS Plan 9.1.3.7
3.5	Fire	EMS Plan 9.1.3.2 **MP4** Fire Prevention and Mitigation Plan
4.1	Record keeping	EMS Plan 11
4.2	Reporting	EMS Plan 10.1.2
4.3.1/4.3.2	Notifications	EMS Plan 11.3
4.3.3	Monitoring or sampling	EMS Plan 10.1.1
4.3.4/4.3.5	Other matters	EMS Plan 11.3
4.4	Interpretation	EMS Plan 11.4

Table 1. Requirements of Permit

1.2.1 Waste Hierarchy

The Waste Hierarchy (as defined in Article 4 of the Waste Framework Directive) will be applied to the generation of waste by the activities, and any waste generated will be treated in accordance with the Waste Hierarchy. Where disposal is necessary this will be undertaken in a manner that minimises any impact on the environment. To this end, once materials recovery has been maximised, energy recovery should be used before landfill wherever possible.

Reviews of measures taken to comply with the Waste Hierarchy will be carried out at least every 4 years. The Site Manager will be responsible to scheduling the review and ensuring relevant staff and advisors are in attendance. Any further appropriate measures identified should be carried out to agreed timescales.

1.3 EMS Review

The Environmental Management System (including this EMS Plan) shall be reviewed annually (or following an incident on site) to confirm whether changes are required to system and procedures.

1.4 Regulations and Guidance

Various guidance documents and statutory instruments have been considered when preparing this plan. These documents include:

Regulations

- The Environmental Permitting (England and Wales) Regulations 2016 (as amended)
- The Waste (England and Wales) Regulations 2011 (as amended)
- The Controlled Waste (England and Wales) Regulations 2012 (as amended)
- Environment Protection Act 1990 (as amended)
- Clean Neighbourhoods and Environment Act 2005 (as amended)
- Groundwater regulations 1998 (as amended)
- Water Resources Act 1991 (as amended)
- Hazardous Waste (England and Wales) Regulations 2005 (as amended)
- The Water Resources (Control of Pollution) (Oil Storage) (Wales) Regulations 2016 (as amended)
- Ozone-Depleting Substances Regulations 2015 (as amended)
- The Waste (Wales) Measure 2010 (as amended)
- The Environment (Wales) Act 2016 (as amended)
- Well-being of Future Generations (Wales) Act 2015 (as amended)

Guidance

- Environmental Permitting Guidance -Core Guidance for the Environmental Permitting (England and Wales) Regulations 2010 – March 2013
- Sector Guidance Note IPPC S5.06: Guidance for the Recovery and Disposal of Hazardous and Non Hazardous Waste
- Environmental Permitting Guidance General Guidance Manual on Policy and Procedures for A2 and B Installations, Sept 2009

- Waste Duty of Care Code of Practice, March 2016
- Environmental Permitting Guidance The IPPC Directive Part A(1) Installations and Part A(1) Mobile Plant, v3 March 2010
- Technical Guidance Document: 'How to comply with your environmental permit', v8.0, Oct 2014
- Control and monitor emissions for your environmental permit, February 2016
- WISH Guidance
- Develop a management system: environmental permits, February 2016
- Environmental Management Toolkit – Waste Sector, October 2014
- Horizontal Guidance Note H1 Risk assessments for specific activities: environmental permits, 2nd February 2016
- Horizontal Guidance Note H3 Part 2 - Noise Assessment and Control, 23rd July 2021
- Horizontal Guidance Note H4 Odour Management, October 2014
- Horizontal Guidance Note H5 Site Condition Report, October 2014

2 PERMIT DETAILS AND CONTACTS

2.1 Environmental Permit Number

EPR/ZP3899FX

2.2 Site Operator

Merthyr Borough Recycling Centre Limited

2.3 Site Address

Unit 5 Pengarnddu Industrial Estate

Dowlais

Merthyr Tydfil

CF48 2TA

2.4 Site Contacts

Office:	01685 370188
General Email:	info@newtredegarskiphire.co.uk
Managing Director:	Mr. Nicholas Brannan
Mobile:	07968 736145
Email:	info@newtredegarskiphire.co.uk

Technically Competent Manager: Mr. Nicholas Brannan

Mobile:	07968 736145
Email:	info@newtredegarskiphire.co.uk
Qualification:	WAMITAB Level 4 in Waste Management Operations – Managing Transfer Hazardous Waste (4TSH)
Site Manager:	Mr. Nicholas Brannan
Mobile:	07968 736145
Email:	info@newtredegarskiphire.co.uk

3 SITE DETAILS

3.1 Site Location

The Site is located at Unit 5 Pengarnddu Industrial Estate, Dowlais, Merthyr Tydfil, CF48 2TA, approximately 4km northeast of Merthyr Tydfil town centre (drawing **10915- 000 - A**). The approximate centre of the site is located at grid reference SO 07961 08897.

The site occupies an area of ~1.6 hectares (~3.96 acres). It is roughly shaped as an inverted "U", and slopes gently downwards from north to south west from 409m AOD to 400m AOD.

The facility is located in an area of historic industrial and minerals use, that has subsequently been redeveloped for commercial and industrial use. The surrounding area is occupied by a mix of commercial and industrial, and agricultural land. Isolated residential properties are located some distance to the south and east of the site.

The facilities immediate neighbours are an End-of-Life Vehicle recycling facility, storage units for construction materials, including a re-use facility, and an abattoir and meat processing facility. There is potential for impact from fires at adjacent sites and these impacts are reviewed in more detail in this plan.

3.2 Site Access

The site is easily accessed from the A465 Heads of the Valleys Road via an unnamed access road to the Pengarnddu Industrial Estate.

The grid reference of the site entrance is SO 07902 08829 and exit SO 07983 08813.

3.3 Site Ownership

The site is owned by Merthyr Borough Recycling Centre Limited.

3.4 Site Layout

The permitted area is shown in drawing **10915 - 000 - B**.

A block plan for the site is shown in drawing **10915 - 000 - C**. The entrance to the site is located in the south western corner of the site. Access to the site is via a pair of 2.0 m high steel palisade fence type gates. A weighbridge and disused containerised office units are located immediately to the north of the site entrance, and to the east an L-shaped portal frame building housing the weighbridge and administrative offices, staff welfare facilities, a large workshop and at its northern extent, a small biomass boiler. To the immediate north of the L-shaped building is a waste processing line comprising screens, a trommel and picking line which is elevated above a series of storage bays. To the immediate west and north of the waste processing line is a storage area for mixed and segregated wastes, to the north east of which is a rectangular portal frame building housing a biomass boiler and drying floor ("Biomass Building 2"). In the centre of the site, immediately to the south of Biomass Building 2, is additional storage. The whole site to the south and west of Biomass Building 2 in impermeably surfaced with a sealed drainage system and is suitable for the storage of non-hazardous and hazardous wastes. To the east of Biomass Building 2 is an area used for the storage of empty skips and a wind turbine. To the south east of the wind turbine, and running parallel with the eastern site boundary, is an area used to store skips containing sorted wastes. To the west of this storage area is a third portal frame building used for vehicle storage, a small containerised biomass plant, and a small concrete manufacturing area containing a cement silo and mixer.

A large bund, approximately 5m high extends along the southern boundary of the site, another bund, approximately 3m high, along the eastern boundary of the site. The site fenced on all sides using a combination of palisade and wire mesh fences 2.0m high.

3.5 Waste Management Operations

Operations taking place at the facility considered by this plan include:

- Delivery of waste in HGVs (chain lift, hook lift, drop-side and articulated vehicles) or PLG vehicles;
- Tipping and inspection of wastes;
- Storage of hazardous and non-hazardous wastes within buildings, covered storage bays or containers, and non-hazardous wastes outside in stockpiles or containers;
- Bulking of hazardous and non-hazardous wastes;
- Repackaging of non-hazardous wastes;
- Manual and automated sorting of non-hazardous mixed wastes to remove recyclable materials;
- Baling of non-hazardous waste;
- Compaction of non-hazardous waste;
- Shredding, baling and wrapping of non-hazardous residual waste to produce Refuse Derived Fuel (RDF);
- Shredding and screening of non-hazardous wood to produce woodchip for panelboard manufacture, animal bedding, mulches and biofuel;
- Crushing and screening of sorted construction, demolition and excavation waste to produce aggregates in accordance with the Aggregates Quality Protocol;
- The use of waste handling equipment to move waste between treatment processes and to/from storage areas within the site; and
- The dispatch of waste and aggregate products in HGVs (hook lift, drop-side and articulated vehicles).

3.6 Hours of Operation

There are no restrictions on the site's planning consent regarding hours of operation.

Normal opening hours are:

Monday – Friday	Saturday	Sunday	Bank/Public Holidays
07:00hrs – 18:00hrs	07:00hrs – 12:00hrs	Closed	Closed

Table 2. Normal opening hours

3.7 Receptors

There are no highly sensitive receptors (schools, hospitals, etc.) within 1000m of the site boundary.

Within 1000m of the site there are a number of residential, commercial, ecological and other receptors. The closest receptor that may be considered permanently occupied, is the adjacent ELV ATF to the west.

A Receptor Plan highlighting human and ecological receptors within the vicinity of the site is presented as Drawing **10915 – 000 - G**.

There are no statutory or locally designated environmental sites within 2km of the site.

3.8 Flood Risk

According to NRW's Flood Risk map the site does not lie within an area at risk of flooding from rivers or sea, surface water and small watercourses.

3.9 Groundwater

The site is not located in a Source Protection Zone.

The Superficial Layer designation of the site is identified as Secondary (undifferentiated). These are rock layers or drift deposits that are assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

The underlying bedrock designation is a Secondary A aquifer. These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

4 WASTE ACTIVITIES

4.1 Permitted Area

The waste activities are only to be undertaken within the permitted area as shown in Drawing **10915 – 000 - B**.

4.2 Site Capacity

The site has a maximum annual throughput of 252,000 tonnes per annum.

4.3 Permitted Activities

Site operations are designed for the purposes of recycling all waste arising from household, commercial and industrial, and construction, demolition and excavation sources imported by licensed waste carriers (including the company's own vehicles).

The site is permitted to carry out the activities listed below.

4.3.1 Hazardous & Non-Hazardous Household, Commercial and Industrial Waste Transfer Station with Treatment and Asbestos Storage

The site is only authorised to carry out the waste activity specified in Table S1.1 (Activity Ref. A1) of the permit.

Only wastes shown in Table S2.1 of the permit may be accepted.

These tables are reproduced in Appendix A of this document.

4.3.2 End-of-Life (ELV) Storage, Depollution & Dismantling

The site is only authorised to carry out the waste activity specified in Table S1.1 (Activity Ref. A2) of the permit.

Only wastes shown in Table S2.2 may be accepted.

These tables are reproduced in Appendix B of this document.

4.3.3 Inert and Excavation Waste Transfer Station with Treatment

The site is only authorised to carry out the waste activity specified in Table S1.1 (Activity Ref. A3) of the permit.

Only wastes shown in Table S2.3 may be accepted.

These tables are reproduced in Appendix C of this document.

4.3.4 Dewatering of Street Sweepings/Gully Suckings

The site is only authorised to carry out the waste activity specified in Table S1.1 (Activity Ref. A4) of the permit.

Only wastes shown in Table S2.4 may be accepted.

These tables are reproduced in Appendix D of this document.

4.3.5 Discharge of Integral Site Drainage (Process Effluent)

The site is only authorised to carry out the discharge activity specified in Table S1.1 of the permit.

This table is reproduced in Appendix A of this document.

5 ENVIRONMENTAL RISKS, IMPACTS AND CONTROLS

5.1 Environmental Risk Assessment

Environmental Risk Assessments have been undertaken for the facility and these have informed the measures implemented in the following sections. A register of Environmental Risk Assessments (**RA1**) identifies those currently valid for the site.

Key considerations for the facility are:

- Release of hazardous substances;
- Contamination of surface water (spillage and fire) due to the facility's proximity to watercourses that are hydrologically connected with designated ecological sites;
- Noise and vibration;
- Dust;
- Release of odours;
- Litter;
- Pests; and
- Unauthorised or uncontrolled access.

Due to the scale of the facility, nature of wastes received and operations carried out, in combination with its proximity to sensitive receptors, the likelihood of impact without mitigation is assessed as High to Low, with all potential impacts being assessed as Low subject to the adoption of physical and management mitigation measures as detailed in this EMS.

5.2 Environmental Impacts and Controls

A register of Environmental Impacts and Controls is presented in **IC1**.

Environmental impacts are managed through the use of equipment or operational management approaches. The measures used are detailed in the following sections.

- Section 6 describes the methods used to manage the site and to ensure that suitably trained staff are available to manage the facility;
- Section 7 provides details regarding site infrastructure and maintenance arrangements;
- Section 8 describes the operations and operating techniques used on-site to ensure that wastes are correctly handled, treated and recovered/disposed of.
- Section 9 provides details of the approaches, processes and procedure to prevent and manage accidents/incidents;
- Section 10 describes monitoring and reporting arrangements adopted on-site; and
- Section 11 provides details of site records held on site-and the requirements to notify NRW of any accidents/incidents or changes to the site operation and management.

6 SITE MANAGEMENT

6.1 General Management

6.1.1 Environmental Management System

The site shall be operated in accordance with the EMS (of which this Environmental Management System Plan (**MP1**) is part).

The site's environmental management system is a suite of documents that work together to manage the facility. This Environmental Management System Plan (**MP1**) describes how on-site operations are managed within the framework of the Environmental Management System, and how they interact to reduce the risk of an environmental incident or accident, or to respond quickly and effectively to an incident to minimise any environmental harm.

6.1.2 Site Personnel

Technically competent staff will supervise the site and ensure that it is operated in accordance with the environmental permit, this Environmental Management System Plan and current legislation.

The site Manager will ensure that sufficient competent staff are present on-site to manage and operate the sites activities without causing pollution. Staff will be competent in the activities they are expected to carry out. Staff will be expected to not only be competent in normal situations, but also be adequately trained so that they are competent in abnormal situations such as plant failures or accidents.

Procedure **PR14** details the method by which the company will record staff responsibilities. It ensures that staff roles and responsibilities are clearly defined and recorded (**FR9**) and names placed against each role and responsibility (e.g. Technically Competent Manager, Plant Operator, etc.). Details of who is responsible for ensuring compliance with each part of the permit and other relevant legislation and guidance are also registered. Documents are reviewed and updated at least every 6 months, or if staff change roles or leave the organisation.

6.1.3 Technically Competent Manager

The company will employ and train at least one Technically Competent Manager (named in section 2.4).

The Technically Competent Manager will hold a WAMITAB Level 4 Operator Competence qualification in compliance with permit requirements.

Other Technically Competent Managers will be recruited as necessary to maintain compliance with permit attendance criteria. The times that the Technically Competent Manager spends at the facility during operating hours will be recorded in the Site Diary.

6.1.4 Staff Training

New employees will be given full induction training by site managerial staff or other appropriately qualified persons and records will be kept of all staff training in relation to operation of the site, site specific emergency procedures and the content and requirements of the Environmental Permit and Environmental Management System Plan.

According to their various roles and responsibilities, individuals will be instructed in the following necessary procedures regarding the environmental aspects of the site operations:

- Receiving and inspecting loaded waste vehicles.
- Duty of Care requirements and record keeping.
- Unloading and scrutinising tipped loads.
- Dealing with any unauthorised wastes.

- Waste segregation and bulking-up of the separated substances.
- Use of any mechanical plant at the site.
- Storage and inspection of wastes.
- Dispatch of recovered materials and discards.
- Hazardous waste controls.
- General housekeeping including: cleanliness of the site and its environs, equipment maintenance, inspection and maintenance of any drainage systems.

All TCM's will undertake training as required to demonstrate Continuing Competence.

A copy of this Environmental Management System Plan and Environmental Permit will be made available at the facility for all staff to read and, as a minimum; they will be informed of the importance of these documents and of the key areas of concern. They will also be fully briefed on the role of NRW in enforcing compliance.

Competence and training of all site employees is monitored by the site's HR Manager in accordance with Procedure **PR12**.

Environmental training of staff is generally undertaken by competent in-house personnel or by third-party contractors.

New employees and contractors will be given full induction training by site managerial staff or other appropriately qualified persons. Staff and contractors will be made aware of the Environmental Permit and EMS during their induction, what is contained in these documents, what their obligations are under them and where, and how to access them, during their initial site induction.

Any person with duties that are controlled by the permit, including both staff and contractors, has convenient access to a copy of it (6.1.5). Staff and contractors will be informed of the importance of these documents and of the key areas of concern. They will also be fully briefed on the role of Natural Resources Wales in enforcing compliance.

According to their various roles and responsibilities, individuals will be instructed in the following necessary procedures regarding the environmental aspects of the site operations:

- Receiving and inspecting loaded waste vehicles.
- Duty of Care requirements and record keeping.
- Unloading and scrutinising tipped loads.
- Dealing with any unauthorised wastes.
- Waste segregation and storage of the separated substances.
- Use of any mechanical plant at the site.
- Storage and inspection of wastes.
- Dispatch of recovered materials and discards.
- Hazardous waste controls.
- General housekeeping including: cleanliness of the site and its environs, equipment maintenance, inspection and maintenance of any drainage systems.

All Technically Competent Managers will undertake training as required to demonstrate Continuing Competence.

Records are kept of all staff training in relation to the operation of the site, site specific emergency

procedures and the content and requirements of the Environmental Permit and Environmental Management System. A training matrix and training records (Forms **FR7** and **FR8**) are kept and maintained in the Weighbridge Office.

6.1.5 Access to Permit and EMS

A copy of the Environmental Permit and the most up-to-date approved copy of the Environmental Management System will be kept in the Weighbridge Office to enable access by members of staff at any time. The copy may be in paper form and/or made available electronically.

6.1.6 Site Health and Safety

The company is conscious of its obligations to its staff, contractors and visitors and the company's Environmental Management System dovetails with the company's in-house Health and Safety management and Quality management processes and/or systems.

The company's Health and Safety Policy, induction pack/employee handbook and training programmes provide significant information to staff and visitors relating to on-site Health and Safety features, processes and duties.

Signage around the site highlights important safety considerations for staff and visitors before entering site. A copy of the site rules is available at the main reception and a further copy affixed to the staff notice board. The full set of site rules (**SR1**) is provided to drivers and visitors entering the facility.

7 SITE INFRASTRUCTURE

7.1 Site Entrance

An identification sign shall be erected and maintained in a prominent position at the site entrance. The sign shall be approximately 1m by 1m and display the following information.

- Site name and address
- Name of site operator
- Name of EP holder
- EP number
- Emergency contact telephone number
- Statement that the site is licensed by NRW
- NRW contact details
- Operational site hours

7.2 Site Accommodation

The site is/will be equipped with the following facilities:

- Site office facilities
- Welfare/Mess facilities

The site office is positioned at the main entrance next to the weighbridge, and is equipped with a telephone line, suitable for emergency calls. The office provides suitable space to permit secure short-term record keeping. All records specifically relating to recycling operations shall be retained on-site (refer to section 11 for further details).

Appropriate welfare facilities are provided and maintained by site staff. Car parking is provided for staff members and site visitors in the parking area to the south east of the site entrance.

7.3 Plant and Equipment

The following plant and equipment is located within the site:

- Materials recovery equipment incorporating screens, blowers and picking lines
- Crushing and screening equipment
- Shredding and chipping equipment
- Mobile lifting and waste handling equipment – excavators, front loading shovels, telehandlers and forklift trucks
- A range if waste collection vehicles
- Storage areas
- Fuel oil storage tanks
- Weighbridge

7.4 Site Engineering for Pollution Prevention and Control

In general waste management activities at the site relate to the receipt, storage, segregation and recovery of a wide range of local household, industrial and commercial wastes.

The site comprises a number of buildings and an open yard nominally divided into areas for the different waste activities.

Drawings **10915 – 000 – C** and **10915 – 000 – D** show the surfacing and drainage arrangements for the site.

Storage and treatment surfacing and drainage for waste is summarised in Table 3.

Waste	Surfacing and Drainage
Activities Currently Carried Out On Site	
Hazardous Waste	All hazardous waste (exc. asbestos) shall be stored in designated areas: • In enclosed, leak and weather proof storage containers in a building on impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer; or • In enclosed, leak and weather proof storage containers in a covered storage bay on impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. Asbestos and asbestos containing waste shall be stored: • Double-bagged in enclosed, leak and weather proof lockable storage containers on impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. There shall be no treatment of hazardous waste except for: • Bulking up and shredding of hazardous waste wood – on impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. • Bulking up for onward transfer only of waste electronic and electrical equipment, waste batteries and/or accumulators and asbestos waste – on impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. In addition: • Lead acid batteries shall be stored in secure containers that are leak-proof with an impermeable, acid resistant base, and in closed containers or under cover to prevent the accumulation of rainwater. • Liquids shall be stored in/on secondary containment bunds.

Non-hazardous Waste	All non-hazardous waste shall be stored in designated areas, either in stockpiles or in skips/containers: • In a building on impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer; or • On impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. Non-hazardous waste shall be treated in designated areas, either in stockpiles or in skips/containers: • In a building on impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer; or • On impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. Following treatment, non-hazardous wood (treated and untreated) and hard plastics may be stored on hardstanding with surface run-off discharging to ground via infiltration. In addition: • Lithium Ion batteries (and WEEE containing lithium or Lithium Ion batteries) shall be stored in 60 litre UN 3480/UN 3090 approved safety barrels with pressure relief valve, and filled with impact absorbing buffer/filler material (vermiculite or custom filler). • Liquids shall be stored in/on secondary containment bunds.
Aggregates and Soils	Aggregates and Soils shall be stored in designated areas in stockpiles: • On impermeable surface with surface run-off passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer; or • On handstand with surface run-off discharging to ground via infiltration.
Quarantine/Non-Conforming Waste Storage	Quarantine/Non-Conforming Waste shall be stored in dedicated waste quarantine areas for temporary storage prior to rejection, or whilst it is being assessed: • Where there is a risk of contaminated runoff from the quarantined

	waste, on impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump; or • Where there is no risk of contaminated runoff from the quarantined waste, on impermeable surface with surface run-off passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer; and in addition • Where there is a risk of fugitive emissions, in a building or in closed or covered containers.
Activities Not Currently Carried Out On Site	
End-of-Life (ELV) storage, depollution & dismantling	All hazardous and non-hazardous waste shall be stored in designated areas: • On impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. Depollution shall take place in a designated area: • On impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. Depolluted vehicles may be stored in a designated area: • On impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer; or • On handstand with surface run-off discharging to ground via infiltration. All hazardous and non-hazardous waste[1] shall be treated in designated areas: • On impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. In addition: • Lead acid batteries shall be stored in secure containers that are leak-proof with an impermeable, acid resistant base, and in closed

[1] Treatment of hazardous waste is limited to bulking up for onward transfer only of waste batteries and/or accumulators, brake pads containing asbestos and hazardous waste.

	containers or under cover to prevent the accumulation of rainwater. • Liquids shall be stored in/on secondary containment bunds.
Dewatering of street sweepings/gully suckings	Street sweepings/gully suckings shall be stored and treated in designated areas in stockpiles: • On impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer.

Table 3. Surfacing of storage areas.

7.4.1 WTS Buildings

The Waste Transfer Station Buildings to the north of the site comprise a number of steel portal frame structures covered in trapezoidal formed steel cladding.

The floors comprises an impermeable reinforced concrete surface 200mm thick on sub-base laid to a minimum depth of 200 mm.

The building floors are graded to channel surface run-off to a central location within the building from where spill kits can be used to remove any liquids.

Roof water from the Waste Transfer Station Buildings is directed through gutters, downpipes onto the surrounding concrete surface from where it flows across the site and discharges to the foul sewer in the highway to the south of the site.

7.5 Depollution/Workshop Building

The existing Depollution/Workshop building comprises a steel portal frame construction covered in trapezoidal formed steel cladding.

The existing floor comprises an impermeable reinforced concrete surface >150mm thick.

A fall towards the centre of the slab ensures the containment of any liquid on the impermeable floor.

Roof water from the Depollution/Workshop building is directed via the surface drainage system to surface water sewer.

7.5.1 Yard Areas

The majority of the site comprises a large open yard nominally divided into three areas for the different waste activities.

The yard areas are surfaced in fibre reinforced concrete 200mm – 300m thick or hard standing constructed from clean hardcore or crushed stone laid to a minimum depth of 200mm. The hardstand area will ultimately be replaced by concrete surfacing.

In general the three connected yard areas are graded to channel surface run-off towards the centre of each area and then to fall by gravity towards cut-off drains located at the southern edge of each area. From here it flows into silt settlement and storage tanks, then through a Class I full retention interceptor before being discharged to sewer. In places the concrete slabs are kerbed to ensure containment of surface run-off. The western, central and north eastern areas of the site (used for the storage of waste) discharge to foul sewer (the central section via a pump that transfers water to a foul sewer connection in the south west of the site).

The eastern part of the site to the south of the wind turbine, which is only used to store plant, equipment, empty containers/skips and AQP-compliant product (not waste) discharges to surface water sewer.

Periodic inspection of each interceptor is used to determine when each interceptor requires emptying.

7.6 Office/Welfare Facilities

Self-contained welfare and toilet facilities are located in the main office building adjacent to the weighbridge.

Roof water from the building is directed through gutters and downpipes and onwards through the surface drainage system to surface water sewer.

7.7 Foul Drainage

Foul water is discharged to sewer.

7.8 Design and Construction of Fuel and Oil Storage Tanks

The following fuel and oil storage is present on-site:

- 10,000 litre bunded static tank containing white diesel.
- 2 x 10 litre cans in a bunded storage area containing petrol.
- 2 x 210 litre streel drums in a bunded storage area containing fresh engine oil.
- 2,000 litre bunded static tank containing used mineral oil.
- 2 x IBCs in a bunded storage area containing AdBlue fuel additive.
- 4 x 25 litre drums in a bunded storage area containing antifreeze.

7.9 Lighting

Security lighting and lighting to ensure H&S requirements are met in low-light conditions is installed where required within buildings and the yard area.

7.10 Site Security

7.10.1 Boundary Security

The whole permitted site is within an enclosed site occupied solely by Merthyr Borough Recycling Limited.

Access to the site is via a pair of 2.0 m high steel palisade fence type gates with a 2.0m security fence enclosing the site boundary on four sides.

The security gates and site boundary are inspected daily as part of the site inspection schedule. The gates are locked at all times when the site is unattended.

In the event of unauthorised intrusion, the circumstances and any subsequent action taken will be entered in the Site Diary.

7.10.2 Equipment Storage

With the exception of large recycling plant and vehicles, all site equipment and machinery shall be securely stored within locked buildings.

7.10.3 CCTV and Lighting

CCTV operates across the site both internally and externally and can be accessed remotely. Video is constantly displayed and monitored by Weighbridge staff and is recorded for a period of at least 7 days.

PIR activated floodlights cover areas of the yard and buildings.

7.10.4 Out of Hours Security

The Site Manager/Owner remotely monitors the site's CCTV and receives alerts via mobile phone. Identified members of staff monitor the site when the Site Manager/Owner is unavailable due to sickness, annual leave or other commitments.

7.11 Inspection and Maintenance Procedures for Site Infrastructure

The Site Manager is responsible for carrying out site inspections on at least a twice daily basis. These inspections provide a mechanism to assess whether site operations are being carried out in accordance with the EMS and that environmental management and control systems are operating within expected performance limits. The yards, buildings, office/welfare area, fence and entrance gates/doors are inspected. Olfactory, Dust and Noise assessments are carried out along the site boundary. The outcome of those inspections are recorded on the daily inspection checklist (**FR1**) along with any remedial action required. If necessary further investigations are carried out in accordance with the Odour Management Plan (**MP3**) where required. For more complex actions (e.g. changes to infrastructure) a Corrective Action Request (**FR11**) is also raised in accordance with **PR15**. The CAR process will identify the root cause of any problem, and allocate a member of staff and timeframe to ensure that the corrective action is carried out. Outstanding CARs are reviewed at the quarterly business management meetings (or sooner if there is a significant risk to the environment or operations of the business).`

Any defect encountered during inspection will be repaired as soon as is reasonably practicable within the working day as a temporary measure and permanent repairs will be completed within 7 working days.

The existing concrete slabs will be cleared of all wastes in a phased sequence to ensure that all areas are progressively exposed for inspection at a frequency no less than once per month. The cleared areas will be swept clean or scraped to remove any adhering solids and to ensure the absence of breeding insects or vermin. The exposed areas will then be inspected thoroughly to ensure continuing impervious integrity and any defects repaired to a standard no less than that when new. The inspections, findings and any repairs undertaken will be entered in the Site Diary.

The impermeable concrete surfaces will be inspected annually by a Chartered Civil Engineer who will report whether or not the impermeable surface is in a good condition and suitable for the purpose described in the Environmental Management System Plan.

The dates of all such inspections, the findings and any repairs and cleaning undertaken will be entered in the Site Diary.

Maintenance procedures are detailed in Procedure **PR11**. A maintenance schedule identifying items of plant, location of maintenance instructions and responsibilities will be kept and maintained (**FR5A** and **FR5B**). Maintenance records (**FR6**) for plant and equipment and site infrastructure will be kept in the Weighbridge Office and maintained by the Site Manager.

8 SITE OPERATIONS

8.1 Operational Flowchart

Drawing **10915 – 000 - H** provides a summary of processes and materials flows carried out at the facility.

8.2 Operating Techniques

The activities will be undertaken in accordance with the methodologies, procedures or guidance detailed in Table S1.2 of the environmental permit.

8.3 Waste Acceptance Procedure

Procedure **PR9** provides details of the company's Waste Acceptance Procedure.

Procedure **PR8** describes what to do in the event of suspicious items being identified (or potentially identified) within loads.

8.4 Waste Sampling and Testing

It is not normally necessary for the Permit Holder to routinely sample and analyse waste inputs, since these are limited to materials of a relatively innocuous and predictable nature and pre-acceptance checks for hazardous wastes ensue that appropriate classification is carried out. Many of the company's suppliers are regular customers and their waste arisings are reasonably consistent. Where there is uncertainty over the content of deliveries or any suspicion of contamination (e.g. liquid residues in drums or suspected fibrous asbestos etc.) these will be quarantined and expert advice sought. This, as appropriate, will include the advice of NRW.

Should a waste supply be offered for which more detailed chemical information is required, then in order to avoid any environmental risk in the handling of such waste, specialist advice and testing to ensure compliance with the site's waste acceptance criteria (as appropriate) will be sought prior to its acceptance.

Where required for classification prior to dispatch, waste is sampled and tested in accordance with WM3 guidance. The sampling and testing of process fines is carried out on a regular basis in accordance with the Sampling Plan (**MP7**)

The occasions when any sampling is undertaken will be recorded in the Site Diary. Results of all such analyses will be filed in the Weighbridge Office.

Aggregate products are periodically tested in accordance with the Aggregates Quality Protocol. The required testing frequencies are detailed in the site's Factory Production Control System (**MP5**).

8.5 Waste Quantity Measurement System

All waste arriving or leaving the facility is required to pass over the site weighbridge for the purposes of recording the consignment weight.

The weighbridge receives at least 1 annual calibration check in addition to the regular system checks as required under weights and measures legislation.

The information regarding weights passing over the weighbridge is retained at the weighbridge office for further reference.

CCTV footage is recorded at the Weighbridge.

8.6 Waste Treatment Processes

8.6.1 Hazardous and Non-Hazardous Waste Transfer Station with Treatment and Asbestos Storage

8.6.1.1 Hazardous Waste

Hazardous wastes delivered to site by waste management contractors or by the company's own vehicles will be received at the weighbridge office, where they will be weighed and accepted in accordance with the site's Waste Acceptance Procedure (**PR9**).

There shall be no treatment of hazardous waste. Activities involving hazardous waste shall solely comprise bulking up and storage.

The maximum amount of hazardous waste stored onsite is 50 tonnes.

Segregated storage, and the use of appropriate separation distances and or suitable engineering measures between incompatible wastes, are used to prevent incidents from incompatible substances and as a means of preventing escalation should an incident occur.

Storage areas are clearly marked and signed with regard to the quantity and hazardous characteristics of the wastes stored therein.

Hazardous waste is stored in purpose-built containers in a covered storage area to the south east of the WTS Building. Containers shall be stored in such a manner that leaks and spillages could not escape over bunds/edge of the sealed drainage area. Containers will be stored with well-fitting lids, caps and valves, secured and in place. Containers will be labelled to indicate the nature of the waste therein and any hazard and/or dangerous goods warnings and/or precautionary statements highlighting measures to be taken when handling the waste.

Storage areas for containers holding substances that are known to be sensitive to heat and light or reactive with water or moisture will be under cover and protected from water, heat and direct sunlight.

Storage areas for containers holding flammable or highly flammable wastes will meet the requirements of HSG 51, HSG71 and HSG76.

Asbestos shall be managed in accordance with the Site's Asbestos Management Plan (**MP6**). It will be stored double-bagged/wrapped in thick polythene sheeting (with the correct hazard warnings and labelling attached) in an enclosed and lockable container/skip to the south of the WTS Building. All waste shall be removed from site and transferred to the disposal facility in the locked container/skip.

8.6.1.2 Non-Hazardous Waste

Builder's skips and RO-RO containers delivered to site by the company's own vehicles (and occasionally by other waste management contractors). They will be received at the weighbridge office, where they will be weighed and accepted in accordance with the site's Waste Acceptance Procedure (8.3).

Waste will be sorted using an excavator (for larger items) and then by hand on the floor or picking line to separate waste fractions into wood, plastic, cardboard, metal, etc. for recycling. Sorted wastes (recyclates) will be stored in bays or skips/containers until sufficient quantities are aggregated for cost-effective transport, or until the maximum storage durations are reached (8.9.3). Containers/bays for each material will be clearly labelled.

Cardboard/paper and plastic film will generally be baled or compacted before being transferred offsite for recycling. Plastic and metals will be loaded loose into containers for off-site recycling. Waste wood will be received, sorted, stored, treated and transferred in accordance with prevailing guidance. Any wood determined to be hazardous following testing will be stored in a separate bay and bulked up for onward transport to a suitably licensed facility. It will not be treated prior to transfer.

Non-hazardous waste wood will be stored in purpose-built stockpile and bays. Once sufficient quantity has been collected non-hazardous wood will be either transferred whole, or shredded to produce products for use in panelboard manufacture and for animal bedding, mulches and biofuel. Size-reduction is carried out using a slow-speed shredder and the resulting woodchip transferred to RO-RO containers or a walking floor collection vehicle awaiting off-site transfer to suitably licensed facilities.

Where waste in containers are repackaged (e.g. non-hazardous paint, etc.), the earliest date of arrival of the wastes will be transposed from the original container onto the bulk container.

Inert wastes separated from mixed waste will be crushed/screened as part of the Inert and Excavation Waste Transfer Station with Treatment activity (8.6.2).

The residual combustible fraction will be shredded and baled as Refuse Derived Fuel (RDF) and sent off-site for energy recovery.

Any non-recoverable fraction will be sent for disposal to landfill.

The pre-treatment of waste for incineration or co-incineration at the site, for the purpose of recovery or a mix of recovery and disposal shall be limited to less than 75 tonnes per day in total.

The pre-treatment of waste for incineration or co-incineration at the site, for the purpose of disposal, shall be limited to less than 50 tonnes per day in total.

The treatment of slags and ashes for the purpose of recovery or a mix of recovery and disposal shall be limited to less than 75 tonnes per day in total.

The treatment of slags and ashes for the purpose of disposal, shall be limited to less than 50 tonnes per day in total.

8.6.2 Inert and Excavation Waste

The facility will receive and treat inert and excavation waste to produce products for use in construction.

Skips and RO-RO containers delivered to site by waste management contractors or by the company's own vehicles will be received at the weighbridge office, where they will be weighed and accepted in accordance with the site's Waste Acceptance Procedure (8.3).

Once inspected and accepted, inert waste is sorted using an excavator or by hand to remove any contaminants. These are aggregated and sent for recycling/disposal at suitably permitted waste management facilities. Inert and excavation materials awaiting processing are stored in stockpiles depending on the type of waste e.g. clean concrete, blocks, bricks etc. or soil, sub soil, clay, etc.

The company's aggregate recycling process involves screening to remove soils and smaller stones, dry crushing and secondary screening to produce sized aggregates. The process is carried out in accordance with the Aggregates Quality Protocol (8.7).

8.6.3 End-of-Life Vehicles

ELVs are not accepted or treated at the facility. Should this situation change, this EMS Plan and other relevant documents within the EMS will be updated accordingly.

8.6.4 Street sweepings/gully suckings

Street sweepings/gully suckings are not accepted or treated at the facility. Should this situation change, this EMS Plan and other relevant documents within the EMS will be updated accordingly.

8.7 Quality Management Systems

Adherence to a Quality Management System (and Quality Protocols where applicable) ensure that the company recycles waste in a consistent and reproducible manner and that once processed, the waste meets

end-of-waste and is no longer subject to waste controls. The following quality management systems are in use at the facility.

- Aggregates Quality Protocol

The site's Factory Production Control System (**MP5**) manages the production and testing of aggregates to ensure compliance with the protocol.

8.8 Technical Requirements

8.8.1 Vehicle depollution and dismantling

The storage (including temporary storage) and treatment of waste motor vehicles shall meet the requirements of article 6(1) of the End-of-Life Vehicles Directive.

8.8.2 WEEE treatment

The storage (including temporary storage) and treatment of WEEE shall be carried out in accordance with the technical requirements of Annex III of the WEEE Directive.

8.8.3 Hazardous waste storage and treatment

Hazardous waste shall not be mixed, either with a different category of hazardous waste or with other waste, substances or materials, unless it is authorised by schedule 1 table S1.1 and appropriate measures are taken.

8.9 Waste storage

8.9.1 General

Waste shall be stored in designated areas of the facility. Areas used for waste storage are shown on the Storage Plan (drawing **10915 – 000 - E**).

Storage and treatment locations, surfacing and drainage for waste is summarised in Table 4.

Waste	Surfacing and Drainage
Activities Currently Carried Out On Site	
Hazardous Waste	All hazardous waste (exc. asbestos) shall be stored in designated areas: • In enclosed, leak and weather proof storage containers in a building on impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer; or • In enclosed, leak and weather proof storage containers in a covered storage bay on impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. Asbestos and asbestos containing waste shall be stored: • Double-bagged in enclosed, leak and weather proof lockable storage containers on impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. There shall be no treatment of hazardous waste except for:

	• Bulking up and shredding of hazardous waste wood – on impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. • Bulking up for onward transfer only of waste electronic and electrical equipment, waste batteries and/or accumulators and asbestos waste – on impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. In addition: • Lead acid batteries shall be stored in secure containers that are leak-proof with an impermeable, acid resistant base, and in closed containers or under cover to prevent the accumulation of rainwater. • Liquids shall be stored in/on secondary containment bunds.
Non-hazardous Waste	All non-hazardous waste shall be stored in designated areas, either in stockpiles or in skips/containers: • In a building on impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer; or • On impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. Non-hazardous waste shall be treated in designated areas, either in stockpiles or in skips/containers: • In a building on impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer; or • On impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. Following treatment, non-hazardous wood (treated and untreated) and hard plastics may be stored on hardstanding with surface run-off discharging to ground via infiltration. In addition: • Lithium Ion batteries (and WEEE containing lithium or Lithium Ion batteries) shall be stored in 60 litre UN 3480/UN 3090 approved safety barrels with pressure relief valve, and filled with impact absorbing buffer/filler material (vermiculite or custom filler).

	• Liquids shall be stored in/on secondary containment bunds.
Aggregates and Soils	Aggregates and Soils shall be stored in designated areas in stockpiles: • On impermeable surface with surface run-off passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer; or • On handstand with surface run-off discharging to ground via infiltration.
Quarantine/Non-Conforming Waste Storage	Quarantine/Non-Conforming Waste shall be stored in dedicated waste quarantine areas for temporary storage prior to rejection, or whilst it is being assessed: • Where there is a risk of contaminated runoff from the quarantined waste, on impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump; or • Where there is no risk of contaminated runoff from the quarantined waste, on impermeable surface with surface run-off passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer; and in addition • Where there is a risk of fugitive emissions, in a building or in closed or covered containers.
Activities Not Currently Carried Out On Site	
End-of-Life (ELV) storage, depollution & dismantling	All hazardous and non-hazardous waste shall be stored in designated areas: • On impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. Depollution shall take place in a designated area: • On impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. Depolluted vehicles may be stored in a designated area: • On impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer; or • On handstand with surface run-off discharging to ground via

	infiltration. All hazardous and non-hazardous waste[2] shall be treated in designated areas: • On impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. In addition: • Lead acid batteries shall be stored in secure containers that are leak-proof with an impermeable, acid resistant base, and in closed containers or under cover to prevent the accumulation of rainwater. • Liquids shall be stored in/on secondary containment bunds.
Dewatering of street sweepings/gully suckings	Street sweepings/gully suckings shall be stored and treated in designated areas in stockpiles: • On impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer.

Table 4 Site surfacing and drainage.

Wastes deemed to be products following processing in line with approved protocols will be separated and labelled as such and their location shown upon the site plan as appropriate.

8.9.2 Hazardous Waste

All hazardous waste shall be stored in a building or in secure enclosed lockable containers/skips where indicated in Drawing **10905 – 000 – E**. The hazardous waste storage area shall be clearly marked and include signage showing the maximum quantity and hazardous properties of wastes that can be stored there.

All hazardous waste shall be stored in suitable containers. Liquids will be stored in secure tanks or drums in/on secondary containment bunds. Wastes that are sensitive to air, light, heat, moisture or extreme ambient temperatures under shall be stored in manner to protect them from such ambient conditions.

Incompatible wastes shall be stored in suitable containers, using appropriate separation distances, or employing suitable engineering measures to ensure they do not come into contact with other wastes.

Rags and filter materials contaminated with metal swarf, low boiling point oils, low flash point solvents and other wastes with the potential for self-heating or self-reactivity shall be stored in sealed metal containers under cover. These will be monitored as part of the daily site inspections for heat build-up.

8.9.3 Storage Durations

All combustible wastes will be stored in accordance with NRW's current Fire Prevention and Mitigation Plan Guidance unless agreed otherwise. The site's Fire Prevention and Mitigation Plan (**MP4**) provides additional

[2] Treatment of hazardous waste is limited to bulking up for onward transfer only of waste batteries and/or accumulators, brake pads containing asbestos and hazardous waste.

details for the storage of these materials.

8.10 Labelling

Storage bays and containers will be labelled to identify their contents.

Baled material will be labelled using marker pen displaying the date of production.

8.11 Dispatch

Wastes (as opposed to products that have ceased to be wastes) leaving the site for further treatment, disposal or recovery, are described, quantified and appropriately containerised in accordance with the Duty of Care.

Wastes will be transported by authorised waste carriers only and dispatched only to authorised outlets.

Hazardous wastes removed from the site, will be transferred in accordance with the required consignment note procedures.

All records of delivery and dispatch, including copies of the Duty of Care Transfer Notes and Hazardous Waste Consignment Notes will be maintained in the Weighbridge Office. These are available for inspection by authorised officers of NRW at any reasonable time. Quarterly 'waste returns' will be provided to NRW as required.

Regular deliveries of waste to the same outlet may be recorded by way of the 'season ticket' provisions.

The Company's regular waste suppliers and outlet providers will be periodically visited and their control procedures assessed to safeguard the Permit Holder's Duty of Care responsibilities.

8.11.1 Contingency

Should the process controls fail at any point within the processing of wastes through any of the operational processes, acceptance of waste into the site will operate in this order:

- The site will not accept more waste that it can process effectively at any one time and not above the permitted tonnage per annum or storage capacities stated in 8.9.
- In the event that the site reaches its maximum capacity, the Site Manager will divert any further incoming waste from the site to neighbouring facilities that are able to process the same types of waste until such a time when the site can resume operations within its normal operating capacity. The procedure detailed in section 9.1.4 should be followed.
- Receipt of feedstock materials shall not recommence until a full review of this Management Plan has been conducted and process controls amended as required.

8.12 Records

Documentation relating to the receipt and dispatch of waste are kept securely in the Weighbridge Office (refer to section 11 for further details).

9 POLLUTION CONTROL, AMENITY MANAGEMENT, MONITORING AND REPORTING SYSTEMS

9.1 Accident/Incident Prevention and Management

9.1.1 Site Emergency Plan

The company has an Accident/Pollution Incident Management Plan (**MP2**) which forms part of its Environmental Management System. This complies with the Natural Resource Wales' requirements for a Site Emergency Plan.

9.1.2 Management of Accidents and Incidents

The Accident/Pollution Incident Plan (**MP2**) and Accident/Pollution Incident Response Procedures (Procedures **PR1 – PR8**) detail the approaches that should be followed in the event of an accident or pollution incident. Any incident should be recorded on an Environmental Accident (and Incident) Record (**FR10**) and reported in accordance with Procedure **PR15**.

9.1.3 Accident/Incident Prevention

9.1.3.1 Surface Water and Groundwater Pollution

All site containment and drainage systems will be inspected at least weekly, and more often during other periods such as adverse weather conditions, throughout the operational life of the site for cracks, defects and cleanliness, by appropriate site staff. The results of each site inspection shall be recorded on the daily/weekly site checklists. All maintenance and repair works will be carried out at the earliest opportunity and with due consideration given to the nature and scale of the issue. NRW shall be informed of all remedial works.

In the event that a storage tank is found to be leaking, arrangements will be made to have the contents transferred to an alternative container, pending completion of repairs. Any water contaminated with fuel and oil in a bunded area will be removed by an appropriately registered waste removal contractor.

The outside storage area will be checked daily as part of the daily site inspection.

The following control measures will be implemented to minimise potential impacts on surface and groundwater:

- Appropriate surfacing and drainage arrangements:
    - Hazardous wastes stored in a building on impermeable surface with sealed drainage system;
    - Asbestos - double-bagged/wrapped in thick polythene sheeting in an enclosed and lockable container/skip on impermeable surface with sealed drainage system;
    - Non-hazardous wastes (with the exception of wood (treated and untreated) and hard plastics which may be stored on hardstanding following treatment) stored and treated on impermeable surface with sealed drainage system;
    - Inert waste stored and treated on either hardstanding or on an impermeable surface with sealed drainage system;
- Regular maintenance of operational areas such as drainage channels will be carried out;
- Containers and bunds will be inspected and maintained; and
- Written management systems in place for the identification and minimisation risks of pollution, including those arising from operations, maintenance, accidents, incidents, non-conformances.

The Company spillage procedure (**PR3**) will be followed in the event of a spill (see 9.1.3.3 for details regarding the control and monitoring of Leaks and Spills).

9.1.3.2 Fire Prevention and Control

The company operates to a Fire Prevention and Mitigation Plan (**MP4**). Adherence to this plan minimises and manages fire risk at the facility. This document provides further detail regarding the methods used on-site to prevent and control fires.

Accident/Pollution Incident Response Procedure – Fire (**PR2**) and procedures described within the Site Emergency Plan should be followed in the event of a fire.

9.1.3.3 Leaks and Spills

EMS Procedure 3 details the spillage procedure and should be followed in the event of a spill.

The following control measures will be implemented to minimise potential impacts from Leaks and Spills:

- Spill equipment will be available and site staff are responsible for and trained in its use. Sand and absorbent granules are to be kept on site at all times for immediate use to soak up minor spillages.
- All fuels and oils will be stored in double-lined bunded fuel tanks.
- Delivery of fuels will be supervised by a responsible member of staff. The quantity of fuel in storage will be checked, either using a sight glass or by dipping, prior to the fuel delivery being made. The maximum residual capacity of the tank will be determined prior to the commencement of re-filling, so as to prevent overfill.
- AdBlue, hydraulic, lubricating and waste oils will be stored in a lockable container, complete with a suitable spillage containment tray, which will collect any leaks from the drums.
- All drums and similar containers stored within the facility will have their contents and capacity clearly marked;
- To prevent spillages, drum openings will be carried out on a spillage tray;
- In the event of a major spill, immediate action will be taken to contain the spillage and prevent contamination of surface water run-off. Once contained, the spillage will be treated with absorbent and removed to a sealed container for disposal at a licensed facility. The stock of sand and granules shall be replenished as soon as possible;
- A supply of lime or similar material will be maintained to neutralise any spillage of battery acid;
- Records shall be recorded and reported in accordance with Procedure **PR15**;
- Operational staff will receive pollution prevention and spill response training; and
- Any significant spillages will result in a CAR (**FR11**) being raised to establish the root cause of the problem and reviewed at quarterly business management meetings or sooner if there is a significant risk to the environment or operations of the business.

9.1.3.4 Odours

The company operates to an Odour Management Plan (**MP3**). Adherence to this plan minimises and manages odours at the facility. This document provides further detail regarding the methods used on-site to prevent and control odours.

Accident/Pollution Incident Response Procedure – Odour (**PR6**) should be followed in the event of an odour release.

9.1.3.5 Dusts, Fibres and Particulates

Dusts which may be produced during unloading, segregating, loading or storage of waste is controlled, both inside and outside the main transfer station building by application of water spray sourced from on-site

storage and/or a mains water supply.

The following measures will be taken to minimise the risk of dust release:

- Waste shall be sheeted and secured during transport;
- Vehicles and tipping area shall be checked prior to transport;
- Vehicle speed shall be limited;
- All waste operations shall take place within designated areas;
- Visual dust monitoring shall be undertaken at least twice per day.
- Dust suppression (water sprays) fitted to crushing and screening equipment;
- Dust suppression water bowser and road sweeper will be deployed in dry conditions to maintain surface cleanliness. The decision to implement the bowser will be taken by a senior site manager or supervisor on site having regard to the conditions inside and outside the facility. A decision to implement the bowser will be recorded as part of the daily site checklist;
- Shift manager is responsible for checking wind strength and direction and recording this. Operations in the yard e.g. movement of product will be stopped in exceptional wind conditions.

9.1.3.6 Noise and Vibration

Site noise is only likely to occur as a result of the movement of plant and vehicles on site or during use of recycling equipment. The noise generated by these activities is similar to other similar plant and vehicles in general commercial use.

All vehicles and plant used at the facility are of a roadworthy type and to the Construction and Use Transport Regulations in respect of engine noise and emissions and exhaust silencers and are maintained at regular intervals as indicated in the manufactures recommendations.

An auditory inspection shall be carried out by the site manager at least twice per day. Noise levels which are considered higher than usual shall be investigated and recorded in the site diary. Activities will be reduced or stopped until operations are able to commence without elevated noise levels.

The following measures will be taken to minimise the risk of noise and vibration:

- Crushing and screening of waste will only take place during the hours of 7 a.m. to 6 p.m.;
- Haul roads will be kept in a reasonable condition such that potential noise from vehicles is minimised;
- All plant machinery will subject to regular inspection and maintenance;
- Installed noise reducing equipment (acoustic panels, silencers, etc) shall be used and maintained;
- Equipment shall be switched off when not in use;
- Processing operations shall be arranged in such a way as to minimise noise production as far as possible.

9.1.3.7 Pests, Scavenging Animals and Scavenging Birds

Small quantities of food and kitchen waste will be accepted at the facility and/or may be present as contamination in incoming waste. These wastes may attract vermin and scavengers. The most likely pests to be attracted by the waste are fly species, rodents and carnivores (foxes, etc.).

The following measures will be taken to minimise the risk of pests:

- Waste inspected before tipping to identify potential contaminants;
- Storage in purpose-built enclosed skip in the WTS Building;
- Quarantine non-conforming putrescible wastes (storage in closed containers) and removal off-site within 72 hours;
- Visual monitoring for pests, vermin performed daily including inspections for evidence of droppings, damage to property/plant or ground disturbance e.g. burrow, nests and excessive infestation present; and
- Good housekeeping and regular inspection of mess facilities.

In the event of a pest infestation being detected the following measures will be implemented:

- Suitable treatment will be implemented either by employees or by suitable contractors, this may involve the application of insecticides or growth inhibitors, the setting of traps and poisons, or other measures as appropriate; and
- Any waste identified as attracting scavengers shall be isolated and removed from site.

Details of any pest control activities will be recorded during the site inspection and if necessary raised as a CAR (**FR11**).

9.1.3.8 Litter

A daily record of litter inspection is logged on the Daily/weekly Inspection Sheet (Form A) and during the working day, site supervisors will be alerted to incidents of litter on site.

Any evidence of litter will be attended to by hand clearance. The litter collected will be deposited in the relevant container, either for recycling or disposal.

The following measures will be taken to minimise the risk of litter:

- All wastes shall be sheeted and secured during transport;
- Effective collection and storage of polythene and biodegradable bags following depackaging;
- Light fractions to be stored in the WTS Building, or securely in containers; and
- Site fencing to be maintained as an effective barrier to litter being blown offsite.

In the event of litter being detected during the daily inspection the following measures will be implemented:

- Any litter that is blown into adjoining parts of the site will be collected at no greater than daily intervals;
- Any litter that is blown outside of the site boundary will be collected no later than 1 hour after the end of the working day.

9.1.3.9 Mud and Debris

The site is largely laid to concrete or hardstand, with concrete, asphalt or stone access roads. This results in limited opportunity for mud generation.

A daily record of mud and debris is logged on the Site Inspection Record (**FR1**) and during the working day, drivers will alert the Site Manager to deposits of mud and debris on site or on the adjacent highway.

Any deposits of mud or debris caused by the site operations are cleansed by mechanical sweeping as soon as they are detected.

9.1.3.10 Other Fugitive Emissions

Due to the nature of operations other fugitive emissions have been risk assessed and it determined that emissions are below threshold levels. The contribution to local Air Quality levels via onsite exhaust emissions is negligible when compared to emissions from nearby highways. The facility will however ensure that it is not a generator of significant additional emissions.

The following measures will be taken to control other fugitive emissions:

- All plant machinery will subject to regular inspection and maintenance;
- Good fuel tank and transfer pipework design.
- Vehicles shall be compliant with relevant exhaust emissions standards;
- All plant machinery will subject to regular inspection and maintenance.

9.1.3.11 Utility Failure

With the exception of minimising the risk of an incident in internal systems through the site infrastructure maintenance programme, utility failure is largely outside of the control of the operator.

Procedure **PR5** describes what to do in the event of services (water, electricity or packaged sewerage treatment plant) failure.

9.1.3.12 Flooding

Procedure **PR4** details the procedure and should be followed in the event of a flood.

Localised flooding of the site from rivers, surface water & small watercourses or the sea is NOT an identified risk for the site. Based on NRW's Flod Risk maps, all areas outside the shaded area are categorised as having a 'very low' chance of flooding, or a chance of flooding of less than 1 in 1000 (0.1%).

In the event of a localised flood event, the southern and western boundaries of the site are bunded, the north enclosed by topography and the west fenced. These features would act to retain waste materials within the site and/or impede the flow of floodwater into the site. Consequently, in the event of a flood, it is unlikely that any permitted wastes would be washed off site, and were this to occur, they would add to the volume of the post-flood clean-up workload, rather than the hazard.

In the event of flooding (or of likely flooding) of the site, the following steps would be taken (where safe to do so):

- Wastes, liquids and other materials with potential to be washed from the site shall be removed from site (or relocated within the site) to areas less likely to be affected by floodwater; and
- Where any risk of contaminated water discharging from site as flood waters recede is identified, actions required to retain and manage flood water within the site will be identified and actioned in agreement with Natural Resources Wales and the Emergency Services.

9.1.4 Site Closure

Where any incident requires the closure of the site, the Site Manager/Supervisor shall instruct the weighbridge operator to hold all incoming traffic. The weighbridge operator shall attempt to contact customers by mobile telephone to advise them that the site is unavailable and that they should take their waste to an alternative waste facility. The closest site with similar waste processing capabilities is Bryn Recycling Limited, Gelliargwellt Farm, Gelligaer Rd, Hengoed, CF82 8FY or Atlantic Recycling Limited, Ty to Maen Farm, Newton Rd, Rumney, St. Mellons, Cardiff, CF3 2EJ. Vehicles arriving at site should be directed to park off of the main industrial access road (at the commercial estate to the south west) if possible while alternative arrangements are made. This will ensure that they do not obstruct access to the site by the

emergency services.

9.1.5 Complaints

The company's Complaints Procedure (**PR14**) applies to all complaints, feedback and requests made by third parties regarding operational activities.

Complaints are to be investigated immediately by the Site Manager. The nature and details of the complaint will be logged on a Complaints Record (**FR2**), along with the findings of the investigations and any action required.

In addition:

- Odour complaints are managed in accordance with the Odour Management Plan (**MP3**), logged on an External Odour Complaints Investigation Record (**FR3**), with an Internal Odour Investigation Record (**FR4**) being completed during investigation of the incident.

The Site Manager is responsible for determining the appropriate action to be taken and will communicate the nature of the actions to be taken and timescales to the Complainant.

All complaints from third parties including external customers, potential customers, statutory authorities, statutory consultees, members of the general public and internal clients will be forwarded to the Site Manager to action as below.

The Site Manager will ensure that:

- All complaints are logged;
- The complaint is investigated to identify the cause. If a complaint is relayed to the company by a 3rd party (e.g. Natural Resources Wales), this may require direct communication with the complainant in order for the complaint to be effectively investigated;
- Necessary preventative action is taken to both address the cause of the complaint and that measures are implemented to prevent a reoccurrence of the same problem. These actions must be documented and a CAR raised as required;
- The Complainant will be contacted and given information on the investigations conducted and actions taken as appropriate;
- Where a complaint or query is likely to involve a statutory authority, the emergency services, an insurance company, or the media, the Managing Director will be informed;
- Complaints linked to contracts with specific complaints procedures will be reported in line with contractual requirements and timescales. Local procedures may need to be in place to ensure these are adhered to;
- All complaints are discussed at site meetings and reviewed at monthly management meetings; and
- If the investigation indicates that the complaint has not been justified this will be clearly recorded on the Incident Report.

In the event of a complaint being verified as resulting from the operation of the facility, the Site Manager is responsible for identifying short and long-term mitigation measures to minimise the risk of future incidents. The efficacy of any mitigation measures will be confirmed through further monitoring at the receptor (subject to the Complainant's agreement) or at a representative position along the site boundary.

Complaints logs, in combination with meteorological data and site monitoring information will be used to assess any trends.

10 MONITORING AND REPORTING

10.1.1 Monitoring

The operator will maintain records of all monitoring required by the permit including records of the taking and analysis of samples, instrument measurements (periodic and continual), calibrations, examinations, tests and surveys and any assessment or evaluation made on the basis of such data.

Monitoring equipment, techniques, personnel and organisations employed for the emissions monitoring programme and the environmental or other monitoring specified above shall have either UKAS accreditation, MCERTS certification, MCERTS accreditation (as appropriate), where available, unless otherwise agreed in writing by Natural Resources Wales.

Permanent means of access shall be provided to enable sampling/monitoring to be carried out in relation to any specified emission points unless otherwise agreed in writing by Natural Resources Wales.

Where Natural Resources Wales has requested in writing that it shall be notified when the operator is to undertake monitoring and/or spot sampling, the operator will inform Natural Resources Wales when the relevant monitoring and/or spot sampling is to take place. The operator shall provide this information to Natural Resources Wales at least 14 days before the date the monitoring is to be undertaken.

10.1.2 Reporting

The operator will report on any aspects of the operation required by the permit.

11 SITE RECORDS, NOTIFICATIONS AND INTERPRETATION

11.1 General

All records required to be made by this permit shall:

a) be legible;
b) be made as soon as reasonably practicable;
c) if amended, be amended in such a way that the original and any subsequent amendments remain legible, or are capable of retrieval; and
d) be retained, unless otherwise agreed in writing by Natural Resources Wales, for at least 6 years from the date when the records were made, or in the case of the following records until permit surrender:
    (i) off-site environmental effects; and
    (ii) matters which affect the condition of the land and groundwater.

11.2 Security and Availability of Records

Most documents are securely stored electronically, with paper copies also available where required.

Access to the statutory documents and records are made available to any authorised NRW Officer.

Details of documentation and security arrangements are considered to be confidential but can be a matter of discussion with an authorised NRW officer.

All wastes delivered to the facility will be weighed and a ticket shall be issued to the vehicle transporting the material, with a copy of the ticket filed at the site office.

NRW will be provided with a summary of types of quantities of wastes received at the site. These records will be relayed to NRW in an agreed format and at an agreed frequency. The site diary will be stored in the office which is locked outside of office hours. The diary will be used to record site activity and any unusual events. The diary will be made readily available for inspection by any NRW officer at any reasonable time.

Written details of site visitors will include:

- Name (including signature) and company/organisation
- Reason for visit
- Time of arrival and departure

The time (when necessary) and the date of the following events shall also be recorded in the site diary:

- Start and finish of any construction/engineering works within the site boundary
- Start and finish of any management processes carried out on site
- All maintenance
- Breakdowns
- Emergencies and environmental incidents and remedial actions taken
- Problems with waste received and action taken
- Evidence of all waste entering and leaving the site; where from, date, time, weight
- Site inspections - who carried out the site inspection, date and time, why and the consequent actions carried out by the operator
- Attendance of technically competent management on site and the date and time of departure of the technically competent manager

- Despatch of records to NRW
- Extreme weather conditions
- Complaints and actions taken

11.3 Notifications

Where an incident is serious, the following information will be submitted to Natural Resources Wales as soon as practicable after the event and in accordance with any stated timescales. Notification should be in accordance with the requirement of the relevant Permit conditions (where applicable):

1. Natural Resources Wales shall be notified without delay following the detection of:
   - Any malfunction, breakdown or failure of equipment or techniques, accident, or emission of a substance not controlled by an emission limit which has caused, is causing or may cause significant pollution (within 24 hours of detection);
   - Breaches of a limit (within 24 hours of detection); and
   - The detection of any significant adverse environmental effect (within 24 hours of detection).
2. Any information provided under 1. above shall be confirmed by sending the information listed in schedule 5 to the permit within the time period specified in that schedule (within 24 hours of detection).
3. Where Natural Resources Wales has requested in writing that it shall be notified when the operator is to undertake monitoring and/or spot sampling, the operator shall inform Natural Resources Wales when the relevant monitoring and/or spot sampling is to take place. The operator shall provide this information to Natural Resources Wales at least 14 days before the date the monitoring is to be undertaken.
4. Natural Resources Wales shall be notified within 14 days of the occurrence of the following matters except where such disclosure is prohibited by Stock Exchange rules:
   a) Where the operator is a registered company:
      - any change in the operator's trading name, registered name or registered office address; and
      - any steps taken with a view to the operator going into administration, entering into a company voluntary arrangement or being wound up.
   b) Where the operator is a corporate body other than a registered company:
      - any change in the operator's name or address; and
      - any steps taken with a view to the dissolution of the operator.
   c) In any other case:
      - the death of any of the named operators (where the operator consists of more than one named individual);
      - any change in the operator's name(s) or address(es); and
      - any steps taken with a view to the operator, or any one of them, going into bankruptcy, entering into a composition or arrangement with creditors, or, in the case them being in a partnership, dissolving the partnership.
5. Where the operator proposes to make a change in the nature or functioning, or an extension of the activities, which may have consequences for the environment and the change is not otherwise the subject of an application for approval under the Regulations or the permit:
   a) Natural Resources Wales shall be notified at least 14 days before making the change; and

b) the notification shall contain a description of the proposed change in operation.

6. Other notifications (not specified in the site permit)

- Breach of operating procedures (within 3 days);
- A change of TCM (7 days);
- A conviction and/or an appeal affecting the site operation and/or permit compliance (14 days);
- Financial changes affecting the site operations with regard to the conditions within the permit (14 days); and
- Activity commencement and/or changes (7 days).

11.4 Interpretation

As per the meanings described within the permit documents.

DRAWINGS

Refer to EMS for current Site Drawings

Drawing **10915 – 000 - A** Permitted Area Plan

Drawing **10915 – 000 - B** Site and Surrounding Area Plan

Drawing **10915 – 000 - C** Site (Block) Plan

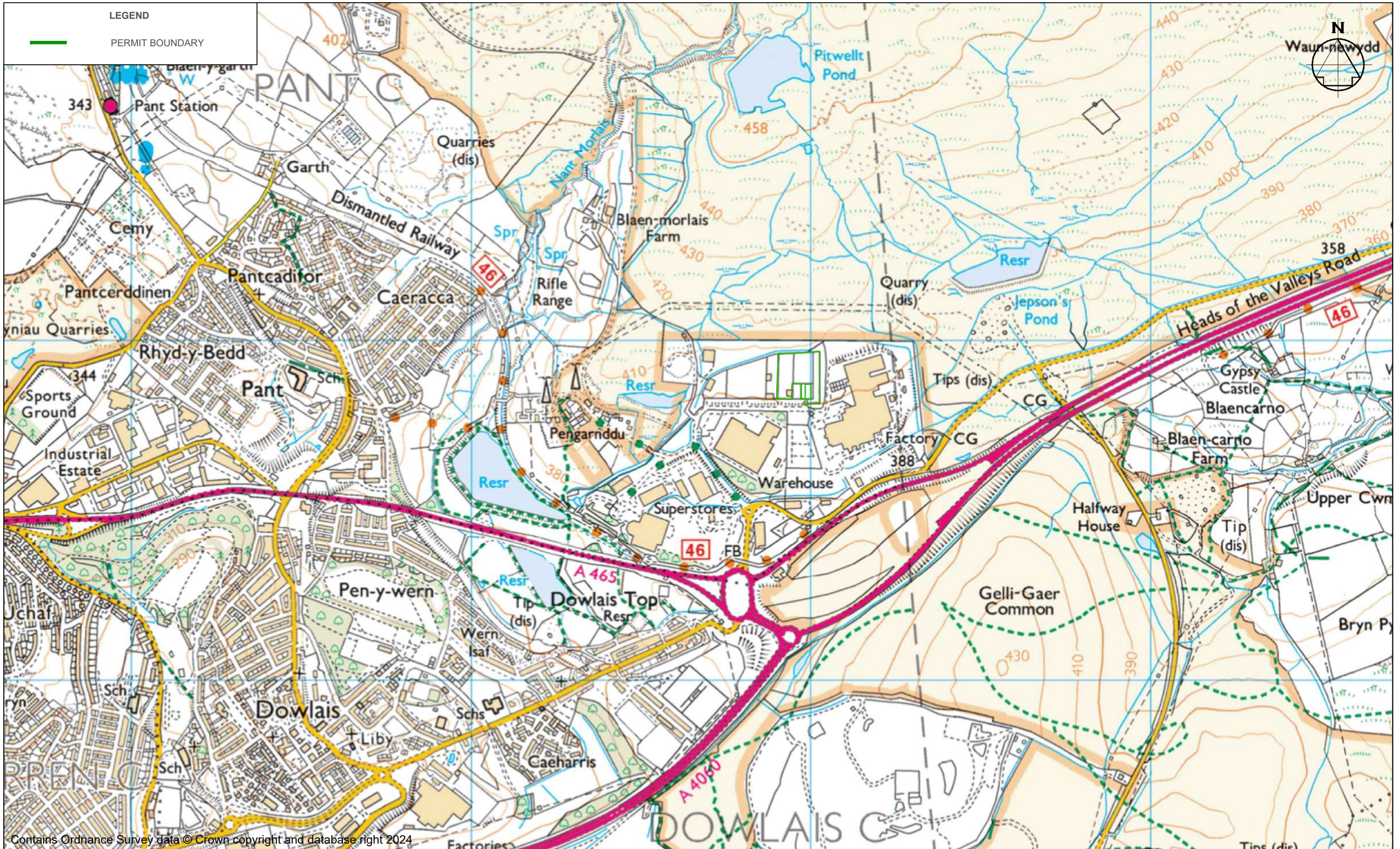
Drawing **10915 – 000 - D** Drainage Plan

Drawing **10915 – 000 - E** Storage Plan

Drawing **10915 – 000 - G** Receptor Plan

Drawing **10915 - 000 - H** Process Flowchart

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AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	UPDATE BASE MAP	04/07/22	SCW	NB
B	UPDATE BASE MAP	24/04/23	SCW	NB
C	UPDATE BASE MAP	25/07/25	SCW	NB

TECHNIA ENVIRONMENT AND PLANNING LTD
UNIT 1 FOXES LANE, OAKDALE BUSINESS PARK
BLACKWOOD, NP12 4AB
TEL: 02921 900400
EMAIL: PLANNING@TEPL.EU

MERTHYR BOROUGH RECYCLING COMPANY LTD

LOCATION PLAN

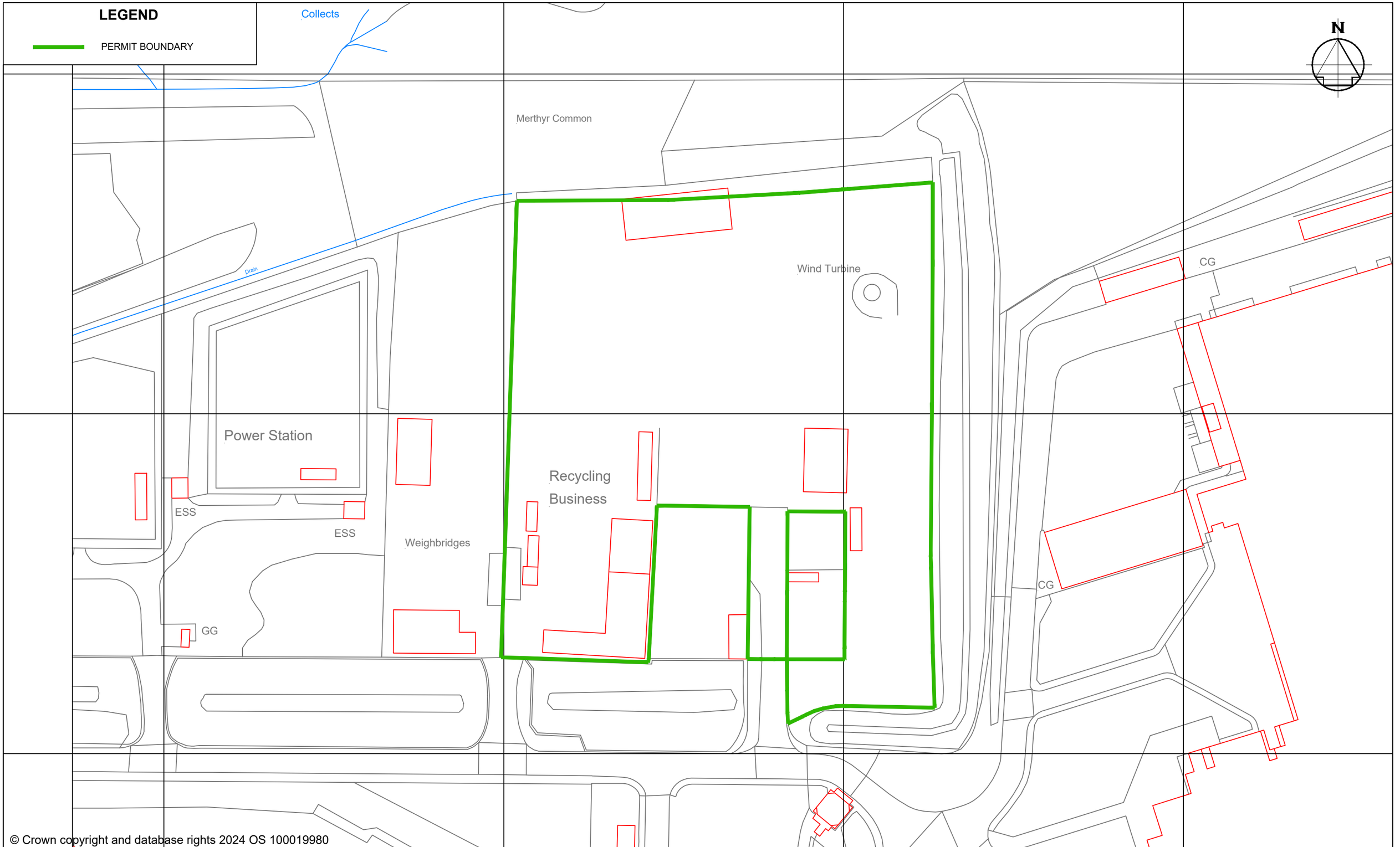
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Drawn	SCW	1:10,000
Ch'kd	NB	
Appr'd	NB	@A3
Date	25/07/25	

Job No. MBRC Drg No. 10915 - 000 - A

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LEGEND

PERMIT BOUNDARY



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AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	UPDATE BASE MAP	24/04/23	SCW	NB
B	UPDATE BASE MAP	25/07/25	SCW	NB

TECHNIA ENVIRONMENT AND PLANNING LTD
UNIT 1 FOXES LANE, OAKDALE BUSINESS PARK
BLACKWOOD, NP12 4AB
TEL: 02921 900400
EMAIL: PLANNING@TEPL.EU

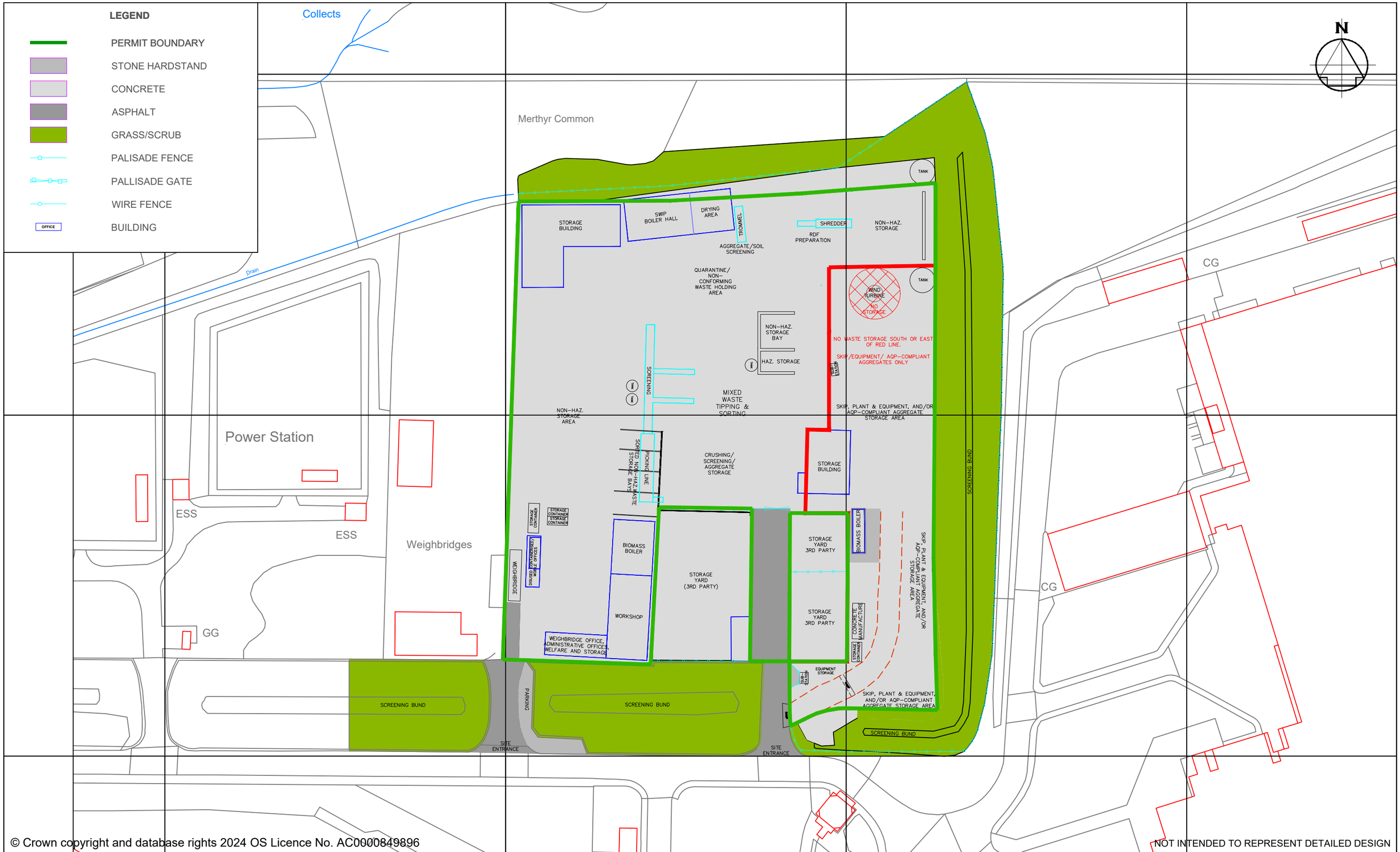
MERTHYR BOROUGH RECYCLING COMPANY LTD

SITE PLAN

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Ch'kd	NB		
Appr'd	NB	@A3	
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NOT INTENDED TO REPRESENT DETAILED DESIGN

AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	UPDATE LAYOUT	19/12/21	SCW	NB
B	UPDATE LAYOUT	24/04/23	SCW	NB
C	UPDATE BASE MAP, UPDATE LAYOUT	25/07/25	SCW	NB

TECHNIA ENVIRONMENT AND PLANNING LTD
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EMAIL: PLANNING@TEPL.EU

MERTHYR BOROUGH RECYCLING COMPANY LTD

SITE LAYOUT

Drawn	SCW	Scale	1:1,000
Ch'kd	NB		
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- PERMIT BOUNDARY
- STONE HARDSTAND
- CONCRETE
- ASPHALT
- GRASS/SCRUB
- BUILDING (OFFICE)

SURFACE WATER DRAINAGE (COLOUR MATCHES CATCHMENT AREA)

- DRAINED AREAS
- FALL
- GULLEY
- BELOW GROUND PIPEWORK (TO SEWER)
- CUT-OFF DRAIN
- SILT TRAP/STORAGE TANK/ INTERCEPTOR
- SILT TRAP
- INTERCEPTOR

Collects
Merthyr Common
Power Station
ESS
ESS
Weighbridges
GG
CG
CG
N
STORAGE BUILDING
SWIP BOILER HALL
DRYING AREA
TROMMEL
SHREDDER
RDF PREPARATION
NON-HAZ. STORAGE
AGGREGATE/SOIL SCREENING
TANK
TANK
WATER
QUARANTINE/ NON-CONFORMING WASTE HOLDING AREA
WIND TURBINE
NO STORAGE
NON-HAZ. STORAGE BAY
NO WASTE STORAGE SOUTH OR EAST OF RED LINE.
SKIP EQUIPMENT/ AQP-COMPLIANT AGGREGATES ONLY
SURFACE WATER DRAINED ACROSS IMPERMEABLE SURFACE TO SILT TRAP /INTERCEPTOR TO SEWER
NON-HAZ. STORAGE BAY
SURFACE WATER DRAINED ACROSS IMPERMEABLE SURFACE TO SILT TRAP /INTERCEPTOR TO SEWER
SCREENING
MIXED WASTE TIPPING & SORTING
SKIP, PLANT & EQUIPMENT, AND/OR AQP-COMPLIANT AGGREGATE STORAGE AREA
SORTED NON-HAZ STORAGE BAYS
PICKING LINE
CRUSHING/ SCREENING/ AGGREGATE STORAGE
INTERCEPTOR OUTLET TO SEWER BLOCKED OFF
STORAGE BUILDING
PUMP DISCHARGE TO FOUL SEWER
PUMP
SILT TRAP/ HOLDING TANK
CLASS 1 FULL-RETENTION INTERCEPTOR
CLASS 1 FULL-RETENTION INTERCEPTOR
KERB
SILT TRAP/ HOLDING TANK
CUT-OFF DRAIN
BIOMASS BOILER
STORAGE YARD 3RD PARTY
BIOMASS BOILER
SURFACE WATER DRAINED ACROSS IMPERMEABLE SURFACE TO SILT TRAP/INTERCEPTOR TO SEWER
SKIP, PLANT & EQUIPMENT, AND/OR AQP-COMPLIANT AGGREGATE STORAGE AREA
STORAGE CONTAINER
STORAGE CONTAINER
STORAGE CONTAINER
CLASS 1 FULL-RETENTION INTERCEPTOR
WEIGHBRIDGE
STORAGE YARD (3RD PARTY)
STORAGE YARD 3RD PARTY
RAISED KERB
WORKSHOP
CONCRETE MANUFACTURE
WEIGHBRIDGE OFFICE, ADMINISTRATIVE OFFICES, WELFARE AND STORAGE
EQUIPMENT STORAGE
PUMP STATION
CHANNEL
SCREENING BUND
SCREENING BUND
SCREENING BUND
PARKING
SITE ENTRANCE
SITE ENTRANCE
SILT TRAP/ HOLDING TANK
EXISTING DISCHARGE TO FOUL SEWER
EXISTING DISCHARGE TO SURFACE WATER SEWER

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AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	UPDATE LAYOUT AND DRAINAGE DETAILS	19/12/21	SCW	NB
B	ADD SILT TRAP PROPOSAL	04/07/22	SCW	NB
C	UPDATE LAYOUT	24/04/23	SCW	NB
D	UPDATE SURFACING AND INTERCEPTOR DETAILS	02/11/23	SCW	NB
E	UPDATE BASE MAP, UPDATE DRAINAGE FOLLOWING DCWW SURVEY	25/07/25	SCW	NB

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MERTHYR BOROUGH RECYCLING COMPANY LTD

DRAINAGE PLAN

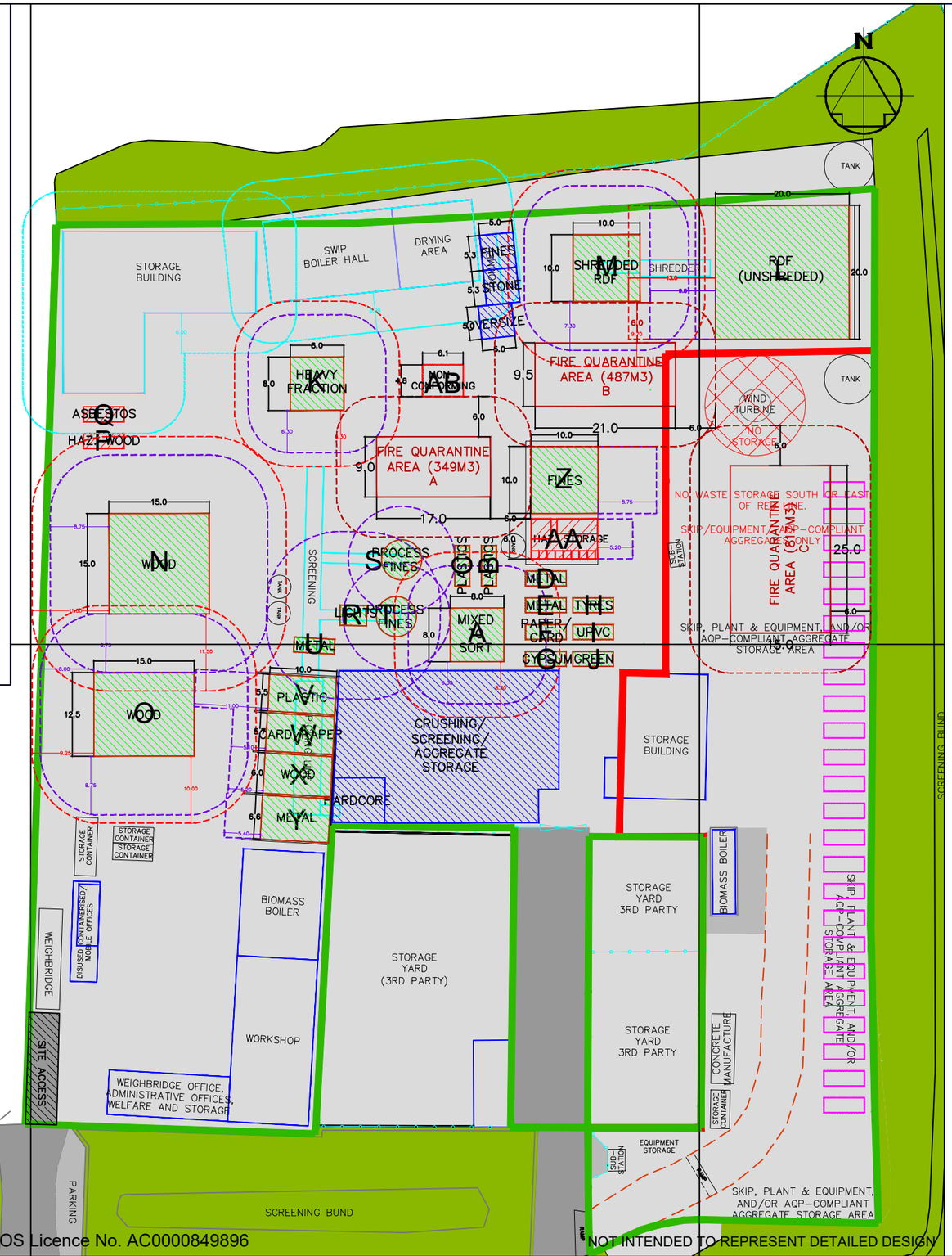
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Ch'kd	NB		
Appr'd	NB		@A3
Date	25/07/25		

Job No. MBRC Drg No. 10915 - 000 - D

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LEGEND

- PERMIT BOUNDARY
- STONE HARDSTAND
- CONCRETE
- ASPHALT
- GRASS/SCRUB
- PALISADE FENCE
- PALLISADE GATE
- WIRE FENCE
- BUILDING
- HAZARDOUS WASTE STORAGE
- NON-HAZARDOUS (COMBUSTIBLE) WASTE STORAGE
- NON-HAZARDOUS (INERT) WASTE STORAGE
- STOCKPILE TO STOCKPILE FIRE BREAK
- STOCKPILE TO BUILDING FIRE BREAK
- FIRE QUARANTINE



A	Incoming Waste (mixed and source segregated)	Central storage yard	Stockpile	No	Yes	8m x 8m x 4m	256.0	1	55.8	7 days
B	Rigid Plastics	Central storage yard	RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	3.1	3 months
C	Plastic Film		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	3.8	3 months
D	Metals		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	11.3	3 months
E			RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	3.8	3 months
F	Paper & Cardboard		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	2.6	3 months
G	Gypsum		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	7.7	3 months
H	Tyres		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	5.8	3 months
I	uPVC		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	3.1	3 months
J	Green		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	4.4	1 month
K	Mixed (Sorted Heavy Fraction)	Central storage yard	Stockpile	No	Yes	8m x 8m x 4m	256.0	1	55.8	3 months
L	Mixed (Sorted Light Fraction)	North eastern storage yard	Stockpile	No	Yes	20m x 20m x 4m	1600.0	1	195.4	3 months
M	Refuse Derived Fuel (RDF)		Stockpile	No	Yes	10m x 10m x 4m	400.0	1	48.8	3 months
N	Unprocessed Wood	Western storage yard	Stockpile	No	Yes	15m x 15m x 4m	900.0	1	98.6	1 months
O	Woodchip		Stockpile	No	Yes	15m x 12.5m x 4m	750.0	1	123.8	3 months
P	Wood		RoRo Skip	Yes	Yes	6.1m x 2.4m x 2.6m	38.1	1	4.1	3 months
Q	Asbestos		Enclosed Container	Yes	No	6.1m x 2.4m x 2.6m	38.1	1	3.9	3 months
R	Mixed (Sorted Light Fraction)	Centre of site below screen and picking line	Cage	No	Yes	4m x 3m x 3m	36.0	1	4.4	3 months
S	Process Fines		Stockpile	No	Yes	10m x 4.55m x 4m	182.0	1	22.2	1 month
T	Process Fines		Stockpile	No	Yes	10m x 4.55m x 4m	182.0	1	22.2	1 month
U	Ferrous Metal		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	11.3	3 months
V	Plastics		Bay	No	Yes	10m x 5.5m x 4m	220.0	1	38.2	3 months
W	Paper & Cardboard		Bay	No	Yes	10m x 5.7m x 4m	228.0	1	15.8	3 months
X	Wood		Bay	No	Yes	10m x 6.0m x 4m	240.0	1	26.1	3 months
Y	Non-Ferrous Metal		Bay	No	Yes	10m x 6.6m x 4m	264.0	1	28.5	3 months
Z	Process Fines	Central storage yard	Bay	No	Yes	10m x 10m x 4m	400.0	1	48.8	1 month
AA	Waste Quarantine		Covered Bay	Yes	Yes	10m x 6m x 4m	240.0	1	26.1	1 months
AB	Non-Conforming Waste		RoRo Skips	No	Yes	6.1m x 2.4m x 2.6m	38.1	2	8.3	7 days

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AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	UPDATE LAYOUT	19/12/21	SCW	NB
B	UPDATE LAYOUT	24/04/23	SCW	NB
C	UPDATE BASE MAP, UPDATE STORAGE ARRANGEMENTS	25/07/25	SCW	NB

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MERTHYR BOROUGH RECYCLING COMPANY LTD

STORAGE PLAN

Drawn	SCW	Scale	1:750
Ch'kd	NB		
Appr'd	NB	@A3	
Date	25/07/25		

Job No.	MBRC	Drg No.	10915 - 000 - E

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LEGEND

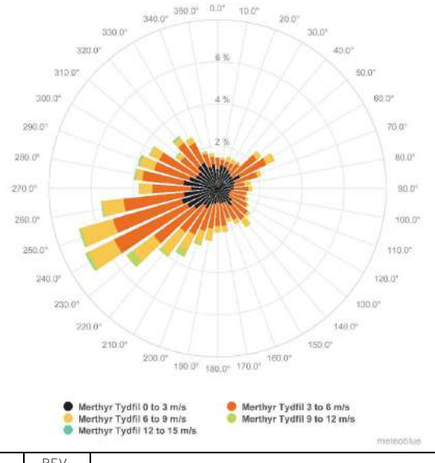
- SITE BOUNDARY
- 1000M/2000M SCREENING BOUNDARIES

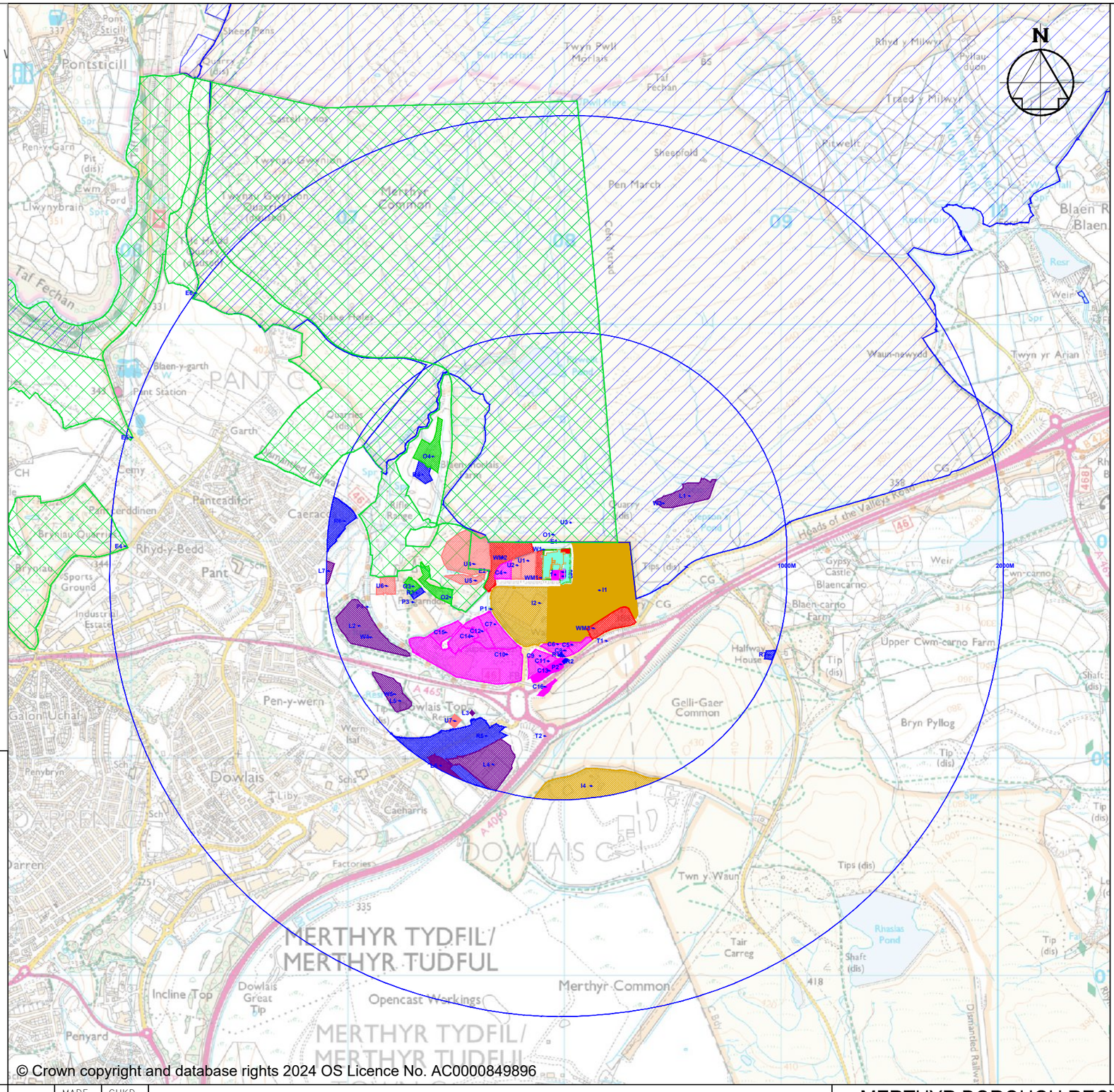
HUMAN RECEPTORS

- R3 RESIDENTIAL
- C3 COMMERCIAL
- I3 INDUSTRIAL
- O3 OTHER
- U3 UTILITY
- L3 LEISURE/RECREATION
- W3 WASTE MANAGEMENT
- T3 KEY TRANSPORT ROUTE
- P3 PUBLIC RIGHT OF WAY
- OPEN ACCESS LAND

ECOLOGICAL RECEPTORS

- E3 SSSI
- E3 SAC
- E3 RAMSAR
- E3 SPA
- E3 NNR
- E3 LNR
- E3 SINC
- W1





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RECEPTOR TYPE

G	0M	GROUNDWATER
C1	0M	STORAGE YARD
C2	0M	STORAGE YARD
C3	0M	SALVAGE YARD
WM1	0M	ELV ATF
W1	2M	WATERCOURSE
I1	8M	ABATTOIR
E1	29M	SSSI
E2	29M	SINC
O1	31M	OPEN ACCESS LAND
U1	34M	STOR ENERGY
I2	36M	AUTOMOTIVE PARTS MANUFACTURER
WM2	45M	WASTE TRANSFER STATION
U2	100M	STOR ENERGY
U3	121M	33KV OVERHEAD POWER LINES
C4	146M	SALVAGE YARD
WM3	221M	ELV ATF
U4	241M	RESERVOIR (UNDERGROUND)
E3	248M	SINC
U5	264M	RESERVOIR (ABOVE GROUND)
C5	264M	CARAVAN STORAGE
P1	276M	PUBLIC RIGHT OF WAY
C6	277M	FURNITURE RETAILER
C7	286M	FURNISHINGS RETAILER
C8	295M	MOT CENTRE
T1	309M	A465 HEADS OF THE VALLEYS ROAD
R1	320M	RESIDENTIAL PROPERTY
C9	326M	GROCERIES RETAILER
C10	326M	GROCERIES RETAILER/PETROL STATION
C11	334M	STORAGE YARD
C12	343M	CARPET RETAILER
C13	357M	OFFICE/STORAGE YARD
R2	348M	RESIDENTIAL PROPERTY
P2	374M	NATIONAL CYCLE ROUTE 46
C14	391M	HOMEWARES RETAILER
O2	416M	STABLES/STORAGE/ALLOTMENTS
C15	428M	FLOORING/FURNITURE RETAILERS
C16	442M	PETROL STATION
W3/L1	445M	POND
R3	549M	RESIDENTIAL PROPERTY
O3	565M	STABLES/STORAGE YARDS
O4	606M	FARM
R4	608M	RESIDENTIAL PROPERTIES
P3	609M	PUBLIC RIGHT OF WAY
U6	682M	ELECTRICITY SUBSTATION
L3	688M	PARK/RECREATION AREA
R5	700M	RESIDENTIAL PROPERTIES
W4/L2	705M	RESERVOIR (ANGLING)
U7	745M	RESERVOIR (UNDERGROUND)
L4	762M	PLAYING FIELDS
W5/L5	816M	RESERVOIR (ANGLING)
P4	820M	PUBLIC RIGHT OF WAY
I5	862M	LANDFILL
R6	878M	RESIDENTIAL PROPERTIES
L6	948M	PLAYING FIELDS
R7	958M	RESIDENTIAL PROPERTY
L7	964M	PLAYING FIELD
E4	1920M	SINC
E5	1967M	SINC
E6	1993M	SINC

AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	REPLACE PREVIOUS RECEPTOR PLAN (FPMP V5 REV 1 – 19/017D 001)	25/07/25	SCW	NB

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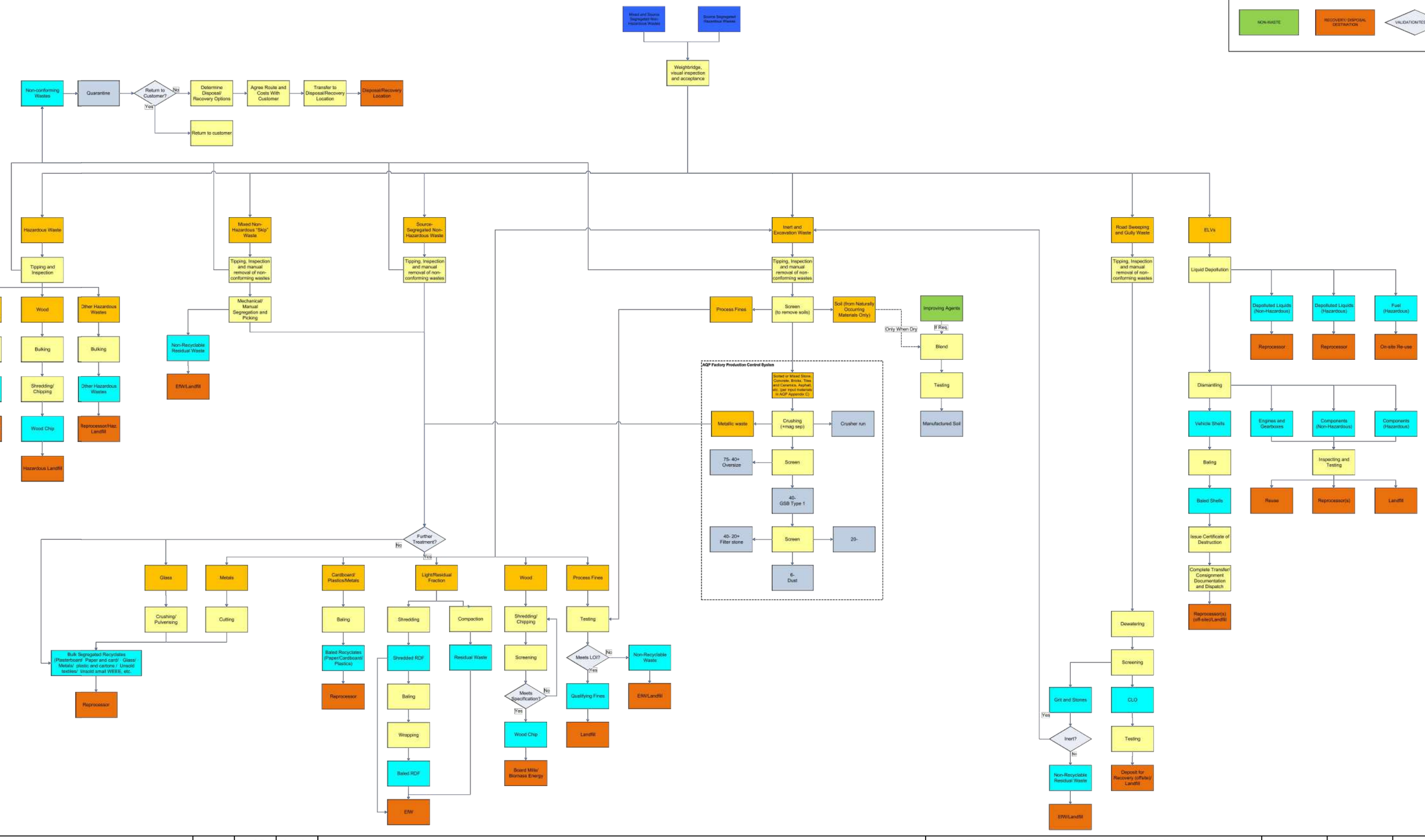
MERTHYR BOROUGH RECYCLING COMPANY LTD

RECEPTOR PLAN

Drawn	SCW	Scale	1:20,000
Ch'kd	NB		
Appr'd	NB		@A3
Date	25/07/25		

Job No. MBRC Drg No. 10915 - 000 - G

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AMENDMENTS	REV REF	DETAILS	DATE	MADE BY	CHKD BY
	A	REVISE LAYOUT TO IMPROVE READABILITY	25/07/25	SCW	NB

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PROCESS FLOWCHART

Drawn	SCW	Scale
Ch'kd	NB	NTS
Appr'd	NB	@A3
Date	25/07/25	

Job No. MBRC Drg No. 10915 - 000 - H

APPENDIX A – PERMITTED ACTIVITES AND WASTE TYPES - HAZARDOUS & NON-HAZARDOUS HCI WTS WITH TREATMENT AND ASBESTOS STORAGE

Table S1.1 activities	Description of activities for waste operations	Limits of activities
A1 Hazardous & non-hazardous household, commercial and industrial waste transfer station with treatment and asbestos storage	**R3:** Recycling/reclamation of organic substances which are not used as solvents **R4:** Recycling/reclamation of metals and metal compounds **R5:** Recycling/reclamation of other inorganic compounds **R13:** Storage of waste pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced) **D15:** Storage pending any of the operations numbered D1 to D14 (excluding temporary storage, pending collection, on the site where it is produced) **D9:** Physico-chemical treatment not specified elsewhere in this Annex which results in final compounds or mixtures which are discarded by means of any of the operations numbered D 1 to D 12 (e.g. evaporation, drying, calcination, etc.)	All hazardous and non-hazardous waste must be stored and treated on an impermeable surface with sealed drainage. Following treatment, specified wastes – non-hazardous wood (treated and untreated) and hard plastics may be stored on hardstanding. All inert waste may be stored and treated on either hardstanding or on an impermeable surface with sealed drainage. Treatment operations shall be limited to manual and/or mechanical: - sorting - separation and segregation - cutting - pulverising - chipping - screening - baling - bulking - wrapping - repackaging - shredding - blending or mixing - crushing or compaction of waste into different components for disposal (no more than 50 tonnes per day for non-hazardous waste, no more than 10 tonnes for hazardous waste) or recovery. Hazardous waste treatment will be limited to bulking up and shredding of hazardous waste wood only. There shall be no treatment of: - waste electronic and electrical equipment - waste batteries and/or accumulators - asbestos waste other than bulking up for onward transfer. Asbestos and asbestos containing waste shall be double bagged and stored within clearly identified, segregated, secure, lockable containers on an impermeable surface with sealed drainage. The maximum quantity of hazardous waste that can be stored at the site in total for recovery or

		disposal, (excluding end of life vehicles and/or waste electrical and electronic equipment stored pending manual dismantling, repair or refurbishment), shall not exceed 50 tonnes at any one time. The maximum quantity of waste slags and/or ashes that can be treated, in total, at the site for recovery or a mix of recovery and disposal shall not exceed 75 tonnes per day. The maximum quantity of waste slags and/or ashes that can be treated, in total, at the site for disposal shall not exceed 50 tonnes per day. Waste types as specified in Table 2.1

The waste types allowed to be imported into the facility and their European Waste Catalogue are listed below:

NOTE: Any waste whose six digit code is marked with an asterisk (*) is a hazardous waste.

Table S2.1 Permitted waste types and quantities for hazardous & non-hazardous household, commercial and industrial waste transfer station with treatment and asbestos storage with treatment and asbestos storage	
Maximum quantity	The maximum quantity of waste to be accepted at the whole site shall not exceed 252,000 tonnes per year.
Exclusions	Wastes having any of the following characteristics shall not be accepted: • wastes consisting solely or mainly of dusts or powders • wastes which are odour producing or likely to be odorous
1	**WASTES RESULTING FROM EXPLORATION, MINING, QUARRYING, AND PHYSICAL AND CHEMICAL TREATMENT OF MINERALS**
01 01	wastes from mineral excavation
01 01 01	wastes from mineral metalliferous excavation
01 01 02	wastes from mineral non-metalliferous excavation
01 03	wastes from physical and chemical processing of metalliferous minerals
01 03 06	tailings other than those mentioned in 01 03 04 and 01 03 05
01 03 09	red mud from alumina production other than the wastes mentioned in 01 03 07
01 04	wastes from physical and chemical processing of non-metalliferous minerals
01 04 08	waste gravel and crushed rocks other than those mentioned in 01 04 07
01 04 09	waste sand and clays
01 04 11	wastes from potash and rock salt processing other than those mentioned in 01 04 07
01 04 12	tailings and other wastes from washing and cleaning of minerals other than those mentioned in 01 04 07 and 01 04 11
01 04 13	wastes from stone cutting and sawing other than those mentioned in 01 04 07
2	**WASTES FROM AGRICULTURE, HORTICULTURE, AQUACULTURE, FORESTRY, HUNTING AND FISHING, FOOD PREPARATION AND PROCESSING**
02 01	wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing
02 01 03	plant-tissue waste
02 01 04	waste plastics (except packaging)
02 01 07	wastes from forestry
02 01 10	waste metal
02 02	wastes from the preparation and processing of meat, fish and other foods of animal origin
02 02 03	materials unsuitable for consumption or processing
02 03	wastes from fruit, vegetables, cereals, edible oils, cocoa, coffee, tea and tobacco preparation and processing; conserve production; yeast and yeast extract production, molasses preparation and fermentation
02 03 04	materials unsuitable for consumption or processing
02 04	wastes from sugar processing
02 04 01	soil from cleaning and washing beet
02 04 02	off-specification calcium carbonate
02 05	wastes from the dairy products industry
02 05 01	materials unsuitable for consumption or processing
02 06	wastes from the baking and confectionery industry
02 06 01	materials unsuitable for consumption or processing

02 06 02	wastes from preserving agents
02 07	wastes from the production of alcoholic and non-alcoholic beverages (except coffee, tea and cocoa)
02 07 01	wastes from washing, cleaning and mechanical reduction of raw materials
02 07 02	wastes from spirits distillation
02 07 04	materials unsuitable for consumption or processing
3	**WASTES FROM WOOD PROCESSING AND THE PRODUCTION OF PANELS AND FURNITURE, PULP, PAPER AND CARDBOARD**
03 01	wastes from wood processing and the production of panels and furniture
03 01 01	waste bark and cork
03 01 05	sawdust, shavings, cuttings, wood, particle board and veneer other than those mentioned in 03 01 04
03 03	wastes from pulp, paper and cardboard production and processing
03 03 01	waste bark and wood
03 03 07	mechanically separated rejects from pulping of waste paper and cardboard
03 03 08	wastes from sorting of paper and cardboard destined for recycling
03 03 10	Fibre rejects, fibre-, filler- and coating-sludges from mechanical separation
4	**WASTES FROM THE LEATHER, FUR AND TEXTILE INDUSTRIES**
04 01	Wastes from the leather and fur industry
04 01 08	waste tanned leather (blue sheetings, shavings, cuttings, buffing dust) containing chromium
04 01 09	wastes from dressing and finishing
04 02	wastes from the textile industry
04 02 21	wastes from unprocessed textile fibres
04 02 22	wastes from processed textile fibres
6	**WASTES FROM INORGANIC CHEMICAL PROCESSES**
06 09	wastes from the MSFU of phosphorous chemicals and phosphorous chemical processes
06 09 02	phosphorous slag
06 09 04	calcium-based reaction wastes other than those mentioned in 06 09 03
06 11	wastes from the manufacture of inorganic pigments and opacificiers
06 11 01	calcium-based reaction wastes from titanium dioxide production
7	**WASTES FROM ORGANIC CHEMICAL PROCESSES**
07 02	wastes from the MFSU of plastics, synthetic rubber and man-made fibres
07 02 13	waste plastic
8	**WASTES FROM THE MFSU OF COATINGS (PAINTS, VARNISHES AND VITREOUS ENAMELS), ADHESIVES, SEALANTS AND PRINTING INKS**
08 01	wastes from MFSU and removal of paint and varnish
08 01 18	wastes from paint or varnish removal other than those mentioned in 08 01 17
9	**WASTES FROM THE PHOTOGRAPHIC INDUSTRY**
09 01	wastes from the photographic industry
09 01 07	photographic film and paper containing silver or silver compounds
09 01 08	photographic film and paper free of silver or silver compounds
09 01 10	single-use cameras without batteries
09 01 12	single-use cameras containing batteries other than those mentioned in 09 01 11
10	**WASTES FROM THERMAL PROCESSES**
10 01	wastes from power stations and other combustion plants (except 19)

10 01 01	bottom ash, slag and boiler dust (excluding boiler dust mentioned in 10 01 04)
10 01 05	calcium-based reaction wastes from flue-gas desulphurisation in solid form
10 01 07	calcium-based reaction wastes from flue-gas desulphurisation in sludge form
10 01 15	bottom ash, slag and boiler dust from co-incineration other than those mentioned in 10 01 14
10 01 19	wastes from gas cleaning other than those mentioned in 10 01 05, 10 01 07 and 10 01 18
10 01 24	sands from fluidised beds
10 02	wastes from the iron and steel industry
10 02 01	wastes from the processing of slag
10 02 02	unprocessed slag
10 02 08	solid wastes from gas treatment other than those mentioned in 10 02 07
10 02 10	mill scales
10 02 14	filter cakes from gas treatment other than those mentioned in 10 02 13
10 02 15	other filter cakes
10 03	wastes from aluminium thermal metallurgy
10 03 02	anode scraps
10 03 05	waste alumina
10 03 16	skimmings other than those mentioned in 10 03 15
10 03 18	carbon-containing wastes from anode manufacture other than those mentioned in 10 03 17
10 03 24	solid wastes from gas treatment other than those mentioned in 10 03 23
10 03 26	filter cakes from gas treatment other than those mentioned in 10 03 25
10 03 28	wastes from cooling-water treatment other than those mentioned in 10 03 27
10 03 30	wastes from treatment of salt slags and black drosses other than those mentioned in 10 03 29
10 04	wastes from lead thermal metallurgy
10 04 10	wastes from cooling-water treatment other than those mentioned in 10 04 09
10 05	wastes from zinc thermal metallurgy
10 05 01	slags from primary and secondary production
10 05 09	wastes from cooling-water treatment other than those mentioned in 10 05 08
10 05 11	dross and skimmings other than those mentioned in 10 05 10
10 06	wastes from copper thermal metallurgy
10 06 01	slags from primary and secondary production
10 06 02	dross and skimmings from primary and secondary production
10 06 10	wastes from cooling-water treatment other than those mentioned in 10 06 09
10 07	wastes from silver, gold and platinum thermal metallurgy
10 07 01	slags from primary and secondary production
10 07 02	dross and skimmings from primary and secondary production
10 07 03	solid wastes from gas treatment
10 07 05	filter cakes from gas treatment
10 07 08	wastes from cooling-water treatment other than those mentioned in 10 07 07
10 08	wastes from other non-ferrous thermal metallurgy
10 08 09	other slags
10 08 11	dross and skimmings other than those mentioned in 10 08 10
10 08 13	carbon-containing wastes from anode manufacture other than those mentioned in 10 08 12
10 08 14	anode scrap

10 08 18	filter cakes from flue-gas treatment other than those mentioned in 10 08 17
10 08 20	wastes from cooling-water treatment other than those mentioned in 10 08 19
10 09	wastes from casting of ferrous pieces
10 09 03	furnace slag
10 09 06	casting cores and moulds which have not undergone pouring other than those mentioned in 10 09 05
10 09 08	casting cores and moulds which have undergone pouring other than those mentioned in 10 09 07
10 09 14	waste binders other than those mentioned in 10 09 13
10 09 16	waste crack-indicating agent other than those mentioned in 10 09 15
10 10	wastes from casting of non-ferrous pieces
10 10 03	furnace slag
10 10 06	casting cores and moulds which have not undergone pouring, other than those mentioned in 10 10 05
10 10 08	casting cores and moulds which have undergone pouring, other than those mentioned in 10 10 07
10 10 14	waste binders other than those mentioned in 10 10 13
10 10 16	waste crack-indicating agent other than those mentioned in 10 10 15
10 11	wastes from manufacture of glass and glass products
10 11 03	waste glass-based fibrous materials
10 11 10	waste preparation mixture before thermal processing, other than those mentioned in 10 11 09
10 11 12	waste glass other than those mentioned in 10 11 11
10 11 16	solid wastes from flue-gas treatment other than those mentioned in 10 11 15
10 11 18	filter cakes from flue-gas treatment other than those mentioned in 10 11 17
10 12	wastes from manufacture of ceramic goods, bricks, tiles and construction products
10 12 01	waste preparation mixture before thermal processing
10 12 05	filter cakes from gas treatment
10 12 06	discarded moulds
10 12 08	waste ceramics, bricks, tiles and construction products (after thermal processing)
10 12 10	solid wastes from gas treatment other than those mentioned in 10.12 09
10 12 12	wastes from glazing other than those mentioned in 10.12.11
10 13	wastes from manufacture of cement, lime and plaster and articles and products made from them
10 13 01	waste preparation mixture before thermal processing
10 13 04	wastes from calcination and hydration of lime
10 13 07	filter cakes from gas treatment
10 13 10	wastes from asbestos-cement manufacture other than those mentioned in 10 13 09
10 13 11	wastes from cement-based composite materials other than those mentioned in 10 13 09 and 10 13 10
10 13 13	solid wastes from gas treatment other than those mentioned in 10 13 12
10 13 14	waste concrete
11	**WASTES FROM CHEMICAL SURFACE TREATMENT AND COATING OF METALS AND OTHER MATERIALS; NON-FERROUS HYDRO METALLURGY**

11 01	wastes from chemical surface treatment and coating of metals and other materials (for example galvanic processes, zinc coating processes, pickling processes, etching, phosphating, alkaline degreasing, anodising)
11 01 10	filter cakes other than those mentioned in 11 01 09
11 01 14	degreasing wastes other than those mentioned in 11 01 13
11 02	wastes from non-ferrous hydrometallurgical processes
11 02 03	wastes from the production of anodes for aqueous electrolytical processes
11 02 06	wastes from copper hydrometallurgical processes other than those mentioned in 11 02 05
11 05	wastes from hot galvanising processes
11 05 01	hard zinc
11 05 02	zinc ash
12	**WASTES FROM SHAPING AND PHYSICAL AND MECHANICAL SURFACE TREATMENT OF METALS AND PLASTICS**
12 01	wastes from shaping and physical and mechanical surface treatment of metals and plastics
12 01 01	ferrous metal filings and turnings
12 01 03	non-ferrous metal filings and turnings
12 01 04	non-ferrous metal dust and particles
12 01 05	plastics shavings and turnings
12 01 13	welding wastes
12 01 17	waste blasting material other than those mentioned in 12 01 16
12 01 21	spent grinding bodies and grinding materials other than those mentioned in 12 01 20
15	**WASTE PACKAGING; ABSORBENTS, WIPING CLOTHS, FILTER MATERIALS AND PROTECTIVE CLOTHING NOT OTHERWISE SPECIFIED**
15 01	packaging (including separately collected municipal packaging waste)
15 01 01	paper and cardboard packaging
15 01 02	plastic packaging
15 01 03	wooden packaging
15 01 04	metallic packaging
15 01 05	composite packaging
15 01 06	mixed packaging
15 01 07	glass packaging
15 01 09	textile packaging
15 02	absorbents, filter materials, wiping cloths and protective clothing
15 02 03	absorbents, filter materials, wiping cloths and protective clothing other than those mentioned in 15 02 02
16	**WASTES NOT OTHERWISE SPECIFIED IN THE LIST**
16 01	end-of-life vehicles from different means of transport [including off-road machinery] and wastes from dismantling of end-of-life vehicles and vehicle maintenance (except 13,14, 16 06 and 16 08)
16 01 03	end-of-life tyres
16 01 17	ferrous metal
16 01 18	non-ferrous metal
16 01 19	plastic
16 02	wastes from electrical and electronic equipment
16 02 11*	discarded equipment containing chloroflourocarbons, HCFC, HFC
16 02 13*	discarded equipment containing free asbestos

16 02 14	discarded equipment other than those mentioned in 16 02 09 to 16 02 13
16 02 16	components removed from discarded equipment other than those mentioned in 16 02 15
16 03	off-specification batches and unused products
16 03 04	inorganic wastes other than those mentioned in 16 03 03
16 03 06	organic wastes other than those mentioned in 16 03 05
16 06	batteries and accumulators
16 06 04	alkaline batteries (except 16 06 03)
16 06 05	other batteries and accumulators
16 11	waste linings and refractories
16 11 02	carbon-based linings and refractories from metallurgical processes others than those mentioned in 16 11 01
16 11 04	other linings and refractories from metallurgical processes other than those mentioned in 16 11 03
16 11 06	linings and refractories from non-metallurgical processes others than those mentioned in 16 11 05
17	**CONSTRUCTION AND DEMOLITION WASTES (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)**
17 01	concrete, bricks, tiles and ceramics
17 01 01	Concrete
17 01 02	Bricks
17 01 03	tiles and ceramics
17 01 06*	mixtures of, or separate fractions of concrete, bricks, tiles and ceramics containing hazardous substances (consisting of asbestos containing materials only)
17 01 07	mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06
17 02	wood, glass and plastic
17 02 01	Wood
17 02 02	Glass
17 02 03	Plastic
17 02 04*	glass, plastic and wood containing or contaminated with hazardous substances
17 03	bituminous mixtures, coal tar and tarred products
17 03 01*	bituminous mixtures containing coal tar
17 03 02	bituminous mixtures other than those mentioned in 17 03 01
17 04	metals (including their alloys)
17 04 01	copper, bronze, brass
17 04 02	Aluminium
17 04 03	Lead
17 04 04	Zinc
17 04 05	iron and steel
17 04 06	Tin
17 04 07	mixed metals
17 04 11	cables other than those mentioned in 17 04 10
17 05	soil (including excavated soil from contaminated sites), stones and dredging spoil
17 05 03*	soil and stones containing hazardous substances (consisting of asbestos containing materials only)
17 05 04	soil and stones other than those mentioned in 17 05 03
17 05 07*	track ballast containing hazardous substances

17 05 08	track ballast other than those mentioned in 17 05 07
17 06	insulation materials and asbestos-containing construction materials
17 06 01*	insulation materials containing asbestos
17 06 04	insulation materials other than those mentioned in 17 06 01 and 17 06 03
17 06 05*	construction materials containing asbestos
17 08	gypsum-based construction material
17 08 02	gypsum-based construction materials other than those mentioned in 17 08 01
17 09	other construction and demolition wastes
17 09 03*	other construction and demolition wastes (including mixed wastes) containing hazardous substances
17 09 04	mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03
18	**WASTES FROM HUMAN OR ANIMAL HEALTH CARE AND/OR RELATED RESEARCH (except kitchen and restaurant wastes not arising from immediate health care)**
18 01	wastes from natal care, diagnosis, treatment or prevention of disease in humans
18 01 04	wastes whose collection and disposal is not subject to special requirements in order to prevent infection (for example dressings, plaster casts, linen, disposable clothing, diapers)
19	**WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREATMENT PLANTS AND PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION/INDUSTRIAL USE**
19 01	wastes from incineration or pyrolysis of waste
19 01 02	ferrous materials removed from bottom ash
19 01 12	bottom ash and slag other than those mentioned in 19 01 11
19 01 18	pyrolysis wastes other than those mentioned in 19 01 17
19 01 19	sands from fluidised beds
19 02	wastes from physico/chemical treatments of waste (including dechromatation, decyanidation, neutralisation)
19 02 03	premixed wastes composed only of non-hazardous wastes
19 02 10	combustible wastes other than those mentioned in 19 02 08 and 19 02 09
19 04	vitrified waste and wastes from vitrification
19 04 01	vitrified waste
19 05	wastes from aerobic treatment of solid wastes
19 05 01	non-composted fraction of municipal and similar wastes
19 05 02	non-composted fraction of animal and vegetable waste
19 05 03	off-specification compost
19 10	wastes from shredding of metal-containing wastes
19 10 04	fluff-light fraction and dust other than those mentioned in 19 10 03
19 12	wastes from the mechanical treatment of waste (for example sorting, crushing, compacting, pelletising) not otherwise specified
19 12 01	paper and cardboard
19 12 02	ferrous metal
19 12 03	non-ferrous metal
19 12 04	plastic and rubber
19 12 05	glass
19 12 06*	wood containing hazardous substances
19 12 07	wood other than that mentioned in 19 12 06

19 12 08	textiles
19 12 09	minerals (for example sand, stones)
19 12 10	combustible waste (refuse derived fuel)
19 12 12	other waste (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 19 12 11
19 13	wastes from soil and groundwater remediation
19 13 02	solid wastes from soil remediation other than those mentioned in 19 13 01
20	**MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS**
20 01	separately collected fractions (except 15 01)
20 01 01	paper and cardboard
20 01 02	Glass
20 01 08	biodegradable kitchen and canteen waste
20 01 10	Clothes
20 01 11	Textiles
20 01 23*	discarded equipment containing chloroflourocarbons
20 01 34	batteries and accumulators other than those mentioned in 20 01 33
20 01 35*	discarded electrical and electronic equipment other than those mentioned in 20 01 21 and 20 01 23 containing hazardous components
20 01 36	discarded electrical and electronic equipment other than those mentioned in 20 01 21, 20 01 23 and 20 01 35
20 01 37*	wood containing hazardous substances
20 01 38	wood other than that mentioned in 20 01 37
20 01 39	Plastics
20 01 40	Metals
20 01 41	wastes from chimney sweeping
20 02	garden and park wastes (including cemetery waste)
20 02 01	biodegradable waste
20 02 02	soil and stones
20 02 03	other non-biodegradable wastes
20 03	other municipal wastes
20 03 01	mixed municipal waste
20 03 02	waste from markets
20 03 03	street-cleaning residues
20 03 07	bulky waste

APPENDIX B - PERMITTED ACTIVITES AND WASTE TYPES - END-OF-LIFE (ELV) STORAGE, DEPOLLUTION & DISMANTLING

Table S1.1 activities	Description of activities for waste operations	Limits of activities
A2 End-of-Life (ELV) storage, depollution & dismantling	**R13:** Storage of waste pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced) **R4:** Recycling/reclamation of metals and metal compounds **R5:** Recycling/reclamation of other inorganic compounds **D15:** Storage pending any of the operations numbered D01 to D14 (excluding temporary storage pending collection on the site where it is produced).	All hazardous and non-hazardous waste must be stored and treated on an impermeable surface with sealed drainage. Storage of lead acid batteries must be in containers with an impermeable, acid resistant base and a cover to prevent ingress of water. Treatment operations shall be limited to manual: - depollution of waste motor vehicles - sorting - separation - grading - shearing - baling - bulking - compacting - granulating and - cutting of waste into different components for recovery and/or disposal. There shall be no treatment of: - waste batteries and/or accumulators - breakpads containing asbestos - hazardous waste other than bulking up for onward transfer. Depollution will take place in a building on an impermeable surface with sealed drainage. Depolluted vehicles may be stored on hardstanding or an impermeable surface with sealed drainage. Waste types as specified in Table 2.2

The waste categories to be imported into the facility are contained in the European Waste Catalogue and are listed below:

NOTE: Any waste whose six digit code is marked with an asterisk (*) is a hazardous waste.

Exclusions:
Wastes having any of the following characteristics shall not be accepted in;

- **Wastes in sludge or liquid form;**
- **Wastes consisting solely or mainly of dusts, powders or loose fibres**

16	**WASTES NOT OTHERWISE SPECIFIED IN THE LIST**
16 01	end-of-life vehicles from different means of transport [including off-road machinery] and wastes from dismantling of end-of-life vehicles and vehicle maintenance (except 13,14, 16 06 and 16 08)
16 01 03	end-of-life tyres
16 01 04*	end-of-life vehicles
16 01 06	end-of-life vehicles (containing neither liquids nor other hazardous components)
16 01 07*	oil filters
16 01 11*	brake pads containing asbestos
16 01 12	brake pads other than those mentioned in 16 01 11
16 06	batteries and accumulators
16 06 01*	lead acid batteries
16 06 05	other batteries and accumulators

Table 5. Permitted waste types for End of Life Vehicle Storage, Depollution & Dismantling (Authorised Treatment) Facility

APPENDIX C - PERMITTED ACTIVITES AND WASTE TYPES - INERT AND EXCAVATION WASTE TRANSFER STATION WITH TREATMENT

Table S1.1 activities		
	Description of activities for waste operations	**Limits of activities**
A3 Inert and excavation waste transfer station with treatment	**R13:** Storage of waste pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced) **R3:** Recycling/reclamation of organic substances which are not used as solvents **R5:** Recycling/reclamation of other inorganic compounds	All non-hazardous waste must be stored and treated on an impermeable surface with sealed drainage. All inert waste may be stored and treated on either hardstanding or on an impermeable surface with sealed drainage. Treatment operations shall be limited to manual and/or mechanical: - sorting - separation and segregation - washing - screening - crushing - blending and - bulking of waste for recovery as a soil, soil substitute or aggregate for recovery only. Waste types as specified in Table 2.3

The waste categories to be imported into the facility are contained in the European Waste Catalogue and are listed below:

NOTE: Any waste whose six digit code is marked with an asterisk (*) is a hazardous waste.

Exclusions:
Wastes having any of the following characteristics shall not be accepted in;

- **Wastes in liquid form;**
- **Wastes consisting solely or mainly of dusts (except sawdust), powders or loose fibres**

1	**WASTES RESULTING FROM EXPLORATION, MINING, QUARRYING, AND PHYSICAL AND CHEMICAL TREATMENT OF MINERALS**
01 04	wastes from physical and chemical processing of non-metalliferous minerals
01 04 08	waste gravel and crushed rocks other than those mentioned in 01 04 07
01 04 09	waste sand and clays
01 04 12	tailings and other wastes from washing and cleaning of minerals other than those mentioned in 01 04 07 and 01 04 11
01 04 13	wastes from stone cutting and sawing other than those mentioned in 01 04 07
2	**WASTES FROM AGRICULTURE, HORTICULTURE, AQUACULTURE, FORESTRY, HUNTING AND FISHING, FOOD PREPARATION AND PROCESSING**
02 01	wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing
02 01 07	wastes from forestry (soil and stones only)
02 04	wastes from sugar processing
02 04 01	soil from cleaning and washing beet
17	**CONSTRUCTION AND DEMOLITION WASTES (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)**
17 01	concrete, bricks, tiles and ceramics
17 01 01	concrete
17 01 02	bricks
17 01 03	tiles and ceramics
17 01 07	mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06 (soils and stones only)
17 02	wood, glass and plastic
17 02 02	glass
17 03	bituminous mixtures, coal tar and tarred products
17 03 02	bituminous mixtures other than those mentioned in 17 03 01
17 05	soil (including excavated soil from contaminated sites), stones and dredging spoil
17 05 04	soil and stones other than those mentioned in 17 05 03
17 05 08	track ballast other than those mentioned in 17 05 07
19	**WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREATMENT PLANTS AND PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION/INDUSTRIAL USE**
19 12	wastes from the mechanical treatment of waste (for example sorting, crushing, compacting, pelletising) not otherwise specified
19 12 09	minerals (for example sand, stones)
19 12 12	other waste (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 19 12 11 (soils and stones only)
19 13	wastes from soil and groundwater remediation

19 13 02	solid wastes from soil remediation other than those mentioned in 19 13 01
20	**MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS**
20 02	garden and park wastes (including cemetery waste)
20 02 02	soil and stones

Table 6. Permitted waste types for Inert and Excavation Waste Transfer Station with Treatment

APPENDIX D - PERMITTED ACTIVITES AND WASTE TYPES - DEWATERING OF STREET SWEEPINGS/GULLY SUCKINGS

Table S1.1 activities	Description of activities for waste operations	Limits of activities
A4 Dewatering of street sweepings/gully suckings	**R13:** Storage of waste pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced) **R3:** Recycling/reclamation of organic substances which are not used as solvents **R4:** Recycling/reclamation of metals and metal compounds **R5:** Recycling/reclamation of other inorganic compounds **D9:** Physico-chemical treatment not specified elsewhere in this Annex which results in final compounds or mixtures which are discarded by means of any of the operations numbered D 1 to D 12 (e.g. evaporation, drying, calcination, etc.) **D15:** Storage pending any of the operations numbered D01 to D14 (excluding temporary storage pending collection on the site where it is produced).	All non-hazardous waste must be stored and treated on an impermeable surface with sealed drainage. Treatment operations shall be limited to the dewatering of street sweepings/gully suckings only by: - sorting - separation - dewatering - segregation and - screening of waste into different components for recovery/disposal. The maximum quantity of non-hazardous waste that can be treated, in total, at the site for disposal shall not exceed 50 tonnes per day. There shall be no biological treatment of street sweepings/gully suckings. Waste types as specified in Table 2.4

The waste categories to be imported into the facility are contained in the European Waste Catalogue and are listed below:

NOTE: Any waste whose six digit code is marked with an asterisk (*) is a hazardous waste.

Exclusions:
Wastes having any of the following characteristics shall not be accepted:

- **hazardous wastes**
- **wastes consisting solely or mainly of dusts or powders**
- **wastes which are odour producing or likely to be odorous**

17	**CONSTRUCTION AND DEMOLITION WASTES (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)**
17 05	soil (including excavated soil from contaminated sites), stones and dredging spoil
17 05 04	soil and stones other than those mentioned in 17 05 03
17 05 06	dredging spoil other than those mentioned in 17 05 05
19	**WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREATMENT PLANTS AND PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION/INDUSTRIAL USE**
19 13	wastes from soil and groundwater remediation
19 13 02	solid wastes from soil remediation other than those mentioned in 19 13 01
19 13 04	sludges from soil remediation other than those mentioned in 19 13 03
20	**MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS**
20 02	garden and park wastes (including cemetery waste)
20 02 02	soil and stones
20 03	other municipal wastes
20 03 03	street-cleaning residues

Table 7. Permitted waste types for Road Sweeping and Gully Waste Processing

APPENDIX E - DISCHARGE OF INTEGRAL SITE DRAINAGE (PROCESS EFFLUENT)

Table S1.1 activities	Description of activities for waste operations	Limits of activities
	Discharge of integral site drainage (process effluent) from the emission points indicated on the drainage plan reference 10915-000-D as incorporated in Table S1.2 of this permit.	Drainage to sewer firstly via silt settlement and storage tanks and then through an interceptor will consist solely of: - clean, rainfall dependant drainage from areas of the site not used in connection with the storage and/or treatment of waste. - run-off from the impermeable surface from areas of the site used to store and/or treat waste including the process effluent from the dewatering activity. No visible oil or grease shall be present in the discharge. There shall be no discharge from the buildings on site used to store and/or treat waste.

MP2 Accident/Pollution Incident Management Plan (Site Emergency Plan)

MP2 Accident/Pollution Incident Management Plan (Site Emergency Plan)

Further help is available from PPG21: Pollution incident response planning (See section 7)

Created by:___N. Brannan_____**Date:**__ 25th July 2025__

Review Date:__24th July 2026_____**Version:**_2.2_____

Accident / Pollution Incident Management Plan Contents

A - Site Plan

B - Key Site and Emergency Contacts

C - List of Substances and Storage Facilities

D - Preventing Accidents / Incidents… and what to do if they happen.

A - Site Plan

Insert site plan showing location of the following items:

- **Site entrances and exits** available to the emergency services
- **Buildings**; the buildings and other main constructions
- **Drainage**; including
  - foul drainage (marked in red),
  - surface water drainage (marked in blue)

showing

  - the direction of flow and
  - the discharge points to the sewer, watercourse or soakaway.
  - The location of manhole covers and drains,
  - The location of stop and diverter valves and interceptors
- **Service mains**; the routes of
  - water supply, gas, electricity)
  - mains water stop tap, and gas and electrical supply isolating valves / switch.
- **Storage of hazardous materials**; e.g. oil and fuel tanks, chemical stores, raw materials, waste materials etc.
- **Process lines**; location and direction of main process lines/pipes.
- **Accident and emergency response items**; such as fire extinguishers, fire hydrants, fire water tanks / ponds, spill kits, sand bags, alarms, first aid kit etc.

- **Vulnerable receptors;** on site or adjacent receptors that could be affected by the site operations, such as porous / unmade ground, watercourses, springs, boreholes, ecologically sensitive sites, residential properties, schools, offices, hospitals etc.
- **Pollution control points**; such as inspection or monitoring points, bunds,
- **Treatment**; location of any on site trade effluent or sewage effluent treatment plant.

B - Key Site and Emergency Contacts

SITE DETAILS			
Location:	Merthyr Borough Recycling Centre Limited, Unit 5 Pengarnddu Industrial Estate, Dowlais, Merthyr Tydfil		
Postcode:	CF48 2TA		
Site Access Grid Reference:	Main entrance - SO 07903 08829 Secondary entrance - SO 07983 08813		
SITE CONTACTS	Name	Office Hours (specify)	Out of hours
Owner:	Nicholas Brannan	01685 370188	07968 736145
General Manager:	Nicholas Brannan	01685 370188	07968 736145
Site Manager:	Nicholas Brannan	01685 370188	07968 736145
Site Supervisor:	Nicholas Brannan	01685 370188	07968 736145
Security Contact:	Nicholas Brannan	01685 370188	01685 370188
Landowner / Agent:	Merthyr Borough Recycling Centre Holdings Ltd	01685 370188	01685 370188

EMERGENCY SERVICES	Office Hours	Out of hours
Emergency:	999	999
Medical: Prince Charles Hospital A&E	01685 721721	111 (non-emergency)
Police: Merthyr Tydfil Bridewell Police Station	01685 722541	101 (non-emergency)
Fire: Merthyr Tydfil Fire Station	01443 232000	01443 232000
REGULATORS	Office Hours	Out of hours
Health and Safety Executive (HSE)	0345 300 9923	0151 922 935
Local Authority:	N/A	N/A
Natural Resources Wales (Local)	02920 772400	N/A
Natural Resources Wales (24 hour emergency hotline)	0800 80 70 60	

UTILITY / KEY SERVICES	Name	Office Hours	Out of hours
Water undertaker:	Dwr Cymru	0800 052 0130	0800 052 0130
Sewerage undertaker:	Dwr Cymru	0800 052 0130	0800 052 0130
Gas supplier:	N/A	N/A	N/A
Electricity supplier:	Yu Energy	0115 975 8258	105
Oil supplier:	N/A	N/A	N/A
Fuel supplier:	Estuary Oils	02920 887 973	07887 777 752/07976 091 307/07449 635 635
Chemical supplier:	N/A	N/A	N/A
Oil spill contractor:	N/A	N/A	N/A
Maintenance contractor:	N/A	N/A	N/A
Electrician:	N/A	N/A	N/A
Plumber:	N/A	N/A	N/A
Locksmith:	N/A	N/A	N/A
Joiner:	N/A	N/A	N/A
OTHER KEY CONTACTS	Name	Office Hours	Out of hours
Head Office:	N/A	N/A	N/A

Adjacent landowners:	Merthyr Tydfil CBC	01685 725000	N/A
Neighbours:	Abba Scrap Metals Limited Kepak Ltd Merthyr Reclamation	01685 722758 01685354800 07702399711	N/A 01685354800 07702399711
Specialist advisors:	PLR Services (H&S) Technia Environment and Planning Limited (Environmental)	Phil Rees 07703 470326 Stuart Watcham 07976 720689	Phil Rees 01792 775404 Stuart Watcham 07976 720689

C - List of Substances and Storage Facilities

The following is a list of liquids, powders etc. that are stored on site and could be harmful to the environment if they escape.

Material	Maximum Quantity	Type and size of storage	Type and size of Secondary Containment
White Diesel	10,000 litres	Metal tank	Bunded tank 110%
Red Diesel	N/A	N/A	N/A
Petrol	20 litres	2 x 10 litre cans	Bunded storage area 110%
Oil (Used)	2,000 litres	Metal tank	Bunded storage tank 110%
Engine oil	420 litres	2 x 210 litre streel drums	Bunded storage area 110%
AdBlue Fuel Additive	2,000 litres	2 x IBCs	Bunded storage area 110%
Antifreeze	200 litres	4 x 25 litre drums	Bunded storage area 110%

D - ACCIDENT MANAGEMENT PLAN

Possible Accident / Incident	What would the harm be?	How do we reduce the chances of it happening?	What to do if it happens
Spillages			
Spillage during transfer, sorting of wastes.	Contamination of land, drains, groundwater and watercourses.	Inspect and validate all in-coming wastes. Remove hazardous liquids from wastes prior to processing. Train staff	Follow Emergency Incident Procedure - Spill (PR3) . It describes what to do in the event of a spill and where the kit is kept.
Spillage during delivery of oil or fuel.		Supervise fuel deliveries. Use drip trays and spill materials. Spill materials available.	
Spillages during refuelling of plant and equipment.		Plant and equipment will be refuelled in designated areas with impermeable surface and sealed drainage. Use of drip trays. Spill materials available.	
Slow seepage of liquids from imported contaminated materials. Slow seepage can be less noticeable than 'spills'.		Incoming wastes that are, or appear to be contaminated will be quarantined until the nature of the contamination has been confirmed, then tipped and stored on impermeable surfaces that are drained to a sealed sump.	
Overfilling			
Overfilling of oil/fuel tanks during delivery.	Contamination of land, drains, groundwater and watercourses.	Stock level control checks, supervised delivery and high level alarms.	Follow Emergency Incident Procedure - Spill (PR3). It describes what to do in the event of a spill and where the kit is kept.
Failure of Plant or Equipment			
Leakages; due to faulty pipe work, valves, over-pressure, blockages, corrosion, severe weather, ground movement etc.	Contamination of land, drains, groundwater and watercourses.	Daily visual inspection and completion of weekly inspection checklist record. Preventative maintenance regime. Any underground pipes and tanks will be tested for integrity. Insulation and protection of pipe work.	Follow Emergency Incident Procedure – Spill (PR3). As described above.

Possible Accident / Incident	What would the harm be?	How do we reduce the chances of it happening?	What to do if it happens
Puncture; of vessels and tanks etc. due to impact - such as fork lift trucks.		Tanks and vessels generally located within / on secondary containment facilities. Storage locations of drums and non-permanent vessels protected by use of barriers or fencing. Movement of drums and containers using safe techniques.	
Fire			
Fire	Smoke and pollution, Firewater causes contamination of land, groundwater and watercourses.	The site has a Fire Prevention and Mitigation Plan (**MP4**) that details the measures taken to reduce the chances of fires occurring.	Follow Emergency Incident Procedure – Fire & Explosion (**PR2**) describing what to do in the event of a fire, including details about fire alarms, exit routes and muster points, responsible personnel such as a fire warden and the location and use of emergency fire equipment such as extinguishers, hoses, sand bags and drain covers.
Cross contamination			
Due to transfer and mixing of incompatible materials, drainage cross connections etc.	Explosion, smoke and pollution of air, Contamination of land, drains, groundwater and watercourses.	Maintenance of up to date drainage plan. Maintenance of inventory of substances with material property details. Procedure for contractors to work on site including induction training and permit to work.	Follow Emergency Incident Procedure - Fire (**PR2**) as described above.
Flood			
Due to ingress of watercourse floodwater, blocked drains, burst water main, use of fire water.	Contamination of raw materials, buildings, land, drainage system, groundwater and watercourses with fire and flood water.	Maintenance of drains. Safe location for storage of hazardous materials.	Follow Emergency Incident Procedure – Flood (**PR4**) describing what to do in the event of a flood warning such as installation of barge boards, use of sand bags, movement or protection of sensitive materials.
Failure of Services			
Due to failure of supply; water, electricity, gas supply	Flooding, explosion with subsequent	Provision of standby facilities.	Follow Emergency Incident Procedure -

Possible Accident / Incident	What would the harm be?	How do we reduce the chances of it happening?	What to do if it happens
and of sewerage system. Due to utility supply being struck and broken / cut.	contamination of land, drains, groundwater and watercourses.	Maintenance of up to date plans showing location of utility services. Procedure for contractors to work on site including induction training and permit to work.	Utility supply failure (**PR5**) describing what to in the event of services supply failure such as manual shut down of process valves, start-up of emergency generator, use of standby materials etc. Follow Accident/Pollution Incident Response Procedure - Flood and Fire & Explosion (**PR4** and **PR2**) as described above.
Failure of Containment			
Failure of containment facilities due to land movement, impact, corrosion etc.	Contamination of land, drains, groundwater and watercourses.	Provision of secondary containment for hazardous liquids. Inspection of primary and secondary containment facilities. Integrity testing of tanks and bunds & pressure loss alarms.	Follow Accident/Pollution Incident Response Procedure - Spillage (**PR3**). It describes what to do in the event of a spill and where the kit is kept.
Vandalism			
Unauthorised entry and tampering or malicious damage to property, plant and equipment.	Contamination of land, groundwater and surface water.	Secure gate and perimeter fence. Site locked when un-manned, tanks and valves locked when not in use out of hours. Plant and equipment locked in secure storage out of hours. Security system installed including camera and recording facilities.	Follow Accident/Pollution Incident Response Procedure - Spillage (**PR3**). It describes what to do in the event of a spill and where the kit is kept.
Odour			
Due to delivery of odorous load(s). Decomposition of biodegradable waste.	Offensive/nuisance odours at nearby receptors.	Waste Acceptance Procedures (**PR9**). Adherence to Odour Management Plan (**MP3**). Storage limits for wastes.	Follow Accident/Pollution Incident Response Procedure - Odour (**PR6**). It describes what to do in the event of odour release.
Fugitive Emissions (dust, fumes, flies, vermin, mud, litter, discharges)			
Due to delivery of fine/dusty/light load(s). Failure of containment (storage, vehicle netting, etc.)		Waste Acceptance Procedures (**PR9**). Skips netted. Twice daily litter checks.	

Possible Accident / Incident	What would the harm be?	How do we reduce the chances of it happening?	What to do if it happens
	Nuisance dust, litter, etc. at nearby receptors.	Site largely surfaced in concrete reducing mud generation. Bowser for dust suppression. Adherence to Odour Management Plan (MP3). Storage limits for wastes.	Follow Accident/Pollution Incident Response Procedure - Fugitive Emissions (PR7). It describes what to do in the event of odour release.
Suspicious Items			
Due to delivery of non-conforming/contaminated loads.	Risk of incompatible materials mixing leading to fire or explosion. Risk of contamination by hazardous wastes. Risk of contamination of groundwater, surface water, land and air.	Waste Acceptance Procedures (PR9). Staff training.	Follow Accident/Pollution Incident Response Procedure - Discovery of Suspicious Items (PR8). It describes what to do in the event of suspicious items being identified (or potentially identified) within loads.

Contents Page

LEGEND

- PERMIT BOUNDARY
- HAZARDOUS WASTE/ CHEMICALS/ COMPRESSED GASES
- COMBUSTIBLE WASTES
- NON-COMBUSTIBLE WASTE
- EMERGENCY VEHICLE ACCESS/EGRESS
- REFER TO STORAGE PLAN FOR DETAILS OF WASTES

N

STORAGE BUILDING
SWIP BOILER HALL
DRYING AREA
FINES
SCREENING
SHREDDED RDF
SHREDDER
RDF PREPARATION
RDF (UNSTORED)
NON-HAZ. (UNSTORED)
AGGREGATE/SOIL SCREENING
HEAVY FRACTION
QUARANTINE/ NON-CONFORMING WASTE HOLDING AREA
Wind Turbine
WIND TURBINE
NO STORAGE
TANK
ASBESTOS
HAZ. WOOD
NON-HAZ. STORAGE BAY
NO WASTE STORAGE SOUTH OR EAST OF RED LINE.
SKIP/EQUIPMENT/ AQP-COMPLIANT AGGREGATES ONLY
WOOD
SCREENING
PLASTICS
LIGHTS
METALS
MIXED WASTE TIPPING & SORTING
METAL
METAL
TYRES
PAPER/ CARD
UPVC
GYPSUM
GREEN
SUB-STATION
NON-HAZ. STORAGE AREA
SKIP, PLANT & EQUIPMENT, AND/OR AQP-COMPLIANT AGGREGATE STORAGE AREA
Power Station
WOOD
PLASTIC
CARD/PAPER
METAL
SORTED NON-HAZ WASTE STORAGE BAYS
CRUSHING/ SCREENING/ AGGREGATE STORAGE
Recycling Business
STORAGE BUILDING
SCREENING BUND
STORAGE CONTAINER
STORAGE CONTAINER
STORAGE CONTAINER
DISUSED CONTAINERISED/ MOBILE OFFICES
WEIGHBRIDGE
BIOMASS BOILER
STORAGE YARD (3RD PARTY)
WORKSHOP
STORAGE YARD 3RD PARTY
BIOMASS BOILER
SKIP, PLANT & EQUIPMENT, AND/OR AQP-COMPLIANT AGGREGATE STORAGE AREA
ESS
ESS
Weighbridges
CG
GG
EMERGENCY GRAB PACK FIXED TO OUTSIDE WALL
WEIGHBRIDGE OFFICE, ADMINISTRATIVE OFFICES, WELFARE AND STORAGE
ACCESS MAY BE RESTRICTED
CONCRETE MANUFACTURE
STORAGE CONTAINER
EQUIPMENT STORAGE
SUB-STATION
SKIP, PLANT & EQUIPMENT, AND/OR AQP-COMPLIANT AGGREGATE STORAGE AREA
SCREENING BUND
SCREENING BUND
PARKING
SCREENING BUND
SCREENING BUND
SITE ENTRANCE
SITE ENTRANCE
SITE ENTRANCE FROM PENGARNDDU IND. EST. (GRID REF. SO 07900 08803)
SITE ENTRANCE FROM PENGARNDDU IND. EST. (GRID REF. SO 07978 08800)

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REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	UPDATE STORAGE ARRANGEMENTS	25/07/25	SCW	NB

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TECHNIA ENVIRONMENT AND PLANNING LTD
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BLACKWOOD, NP12 4AB
TEL: 02921 900400
EMAIL: PLANNING@TEPL.EU

MERTHYR BOROUGH RECYCLING COMPANY LTD

EMERGENCY ACCESS PLAN

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Ch'kd	NB		
Appr'd	NB		@A3
Date	22/04/23		

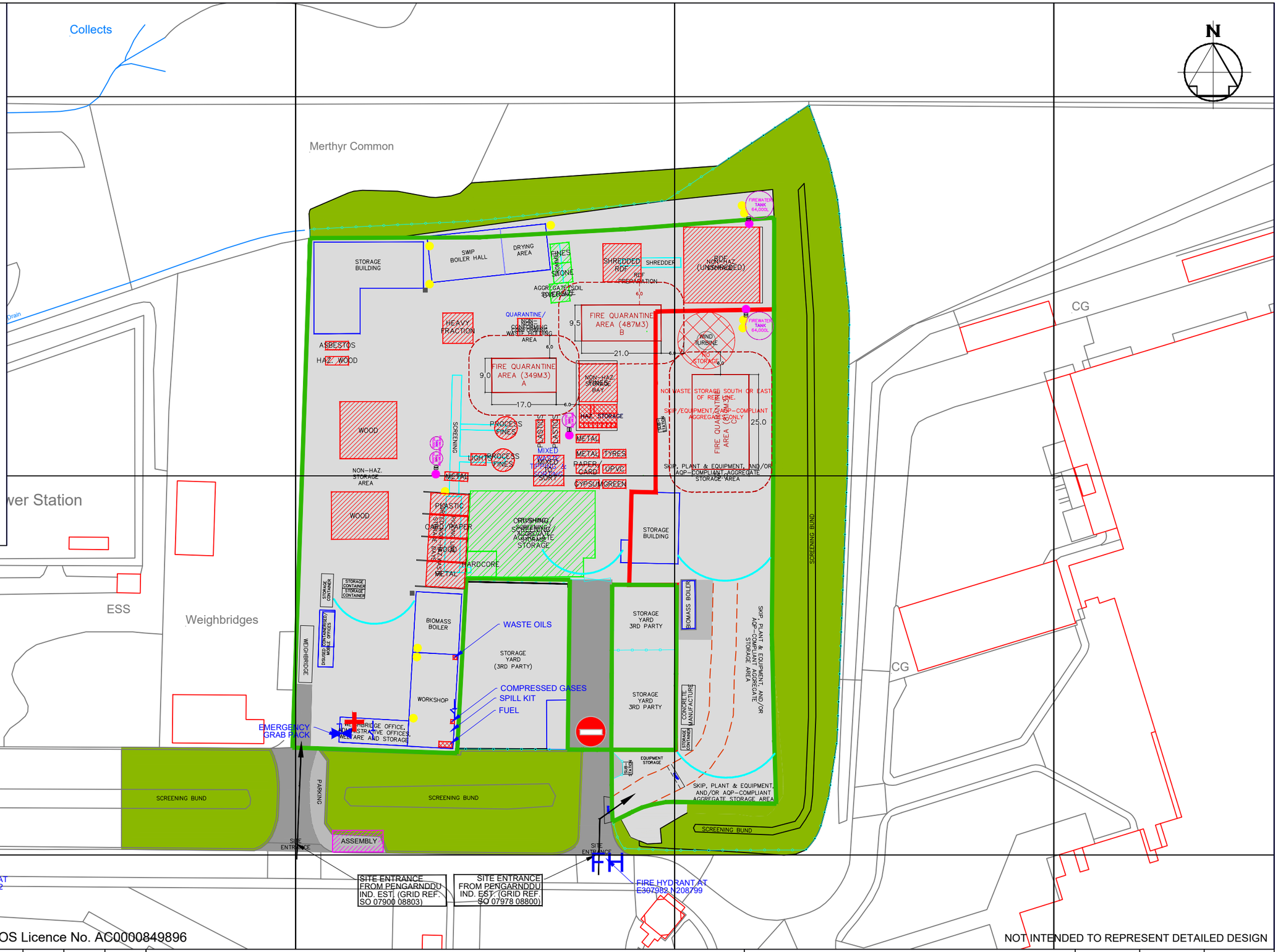
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LEGEND

- PERMIT BOUNDARY
- HAZARDOUS WASTE/ CHEMICALS/ COMPRESSED GASES
- COMBUSTIBLE WASTES
- NON-COMBUSTIBLE WASTE
- FH — FIRE HYDRANT
- FE — FIRE ESCAPE
- ASSEMBLY — FIRE ASSEMBLY POINT
- FIRE EXTINGUISHER
- FIRE HOSE
- TANK — FIREWATER TANK
- IBC WATER TANK
- FIRST AID KIT
- MAIN ELECTRICAL BREAKER
- MAINS WATER STOPCOCK
- FIRE QUARANTINE AREA
- FIREWATER CONTAINMENT BOOM

REFER TO STORAGE PLAN FOR DETAILS OF WASTES



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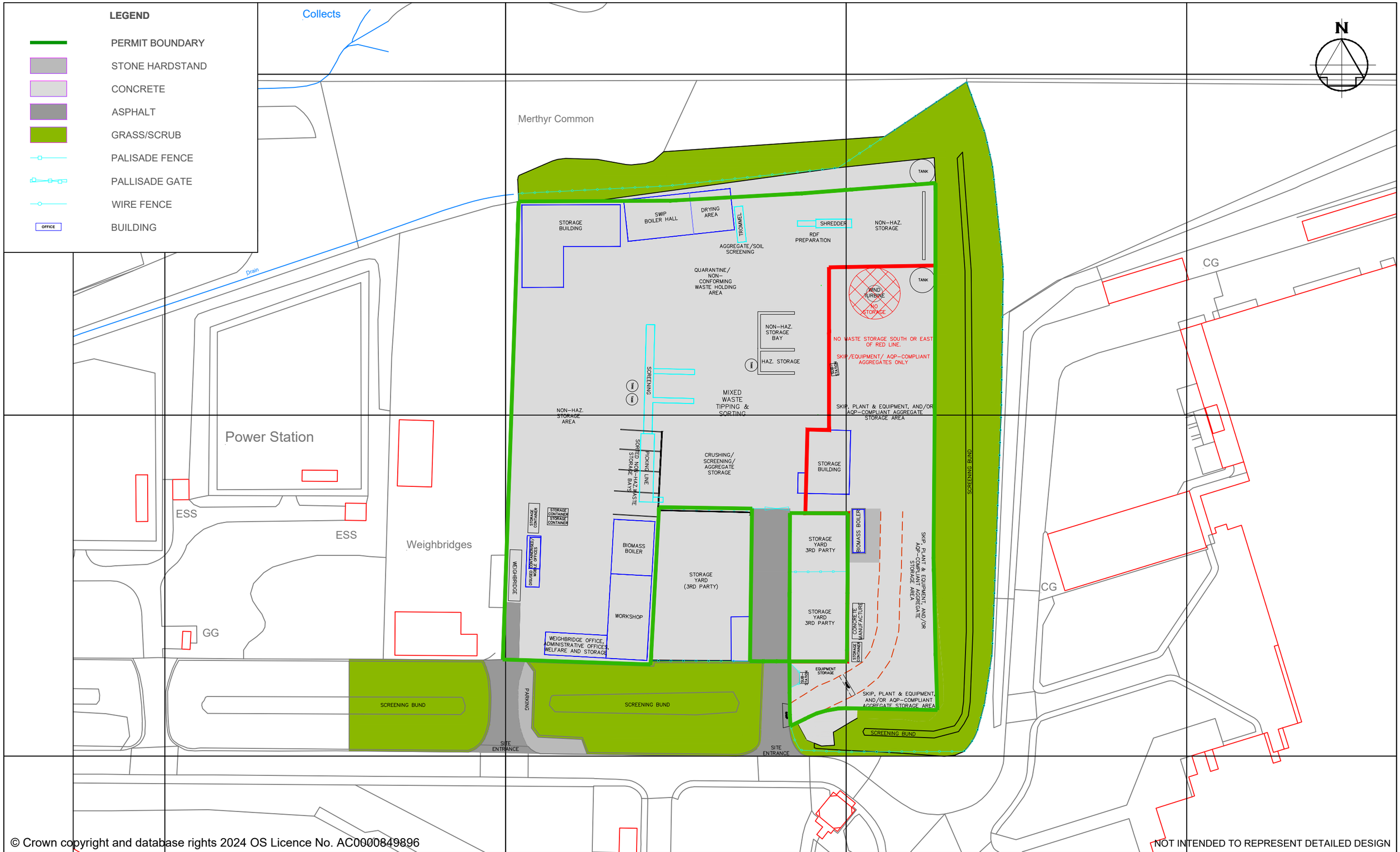
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A	UPDATE STORAGE ARRANGEMENTS	25/07/25	SCW	NB

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REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	UPDATE LAYOUT	19/12/21	SCW	NB
B	UPDATE LAYOUT	24/04/23	SCW	NB
C	UPDATE BASE MAP, UPDATE LAYOUT	25/07/25	SCW	NB

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SITE LAYOUT

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Date	25/07/25		

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LEGEND

- PERMIT BOUNDARY
- STONE HARDSTAND
- CONCRETE
- ASPHALT
- GRASS/SCRUB
- BUILDING (OFFICE)

SURFACE WATER DRAINAGE (COLOUR MATCHES CATCHMENT AREA)

- DRAINED AREAS
- FALL
- GULLEY
- BELOW GROUND PIPEWORK (TO SEWER)
- CUT-OFF DRAIN
- SILT TRAP/STORAGE TANK/ INTERCEPTOR
- SILT TRAP
- INTERCEPTOR

Collects
Merthyr Common
Power Station
ESS
ESS
Weighbridges
GG
CG
CG
N
STORAGE BUILDING
SWIP BOILER HALL
DRYING AREA
TROMMEL
SHREDDER
RDF PREPARATION
NON-HAZ. STORAGE
AGGREGATE/SOIL SCREENING
TANK
TANK
WATER
QUARANTINE/ NON-CONFORMING WASTE HOLDING AREA
WIND TURBINE
NO STORAGE
NON-HAZ. STORAGE BAY
NO WASTE STORAGE SOUTH OR EAST OF RED LINE.
SKIP EQUIPMENT/ AQP-COMPLIANT AGGREGATES ONLY
SURFACE WATER DRAINED ACROSS IMPERMEABLE SURFACE TO SILT TRAP /INTERCEPTOR TO SEWER
NON-HAZ. STORAGE BAY
SURFACE WATER DRAINED ACROSS IMPERMEABLE SURFACE TO SILT TRAP /INTERCEPTOR TO SEWER
SCREENING
MIXED WASTE TIPPING & SORTING
SKIP, PLANT & EQUIPMENT, AND/OR AQP-COMPLIANT AGGREGATE STORAGE AREA
SORTED NON-HAZ STORAGE BAYS
PICKING LINE
CRUSHING/ SCREENING/ AGGREGATE STORAGE
INTERCEPTOR OUTLET TO SEWER BLOCKED OFF
STORAGE BUILDING
PUMP DISCHARGE TO FOUL SEWER
PUMP
SILT TRAP/ HOLDING TANK
CLASS 1 FULL-RETENTION INTERCEPTOR
CLASS 1 FULL-RETENTION INTERCEPTOR
KERB
SILT TRAP/ HOLDING TANK
CUT-OFF DRAIN
BIOMASS BOILER
STORAGE YARD 3RD PARTY
BIOMASS BOILER
SURFACE WATER DRAINED ACROSS IMPERMEABLE SURFACE TO SILT TRAP/INTERCEPTOR TO SEWER
SKIP, PLANT & EQUIPMENT, AND/OR AQP-COMPLIANT AGGREGATE STORAGE AREA
STORAGE CONTAINER
STORAGE CONTAINER
STORAGE CONTAINER
CLASS 1 FULL-RETENTION INTERCEPTOR
WEIGHBRIDGE
STORAGE YARD (3RD PARTY)
STORAGE YARD 3RD PARTY
RAISED KERB
WORKSHOP
CONCRETE MANUFACTURE
WEIGHBRIDGE OFFICE, ADMINISTRATIVE OFFICES, WELFARE AND STORAGE
EQUIPMENT STORAGE
PUMP STATION
CHANNEL
SCREENING BUND
SCREENING BUND
SCREENING BUND
PARKING
SITE ENTRANCE
SITE ENTRANCE
SILT TRAP/ HOLDING TANK
EXISTING DISCHARGE TO FOUL SEWER
EXISTING DISCHARGE TO SURFACE WATER SEWER

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REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	UPDATE LAYOUT AND DRAINAGE DETAILS	19/12/21	SCW	NB
B	ADD SILT TRAP PROPOSAL	04/07/22	SCW	NB
C	UPDATE LAYOUT	24/04/23	SCW	NB
D	UPDATE SURFACING AND INTERCEPTOR DETAILS	02/11/23	SCW	NB
E	UPDATE BASE MAP, UPDATE DRAINAGE FOLLOWING DCWW SURVEY	25/07/25	SCW	NB

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MERTHYR BOROUGH RECYCLING COMPANY LTD

DRAINAGE PLAN

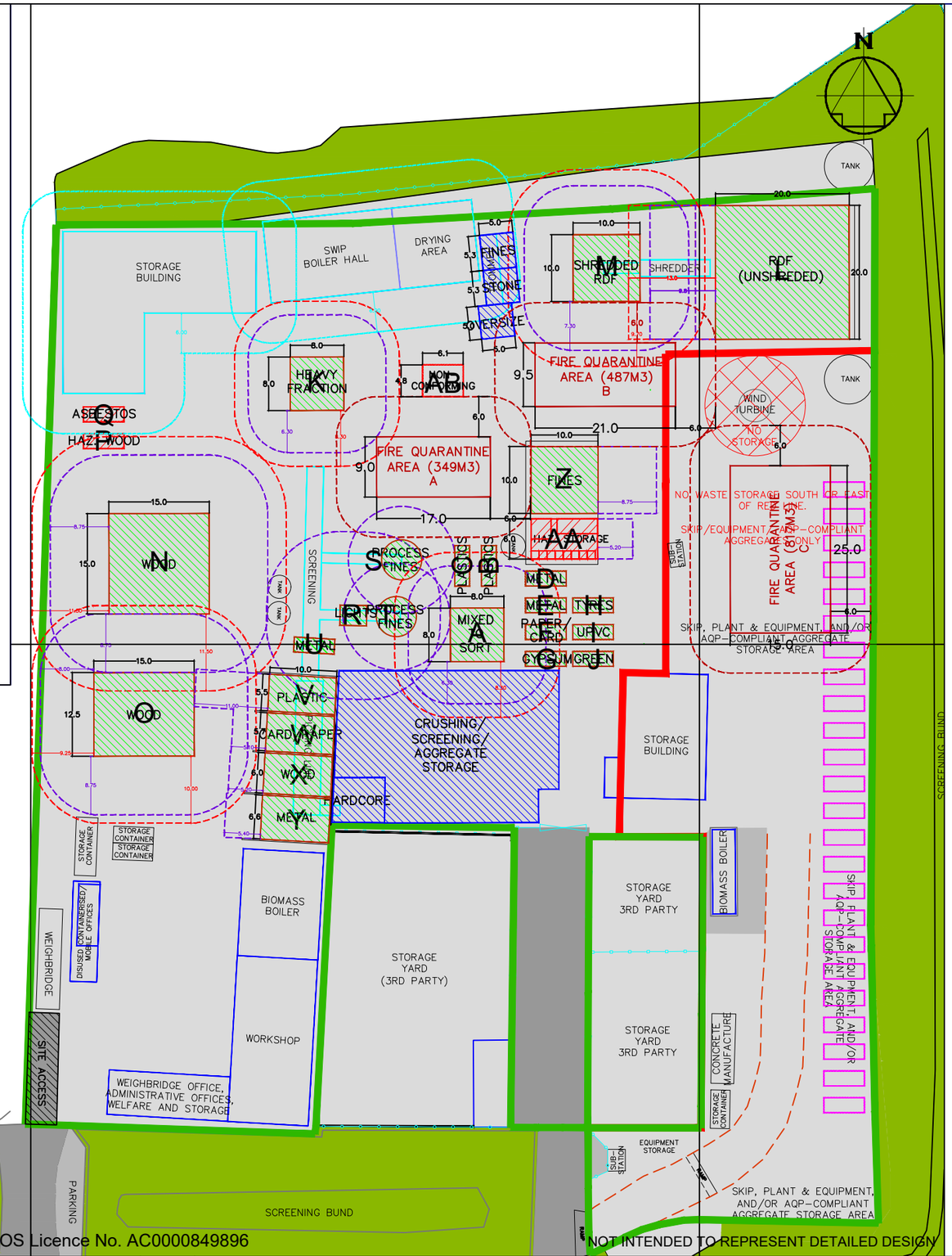
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Date	25/07/25		

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LEGEND

- PERMIT BOUNDARY
- STONE HARDSTAND
- CONCRETE
- ASPHALT
- GRASS/SCRUB
- PALISADE FENCE
- PALLISADE GATE
- WIRE FENCE
- BUILDING
- HAZARDOUS WASTE STORAGE
- NON-HAZARDOUS (COMBUSTIBLE) WASTE STORAGE
- NON-HAZARDOUS (INERT) WASTE STORAGE
- STOCKPILE TO STOCKPILE FIRE BREAK
- STOCKPILE TO BUILDING FIRE BREAK
- FIRE QUARANTINE



A	Incoming Waste (mixed and source segregated)	Central storage yard	Stockpile	No	Yes	8m x 8m x 4m	256.0	1	55.8	7 days
B	Rigid Plastics	Central storage yard	RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	3.1	3 months
C	Plastic Film		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	3.8	3 months
D	Metals		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	11.3	3 months
E			RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	3.8	3 months
F	Paper & Cardboard		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	2.6	3 months
G	Gypsum		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	7.7	3 months
H	Tyres		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	5.8	3 months
I	uPVC		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	3.1	3 months
J	Green		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	4.4	1 month
K	Mixed (Sorted Heavy Fraction)	Central storage yard	Stockpile	No	Yes	8m x 8m x 4m	256.0	1	55.8	3 months
L	Mixed (Sorted Light Fraction)	North eastern storage yard	Stockpile	No	Yes	20m x 20m x 4m	1600.0	1	195.4	3 months
M	Refuse Derived Fuel (RDF)		Stockpile	No	Yes	10m x 10m x 4m	400.0	1	48.8	3 months
N	Unprocessed Wood	Western storage yard	Stockpile	No	Yes	15m x 15m x 4m	900.0	1	98.6	1 months
O	Woodchip		Stockpile	No	Yes	15m x 12.5m x 4m	750.0	1	123.8	3 months
P	Wood		RoRo Skip	Yes	Yes	6.1m x 2.4m x 2.6m	38.1	1	4.1	3 months
Q	Asbestos		Enclosed Container	Yes	No	6.1m x 2.4m x 2.6m	38.1	1	3.9	3 months
R	Mixed (Sorted Light Fraction)	Centre of site below screen and picking line	Cage	No	Yes	4m x 3m x 3m	36.0	1	4.4	3 months
S	Process Fines		Stockpile	No	Yes	10m x 4.55m x 4m	182.0	1	22.2	1 month
T	Process Fines		Stockpile	No	Yes	10m x 4.55m x 4m	182.0	1	22.2	1 month
U	Ferrous Metal		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	11.3	3 months
V	Plastics		Bay	No	Yes	10m x 5.5m x 4m	220.0	1	38.2	3 months
W	Paper & Cardboard		Bay	No	Yes	10m x 5.7m x 4m	228.0	1	15.8	3 months
X	Wood		Bay	No	Yes	10m x 6.0m x 4m	240.0	1	26.1	3 months
Y	Non-Ferrous Metal		Bay	No	Yes	10m x 6.6m x 4m	264.0	1	28.5	3 months
Z	Process Fines	Central storage yard	Bay	No	Yes	10m x 10m x 4m	400.0	1	48.8	1 month
AA	Waste Quarantine		Covered Bay	Yes	Yes	10m x 6m x 4m	240.0	1	26.1	1 months
AB	Non-Conforming Waste		RoRo Skips	No	Yes	6.1m x 2.4m x 2.6m	38.1	2	8.3	7 days

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A	UPDATE LAYOUT	19/12/21	SCW	NB
B	UPDATE LAYOUT	24/04/23	SCW	NB
C	UPDATE BASE MAP, UPDATE STORAGE ARRANGEMENTS	25/07/25	SCW	NB

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MERTHYR BOROUGH RECYCLING COMPANY LTD

STORAGE PLAN

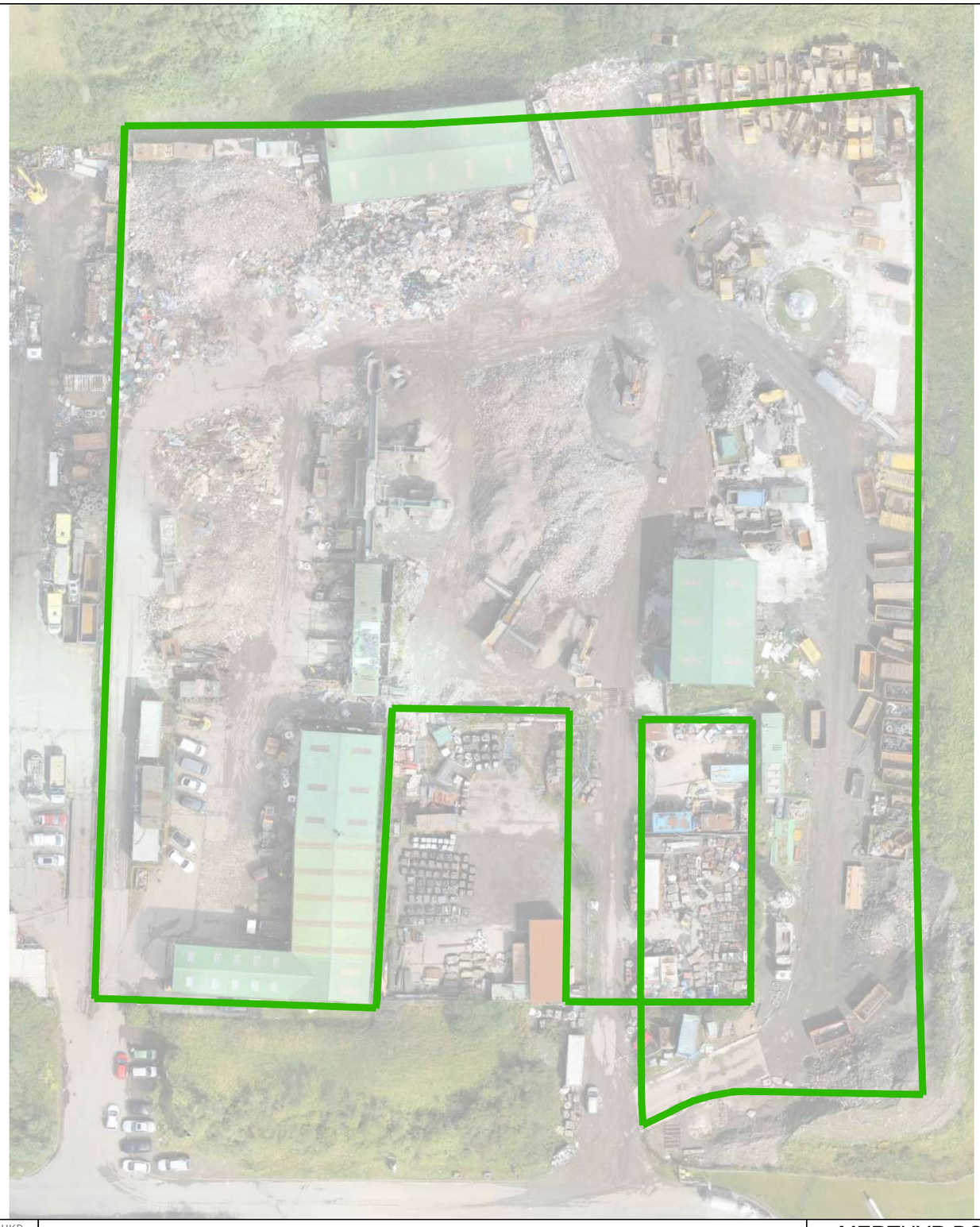
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LEGEND

PERMIT BOUNDARY



N

AMENDMENTS	REV REF	DETAILS	DATE	MADE BY	CHKD BY
	A	UPDATE SATELLITE PHOTOGRAPH	19/12/21	SCW	NB
	B	UPDATE SATELLITE PHOTOGRAPH	25/07/25	SCW	NB

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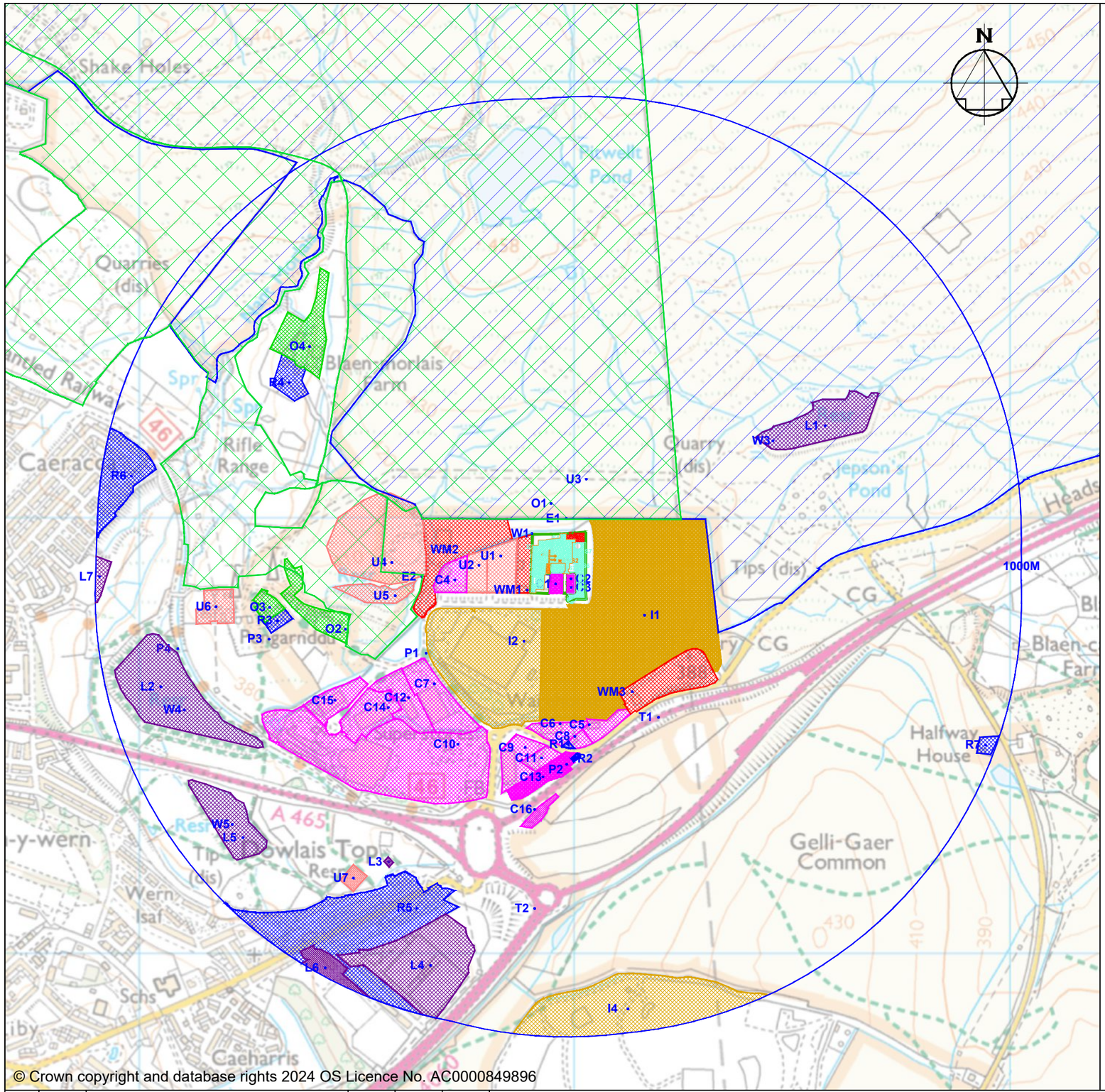
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SATELLITE IMAGE 16/08/24

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		RECEPTOR TYPE	PROPERTY/ORGANISATION	CONTACT NUMBER
G	0M	GROUNDWATER	GROUNDWATER	NO CONTACT NUMBER
C1	0M	STORAGE YARD	PAUL BROGDAN	NO CONTACT NUMBER
C2	0M	STORAGE YARD	UNKNOWN	NO CONTACT NUMBER
C3	0M	SALVAGE YARD	MERTHYR RECLAMATION	07702 399711
WM1	0M	ELV ATF	ABBA SCRAP METALS	01685 722758
W1	2M	WATERCOURSE	WATERCOURSE	NO CONTACT NUMBER
I1	8M	ABATTOIR	ST MERRYN/KEPAK	01685 354800
E1	29M	SSSI	MYNYDDOEDD LLANGYNIDR A LLANGATWG	NO CONTACT NUMBER
E2	29M	SINC	MERTHYR COMMON NORTH	NO CONTACT NUMBER
O1	31M	OPEN ACCESS LAND	GELIGAER AND MERTHYR COMMON	NO CONTACT NUMBER
U1	34M	STOR ENERGY	CONRAD ENERGY	01235 427290
I2	36M	AUTOMOTIVE PARTS MANUFACTURER	TENNECO WALKER UK	01495 711211
WM2	45M	WASTE TRANSFER STATION	HAMPSHIRE DEMOLITION AND RECYCLING	01685 725000
U2	100M	STOR ENERGY	PULSE CLEAN ENERGY	01675 437777
U3	121M	33KV OVERHEAD POWER LINES	NATIONAL GRID	0800 096 3080
C4	146M	SALVAGE YARD	MERTHYR SALVAGE	01685 375406
WM3	221M	ELV ATF	HEADS OF THE VALLEYS SALVAGE	01685 386649
U4	241M	RESERVOIR (UNDERGROUND)	DWR CYMRU WELSH WATER	0800 052 0145
E3	248M	SINC	BLAENMORLAIS	NO CONTACT NUMBER
U5	264M	RESERVOIR (ABOVE GROUND)	DWR CYMRU WELSH WATER	0800 052 0145
C5	264M	CARAVAN STORAGE	ROBINS CARAVAN STORAGE	01685 384264
P1	276M	PUBLIC RIGHT OF WAY	PUBLIC ACCESS ROUTE	NO CONTACT NUMBER
C6	277M	FURNITURE RETAILER	COMFORTZONE	01685 377880
C7	286M	FURNISHINGS RETAILER	DUNELM	01685 490043
C8	295M	MOT CENTRE	BLAKEY'S MOT CENTRE	01685 384264
T1	309M	A465 HEADS OF THE VALLEYS ROAD	SOUTH WALES TRUNK ROAD AGENT (SWTRA)	0300 123 1213
R1	320M	RESIDENTIAL PROPERTY	BLAKEY'S MOT CENTRE	01685 384264
C9	326M	GROCERIES RETAILER	LIDL	020 3966 5566
C10	326M	GROCERIES RETAILER/PETROL STATION	ASDA	01685 379981
C11	334M	STORAGE YARD	PINNACLE CONSTRUCTION	07494 446260
C12	343M	CARPET RETAILER	CARPETRIGHT	01685 707080
C13	357M	OFFICE/STORAGE YARD	PENGARNDDU HIGHWAYS	NO CONTACT NUMBER
R2	348M	RESIDENTIAL PROPERTY	STATION HOUSE	NO CONTACT NUMBER
P2	374M	NATIONAL CYCLE ROUTE 46	WALK WHEEL CYCLE TRUST	0117 926 8893
C14	391M	HOMEWARES RETAILER	B&M HOME STORE	0330 838 9521
O2	416M	STABLES/STORAGE/ALLOTMENTS	CASTLE ROW, PENGARNDDU	NO CONTACT NUMBERS
C15	428M	FLOORING/FURNITURE RETAILERS	CARPET & BED CO, TRADE PRICE SOFAS, FLOOR GIANTS	01685 388340
C16	442M	PETROL STATION	TEXACO, VALLEY HEIGHTS	01685 374792
W3/L1	445M	POND	JEPSON'S POND (MERTHYR TYDFIL ANGLING ASSOCIATION)	01685 723520
R3	549M	RESIDENTIAL PROPERTY	CASTLE ROW, PENGARNDDU	NO CONTACT NUMBER
O3	565M	STABLES/STORAGE YARDS	CASTLE ROW, PENGARNDDU	NO CONTACT NUMBERS
O4	606M	FARM	BLAEN-MORLAIS FARM	NO CONTACT NUMBER
R4	608M	RESIDENTIAL PROPERTIES	BLAEN-MORLAIS FARM	NO CONTACT NUMBER
P3	609M	PUBLIC RIGHT OF WAY	FOOTPATH	NO CONTACT NUMBER
U6	682M	ELECTRICITY SUBSTATION	DOWLAIS GRID STATION (NATIONAL GRID)	NO CONTACT NUMBER
L3	688M	PARK/RECREATION AREA	PLAYGROUND	NO CONTACT NUMBER
R5	700M	RESIDENTIAL PROPERTIES	DOWLAIS TOP	NO CONTACT NUMBERS
W4/L2	705M	RESERVOIR (ANGLING)	PENYWERN POND - TOP POND (MTAA)	07931 512483
U7	745M	RESERVOIR (UNDERGROUND)	DOWLAIS TOP RESERVOIR (DCWW)	0800 052 0145
L4	762M	PLAYING FIELDS	DOWLAIS RFC AND PLAYGROUND	01685 382322
W5/L5	816M	RESERVOIR (ANGLING)	PENYWERN POND - MIDDLE POND (MTAA)	07931 512483
P4	820M	PUBLIC RIGHT OF WAY	FOOTPATH	NO CONTACT NUMBER
I5	862M	LANDFILL	BIFFA, TRECATTI LANDFILL	0800 307307
R6	878M	RESIDENTIAL PROPERTIES	CAERACCA, PANT	NO CONTACT NUMBERS
L6	948M	PLAYING FIELDS	DOWLAIS RFC	01685 382322
R7	958M	RESIDENTIAL PROPERTY	HALFWAY HOUSE	NO CONTACT NUMBER
L7	964M	PLAYING FIELD	CAERACCA PLAYING FIELDS	NO CONTACT NUMBER
E4	1920M	SINC	BLAENMORLAIS	NO CONTACT NUMBER
E5	1967M	SINC	BRYNIAU	NO CONTACT NUMBER
E6	1993M	SINC	TYLE HAIDD	NO CONTACT NUMBER

AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY

TECHNIA ENVIRONMENT AND PLANNING LTD
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MERTHYR BOROUGH RECYCLING COMPANY LTD

RECEPTOR PLAN (FIRE RESPONSE)

Drawn	SCW	Scale	1:10,000
Ch'kd	NB		
Appr'd	NB		@A3
Date	25/07/25		

Job No.	MBRC	Drg No.	10915 - 000 - K

MP3 Odour Management Plan

MP3 Odour Management Plan

Waste Transfer Station with Treatment

Bespoke Environmental Permit

PERMIT NUMBER EPR/ZP3899FX

Unit 5 Pengarnddu Industrial Estate

Dowlais, Merthyr Tydfil, CF48 2TA

Tel: 01685 370188

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Document Revisions

Version	Date	Author	Checked / App'd	Revision
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1 INTRODUCTION

1.1 Background

An odorant is a substance which stimulates a human olfactory system so that an odour is perceived. Odorants may be a single chemical but more typically are a complex mixture of compounds and can also be associated with fine particulates. The human nose is very sensitive and humans can detect concentrations of odourous chemicals and compounds as low as a few parts per billion (ppb), or less in air.

Some odours are considered more offensive than others and the actual level of nuisance is a function of the source, pathway and sensitivity of the receptor.

Odour sources and their impacts are characterised by their sensory properties; i.e. threshold, discrimination, intensity, hedonic tone and quality; as well as their origin, i.e. the type of emission.

Characteristic	Definition
Detection (at Threshold)	Concentration of an odour when first detectable
Recognition	Human ability to differentiate between odours, e.g. wine or vinegar
Intensity	Perceived strength at differing concentrations, e.g. faint, distinct, strong
Hedonic Tone	Pleasantness / offensiveness, e.g. pleasant, unpleasant, offensive
Odour Quality or Character	Association & complexity, e.g. the many "tones" and associations we have with an odour such as flowers, coffee, waste, sewage, etc.

Table 1 Basic Sensory Properties of Odour

Individual responses to odour vary greatly and not all unpleasant odours are considered offensive at all times. Examples of this are well established where communities have become accustomed to "healthy farmyard odours" or "comforting coal fire smells". Equally these same odours can trigger complaints and can impact upon people's daily lives where exposure to "manure odours" or "soot" is perceived as unwanted and objectionable.

When an individual exposed to odour perceives this as unwanted it is argued that the following factors are the main determinants[1]:

- Offensiveness of the odour;
- Intensity of the odour;
- Duration of exposure to the odour;
- Frequency of the odour exposure; and
- Tolerance and expectation of the exposed subject

Defining the origin of an odour, as well as recognising common odour sources, and utilising methods for assessing the concentration and emission rates from the source, are all important aspects of defining the problems presented by odours. The ability to recognise and discriminate between potential sources is important to determine the sources of the odour problem and the relative effectiveness of mitigation measures. Odour sources vary greatly in concentration, hedonic tone and quality even for the same source types.

[1] Environment Agency (2002) Assessment of Community Response to Odorous Emissions, R&D Technical Report P4-095/TR, ISBN 1 857059 24

1.2 Purpose of This Odour Management Plan

This Odour Management Plan outlines the methods by which Merthr Borough Recycling Centre (MBRC) will systematically assess, reduce and prevent potentially odorous emissions from their site at Unit 5 Pengarnddu Industrial Estate, Dowlais, Merthyr Tydfil, CF48 2TA. The odour management plan is a working document with the specific objectives of:

- understanding the risks of odour pollution caused by your activities;
- ensuring that odour impact is considered as part of routine inspections;
- using appropriate measures (or best available techniques (BAT)), including monitoring and contingencies, to control and minimise odour pollution;
- demonstrating that all appropriate measures are taken to prevent or, where that is not reasonably practicable, to reduce odorous emissions to air at nearby receptors:
- always preventing serious pollution;
- minimising the risk of odour releasing incidents or accidents by anticipating them and planning accordingly; and
- documenting odour control measures taken and the performance of those controls

The Environmental Permit covering the site activities allows MBRC to accept up to 252,500 tonnes per annum of non-hazardous/hazardous waste from mixed sources for the following operations:

- HCI Waste Transfer Station with Treatment and Hazardous Storage and the manufacture of Refuse Derived Fuel (RDF).
- Wood Waste Processing
- Inert WTS with Treatment incorporating the manufacture of soils, fines Separation and the manufacture of concrete and pre-cast concrete products
- Road Sweeping and Gully Waste Processing
- End of Life Vehicle Storage, Depollution and Dismantling

Such operations will inevitably lead to the generation of some odour due to the nature of material and the processes. Effective operation and management of such facilities is therefore required to minimise the odour emissions from routine operations and minimise the risk of abnormal operational conditions that would lead to in increased risk of odour generation at the site.

This Odour Management Plan (OMP) has been produced in accordance with Natural Resources Wales Additional Guidance for H4 Odour Management[2] and considering IAQM guidance on the assessment of odour for planning[3]. It addresses the impact of odour release and the control measures employed to mitigate the risk. These are supported through monitoring procedures to identify both elevated levels and review complaints should they arise. The complaints management procedure including the management responsibilities are also addressed.

The OMP structure is in accordance with the NRW guidance and considers:

- Feedstock Inventory;

[2] Additional guidance for H4 Odour Management, Environment Agency, March 2011
[3] Guidance on the assessment of odour for planning, Institute of Air Quality Management, July 2018

- Process Management;
- Evaporation;
- Containment and abatement;
- Dispersion;
- Sensitive Receptors; and
- Incidents and Emergencies.

2 RISK ASSESSMENT

2.1 Screening Assessment

The screening assessment is used to determine whether a Detailed Risk Assessment is required.

For the purpose of this assessment it has been determined that a Detailed Assessment will be required where there are:

- human receptors within 500 m of the boundary of the site

Human receptors are defined as people likely to be present within the screening radius for prolonged or frequent periods. This term would therefore apply to dwellings (and amenity areas such as gardens), workplaces where workers would frequently be present, schools and colleges, hotels, etc. It does not apply to the operators of the MBRC recycling facility or their staff as their health is covered by Health and Safety legislation. It would not apply for example to public footpaths, bridleways, highways, roads and railway.

Ecological receptors themselves are not considered sensitive to odour and have been screened from the assessment.

A Receptor Plan highlighting human and ecological receptors within the vicinity of the site is presented as Drawing **10915 - 000 - G**.

The following Receptors were identified within 500 m of the site boundary:

Receptor	Type	Distance from Site Boundary to Amenity Boundary (Residential) or Frequently Occupied Area (Other)	Direction from site
C1	Storage Yard	0m	South
C2	Storage Yard	0m	South East
C3	Salvage Yard	0m	South East
WM1	ELV ATF	0m	West
I1	Abattoir	8m	East
E1	Mynyddoedd Llangynidr a Llangatwg, Cefn yr Ystrad a Chomin Merthyr SSSI	29m	North/East
E2	Merthyr Common North SINC	29m	North/West
O1	Open Access Land	31m	North
U1	STOR Energy	34m	West
I2	Automotive Parts Manufacturer	35m	South West
WM2	Waste Transfer Station	45m	West North West
U2	STOR Energy	100m	West
C4	Salvage Yard	146m	West
WM3	ELV ATF	221m	South East
U4	Reservoir (Underground)	241m	West
E3	Blaenmorlais SINC	248m	West/North
U5	Reservoir (Above Ground)	264m	West
C5	Caravan Storage	264m	South
P1	Public Right of Way	276m	South West

C6	Furniture Retailer	277m	South
C7	Furnishings Retailer	286m	South West
C8	MOT Centre	295m	South
T1	A465 Heads of the Valleys Road	309m	South West/South East
R1	Residential Property	320m	South
C9	Groceries Retailer	326m	South
C10	Groceries Retailer and Petrol Station	326m	South West
C11	Storage Yard	334m	South
C12	Carpet Retailer	343m	South West
C13	Storage Yard and Office	346m	South
R3	Residential Property	348m	South
P2	National Cycle Route	374m	West/South East
C14	Homewares Retailer	391m	South West
O2	Stables/ Storage/ Allotments	416m	West
C15	Flooring/ Furniture Retailer	428m	South West
C16	Petrol Station	442m	South
W3/L1	Pond (Recreational Use)	445m	North East

Table 2 Identified Receptors (C = Commercial, I = Industrial, R = Residential, WM = Waste Management, U = Utilities, E=Environmental, W=Watercourse, L = Leisure/Recreation, T = Transport, P = Public Right of Way), O = Other)

A more detailed assessment is required to establish that the level of risk is "negligible", and any effects will be not be significant. This assessment is presented in the following section.

2.2 Qualitative Risk Assessment

2.2.1 Potentially Odour Generating Operations

The site will operate as a waste recovery operation sorting non-hazardous and inert wastes for recovery.

The key potential odour sources at the site relate to activities that agitate and increase the evapouration and then dispersion of odour. These are:

- Transport: fugitive odour releases from waste collection vehicle transport to site; dependent on the age and nature of delivered waste;
- Tipping: fugitive emissions during waste tipping;
- Processing: fugitive emissions during screening, sorting, crushing, shredding, baling, etc.; and
- Storage: fugitive emissions during storage of waste following processing.

2.2.2 Other Potential Sources of Odour

The site is located on an existing industrial estate. To the immediate east of the site is an abattoir and meat processing factory. Strong odours from the abattoir occur from time to time and the issue has been raised with the site owners.

A number of waste management and manufacturing companies are located with 350m of the site. These also have the potential to generate odorous emissions.

A number of farms and open access land used for grazing is located beyond the boundary of the site to the north and outside of the wider industrial estate to the east, south and north west. Farming activity may also give rise to odours.

2.2.3 Waste Inventory

In order to understand the odour potential of the different waste streams that enter these processes, a feedstock inventory has been provided for the various waste types. Table 3 below provides an assessment of each waste type by source of material, identifying the typical and abnormal compositions of those waste types and providing and overall odour potential of that feedstock based upon the likelihood of abnormal compositions being encountered at site.

Waste Type	Waste Source	Typical Composition	Abnormal Composition	Likelihood	Odour Potential
Mixed Municipal 20 03 01	Domestic/ domestic-type mixed residual "black bag" waste from residential or C&I sources	Predominantly mixed paper, cardboard, plastics, glass, metals.	Loads may contain decomposing food and green waste(potentially anaerobic), and/or odourous wastes such as pet faeces.	High	High if waste stored for extended periods before collection. Medium for wastes of normal composition, stored for short durations before collection.
Kitchen and Canteen (Food) 20 01 08	Source segregated and sorted wastes from Domestic and C&I	Uncontaminated food from kitchens and canteens	Loads may contain decomposing food waste (potentially anaerobic).	Medium	High if waste stored for extended periods before collection. Medium for wastes of normal composition, stored for short durations before collection.
Food processing waste 02 02 03 02 03 04 02 04 01 02 05 01 02 06 01 02 07 01 02 07 02 02 07 04	Source segregated wastes from C&I	Uncontaminated food processing waste from animal, fruit, vegetable, sugar, beverage and diary processing	Loads may contain decomposing food waste (potentially anaerobic).	Medium – Low	High if waste stored for extended periods before collection. Medium for wastes of normal composition, stored for short durations before collection.
Post-Sorting Residues/ Residual Waste 19 12 12	Commercial and Industrial, Construction and Demolition	Residual waste materials that have resulted from the mechanical treatment of waste. Generally a mixture of non-odourous wastes (plastics, wood, textiles).	Loads may contain decomposing food/green waste and odorous contraries (e.g. pet faeces).	Medium – Low	Medium to Low for wastes of normal composition, stored for short durations before collection.
Process (Trommel) Fines 19 12 12	Small waste particles screened from mixed waste	<10mm mixture of non-odourous wastes (soils, minerals, gypsum, plastics, metals) and biodegradable wastes (food,	Loads may contain decomposing food/green waste (potentially anaerobic), odorous	Medium – Low	Medium to Low for wastes of normal composition, stored for short durations before collection.

		green, wood)	contraries (e.g. pet faeces).		
Refuse Derived Fuel 19 12 10	Combustible waste sorted from domestic, C&I and C&D mixed waste	Generally lightweight fractions including unsortable and non-recyclable plastics and paper/cardboard.	Loads may contain food/green waste and odorous contraries.	Medium – Low	Medium to Low for wastes of normal composition, stored for short durations before collection.
Mixed C&D 17 09 04	Domestic (DIY) and C&D "skip" waste	Predominantly inert fractions mixed with wood, plastic, glass, green and metal.	Loads may contain decomposing food/green waste (potentially anaerobic) and/or odorous contraries (e.g. pet faeces) - generally at lower volumes than Domestic/C&I.	Medium	Medium if waste stored for extended periods before collection. Low for wastes of normal composition, stored for short durations before collection.
Green Waste 20 02 01 02 01 03 02 01 07	Source segregated and sorted wastes from Domestic, C&I and C&D	Uncontaminated green waste (woody and green vegetation from forestry, landscaping, site clearance, gardens and parks)	Loads may contain decomposing green waste stored for some time before disposal (potentially anaerobic).	Medium	Medium if waste stored for extended periods before collection (rotting vegetation not generally considered offensive unless anaerobic). Low for wastes of normal composition, stored for short durations before collection.
Non-composted fractions and off-specification compost 19 05 01 19 05 02 19 05 03	Sorted C&I	Non-composted fraction of wastes, off-specification compost,	Loads may contain decomposing biodegradable waste stored for some time before disposal (potentially anaerobic).	Medium	Medium if waste stored for extended periods before collection Low for wastes of normal composition, stored for short durations before collection.
Wood 15 01 03 17 02 01 19 12 07 20 01 38	Source segregated and sorted wastes from Domestic, C&I and C&D	Untreated and treated wood, wooden packaging, wood offcuts.	Loads may contain sawdust and rotting wood.	Low	Low for wastes of normal composition, stored for short durations before collection.

Wood 17 02 04* 19 12 06* 20 01 37*	Source segregated and sorted wastes from Domestic, C&I and C&D	Wood treated with chromated copper arsenate (CCA) or other hazardous compounds. Includes railway sleepers, telegraph poles and creosote treated wood and some demolition wood from pre-2007 buildings.	Loads may contain rotting wood.	Low	Low for wastes of normal composition, stored for short durations before collection.
Mixed Packaging 15 01 06	Packaging waste from Domestic and C&I sources	Mixtures of paper, cardboard, plastic, wood, metal and glass packaging.	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition, stored for short durations before collection.
Composite Packaging 15 01 05	Source segregated and sorted wastes from Domestic, C&I and C&D	Fibre-based composites including Tetrapak-type cartons (milk cartons, juice boxes) and coffee cups.	Loads may be contaminated with odourous contraries including liquid residues.	Low	Low for wastes of normal composition, stored for short durations before collection.
Paper/Card 15 01 01 19 12 01 20 01 01	Source segregated and sorted wastes from Domestic, C&I and C&D	Uncontaminated paper and/or cardboard waste stockpiled or baled.	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition, stored for short durations before collection.
Textiles 15 01 09 19 12 08 20 01 10 20 01 11	Source segregated wastes from domestic, C&I and C&D	Industrial off-cuts, clothing, curtains and draperies, soft furnishings.	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition, stored for short durations before collection.
Metals 02 01 10 12 01 01 12 01 03 12 01 04 15 01 04 16 01 17	Source segregated and sorted wastes from Domestic, C&I and C&D	Fe and non-Fe scrap, plumbing pipe and fittings, decorative trim, furniture,	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.

16 01 18 17 04 01 17 04 02 17 04 03 17 04 04 17 04 05 17 04 06 17 04 07 17 04 11 19 12 02 19 12 03 20 01 40					
Plastic Film 02 01 04 07 02 13 15 01 02 17 02 03 19 12 04 20 01 39	Source segregated and sorted wastes from Domestic, C&I and C&D	Plastic waste stockpiled or baled by type (LDPE film, PP Film, etc.).	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.
Rigid Plastics 02 01 04 07 02 13 12 01 05 15 01 02 16 01 19 17 02 03 19 12 04 20 01 39	Source segregated and sorted wastes from Domestic, C&I and C&D	Plastic waste stockpiled or baled by type (uPVC (windows/doors), HDPE utility pipe, mixed hard plastic).	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.
Glass 10 11 03	Source segregated and sorted wastes from	Glass (panes, chips, shards) bottles, containers and jars.	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.

10 11 12 15 01 07 17 02 02 17 02 04* 19 12 05 20 01 02	Domestic, C&I and C&D				
Absorbents 15 02 03	Source segregated and sorted wastes from Domestic, C&I and C&D	Absorbents, filter materials, wiping cloths and protective clothing.	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.
Batteries 20 01 34 16 06 04 16 06 05	Source segregated wastes from domestic, C&I and C&D	Non-hazardous alkaline, lithium or lithium-ion batteries.	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.
Batteries 16 06 01* 20 01 33*	Source segregated and sorted wastes from Domestic, C&I and C&D.	Lead acid vehicle and domestic batteries, nickel-cadmium batteries, mercury containing batteries	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.
WEEE (Non-Hazardous) 20 01 36 16 02 14 16 02 16	Source segregated wastes from domestic, C&I and C&D	Small WEEE: Toys, Microwaves, Radios Large domestic appliances (LDA): white goods (washing machines, Vented and condenser tumble dryers, dishwashers and cookers), LED and incandescent lighting	Loads may be contaminated with odourous contraries.	Low/nil	Low for wastes of normal composition.
WEEE (Hazardous or POPs) 20-01-35* 21 01 23* 20 01 35*	Source segregated wastes from domestic, C&I and C&D	Screens, circuit boards, batteries, cables or any plastic parts containing hazardous chemicals or POPs. Cathode ray tube (CRT), flatscreen (plasma or LCD), fridges, freezers,	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.

16 02 11* 16 02 13*		chillers, air-conditioning units, heat pump tumble dryers, linear fluorescent tubes, compact fluorescent lamps			
Domestic Seating 20 03 07	Source segregated and sorted wastes from Domestic and C&I	Sofas, sofa beds, armchairs, kitchen and dining room chairs, stools and foot stools, home office chairs, futons, bean bags, floor, and sofa cushions.	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.
Bulky Waste 20 03 07	Source segregated and sorted wastes from Domestic and C&I	Bulky household waste including mattresses, gas fuelled domestic appliance, non-upholstered furniture e.g. bed frames, etc,	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.
ELVs 16 01 03 16 01 04* 16 01 06	Source segregated wastes from domestic, C&I and C&D	PLG/Light Commercial Vehicles	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.
Tyres 16 01 03	Sorted from Domestic, C&I and C&D	Car/Truck Tyres	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.
Oil Filters 16 01 07*	Sorted from Domestic and C&I	Vehicle and plant oil filters	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.
Brake Pads 16 01 12 16 01 11*	Sorted from Domestic and C&I	Vehicle brake pads containing asbestos	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.
Linings and refractories 16 11 02 16 11 04 16 11 06	Source segregated and sorted wastes from C&I	Linings and refractories from metallurgical processes	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.
Off-specification	Source segregated	off-specification batches and	Loads may be contaminated	Low	Low for wastes of normal composition.

batches and unused products 16 03 04 16 03 06	wastes from C&I	unused inorganic and organic products	with odourous contraries.		
Asbestos 17 06 01* 17 06 04 17 06 05*	Source segregated wastes from C&D	Insulation materials and mixed C&D waste containing asbestos	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.
Gypsum 17 08 02	Source segregated wastes from C&D	Gypsum-based construction materials	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.
Street Sweepings/Gully Suckings 17 05 04 17 05 06 19 13 02 19 13 04 20 02 02 20 03 03	Source segregated from C&I	Gully waste and road sweepings	Decomposing organic fraction or contaminated with odorous contraries.	Low	Low – organic fraction normally small and not subject to extensive decomposition.
Inert Wastes 01 04 08 01 04 09 01 04 12 01 04 13 02 01 07 02 04 01 17 01 01 17 01 02 17 01 03 17 01 07	Source segregated and sorted wastes from Domestic and C&D	Minerals, soils, gravel, bricks, breeze blocks (or similar) concrete blocks, rubble, tiles (internal and external) and other ceramics. Selected mining, quarrying and forestry wastes from Ch. 1 and 2	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.

17 02 02 17 03 02 17 05 04 17 05 08 19 12 09 19 12 12 19 13 02 20 02 02					
Other permitted wastes received infrequently and/or in small volumes					
Exploration, mining, quarrying, and physical and chemical treatment of minerals wastes 01 01 01 01 01 02 01 03 06 01 03 09 01 04 11	Source segregated C&I	Wastes from mineral extraction, tailings, red mud, gravel. Wastes from potash and rock salt processing.	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.
Agriculture, horticulture, aquaculture, forestry, hunting and fishing, food preparation and processing wastes 02 04 02 02 06 02	Source segregated C&I	Off-specification calcium carbonate from sugar processing, preserving agents from the baking and confectionery industry.	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.

Wood processing and the production of panels and furniture, pulp, paper and cardboard wastes 03 01 01 03 01 05 03 03 01 03 03 07 03 03 08 03 03 10	Source segregated C&I	Bark and cork, sawdust, shavings, cuttings, wood, particle board and veneer, rejects from pulping of waste paper and cardboard, wastes from sorting of paper and cardboard destined for recycling, fibre rejects, fibre-, filler- and coating-sludges from mechanical separation.	Loads may contain biodegrading materials and/or be contaminated with odourous contraries.	Low	Low for wastes of normal composition.
Leather, fur and textile industries waste 04 01 08 04 01 09 04 02 21 04 02 22	Source segregated C&I	Tanned leather (blue sheetings, shavings, cuttings, buffing dust), unprocessed and processed textile fibres.	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.
Inorganic chemical processes wastes 06 09 02 06 09 04 06 11 01	Source segregated C&I	Phosphorous slag, calcium-based reaction wastes	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.
Mfsu of coatings (paints, varnishes and vitreous enamels),	Source segregated C&I	Wastes from paint or varnish removal	Loads may contain solvents and/or be contaminated with odourous contraries.	Low	Low for wastes of normal composition.

adhesives, sealants and printing inks wastes 08 01 18					
Photographic industry wastes 09 01 07 09 01 08 09 01 10 09 01 12	Source segregated C&I	Photographic film and paper, single-use cameras	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.
Thermal processes wastes 10 01 01 10 01 05 10 01 07 10 01 15 10 01 19 10 01 24 10 02 01 10 02 02 10 02 08 10 02 10 10 02 14 10 02 15 10 03 02 10 03 05 10 03 16 10 03 18 10 03 24	Source segregated C&I	Bottom ash, slag and boiler dust, calcium-based reaction wastes, wastes from gas cleaning, sands from fluidised beds, mill scales, filter cakes, anode scraps, skimmings, dross, binders, moulds, ceramics, bricks, tiles and construction products.	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.

10 03 26 10 03 28 10 03 30 10 04 10 10 05 01 10 05 09 10 05 11 10 06 01 10 06 02 10 06 10 10 07 01 10 07 02 10 07 03 10 07 05 10 07 08 10 08 09 10 08 11 10 08 13 10 08 14 10 08 18 10 08 20 10 09 03 10 09 06 10 09 08 10 09 14 10 09 16 10 10 03 10 10 06 10 10 08 10 10 14					

10 10 16 10 11 03 10 11 10 10 11 12 10 11 16 10 11 18 10 12 01 10 12 05 10 12 06 10 12 08 10 12 10 10 12 12 10 13 01 10 13 04 10 13 07 10 13 10 10 13 11 10 13 13 10 13 14					
Chemical surface treatment and coating of metals and other materials; non-ferrous hydro metallurgy 11 01 10 11 01 14 11 02 03 11 02 06	Source segregated C&I	Filter cakes, degreasing wastes,hard zinc, zinc ash.	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.

11 05 01 11 05 02					
Shaping and physical and mechanical surface treatment of metals and plastics wastes 12 01 13 12 01 17 12 01 21	Source segregated C&I	Welding wastes, blasting material, spent grinding bodies and grinding materials	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.
Hazardous construction and demolition wastes (including excavated soil from contaminated sites) wastes 17 01 06* 17 03 01* 17 05 03* 17 05 07* 17 09 03*	Source segregated wastes from C&D	Mixtures of, or separate fractions of concrete, bricks, tiles and ceramics, bituminous mixtures containing coal tar, soil and stones, track ballast, other construction and demolition wastes (including mixed wastes).	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.
Human or animal health care and/or related research wastes 18 01 04	Source segregated C&I	Wastes whose collection and disposal is not subject to special requirements in order to prevent infection (for example dressings, plaster casts, linen, disposable clothing, diapers)	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.

Waste management facilities, off-site waste water treatment plants and preparation of water intended for human consumption/industrial use wastes 19 01 02 19 01 12 19 01 18 19 01 19 19 02 03 19 02 10 19 04 01 19 10 04	Sorted C&I	Ferrous materials removed from bottom ash, bottom ash and slag, pyrolysis wastes, sands from fluidised beds, wastes from physico/chemical treatment, vitrified waste, fluff-light fraction and dust from shredding of metal-containing wastes.	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.
Quarantine Various	Non-conforming wastes	Various incidental hazardous wastes picked from mixed loads following acceptance	Loads may be contaminated with odourous contraries.	Low	Low for wastes of normal composition.

Table 3 Assessment of Odour Potential from Feedstock Inventory.

The facility will have the following maximum tonnages and storage times for incoming waste:

Material	Tonnes	Storage Time
Incoming Mixed Waste Feedstock	500	7 Days

The facility will have the following maximum tonnages and storage times for processed waste:

Material	Tonnes	Storage Time
Baled Recyclates	100	3 months
RDF	100	1 month
Wood Waste	500	3 months
Inert Waste	10,000	3 Months
Road Sweepings and Gully Waste	250	3 months
Asbestos	50	3 Months
Tyres	50	3 months
End of Life vehicles	210	3 years
Manufactured Soils	10,000	3 Months
Process Fines	1,250	1 month

2.2.4 Sources

Due to the potential for malodorous wastes to be present in incoming loads and odour increasing with agitation of the waste (through higher rates of evapouration), the key potential odour sources at the site are likely to be associated with the deposition of freshly tipped and potentially malodorous wastes, and the treatment operations these wastes are subject to following tipping.

Whilst there is the potential for the inclusion of odourous materials in any load, in general, and based on the site inventory, mixed “skip” waste, black bag waste and green waste represent the waste types with the greatest potential to contain odour generating material on a day to day basis, with the level of odour dependent on the storage time and conditions prior to delivery.

With respect to the mixed municipal black bag waste, this is not subject to manual or automated sorting due to the poor recovery levels of recyclable material that can be achieved. Black bag waste, is shredded unsorted mixed with a sorted “lights” fraction (comprising non recyclable paper, cardboard and plastics) from the manual picking process prior to its immediate loading into a walking floor articulated vehicles. As the black bag waste is unsorted and often in sealed bags, the shredding operation represents a potentially high risk for odour emissions.

For the purpose of this assessment the following source magnitude of emissions categories have been applied.

Activity	Source Magnitude Ranking of Emissions
Tipping/handling of incoming non-hazardous (S1)	Medium
Tipping/handling of incoming inert waste, bulking of hazardous waste (S2)	Low
Manual sorting of non-hazardous waste (S3)	Medium
Shredding of non-hazardous black bag waste (S4)	High
Processing of inert waste (S5)	Negligible
Traffic movements (S6)	Negligible
Storage (S7)	Negligible

Figure 1. Source magnitude of emissions

2.2.5 Receptors

The site is located northeast of Merthyr at Dowlais where a range of commercial and industrial activities occur. Penygarnddu Industrial Estate, which comprises light industrial and commercial units and offices is effectively zoned for the development of more difficult business activities and includes a number of waste businesses and an abattoir and meat packing facility. Due to the nature of the site it is located some distance from residential properties. The western and southern extents of the estate have been developed for out-of-town retail businesses.

2.2.5.1 Human Receptors

A number of bodies have published guidance relating ot the sensitivity of receptors to odour.

The IAQM guidance determines a receptor's sensitivity to odours using a set of general principles (Figure 2).

High sensitivity receptor	Surrounding land where: • users can reasonably expect enjoyment of a high level of amenity; and • people would reasonably be expected to be present here continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. Examples may include residential dwellings, hospitals, schools/education and tourist/cultural.
Medium sensitivity receptor	Surrounding land where: • users would expect to enjoy a reasonable level of amenity, but wouldn't reasonably expect to enjoy the same level of amenity as in their home; or • people wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. Examples may include places of work, commercial/retail premises and playing/recreation fields.
Low sensitivity receptor	Surrounding land where:

	• the enjoyment of amenity would not reasonably be expected; or • there is transient exposure, where the people would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Examples may include industrial use, farms, footpaths and roads.

Figure 2. IAQM receptor sensitivity to odours.

NRW's H4 Odour management guidance is not explicit in defining the sensitivity of specific types of receptors, providing some general qualitative commentary regarding "*domestic residences, or a pub with a beer garden are more likely to be sensitive than an industrial complex or passers-by*", "*Some individuals will be extremely tolerant of odours at high intensities while others will be unable to tolerate an odour as soon as they identify it*" and "*There are a very small number of people (e.g. Addison's sufferers), who have conditions which put them well outside the normal range of sensitivities*". An example odour report form, included as an Appendix, suggests the following classification:

- Low (e.g footpath, road)
- Medium (e.g. industrial or commercial workplaces)
- High (e.g. housing, pub/hotel etc)

Environment Agency historic guidance[4] described a number of categories of receptor and resources for identifying their presence in the vicinity of a site.

DEFRA[5] also published sensitivity ranking for potential receptors to waste activity.

These guidance documents have been considered and used to categorise the sensitivity of nearby receptors for the detailed assessment.

Where a receptor is categorized under one or more usages, the higher sensitivity category and ranking has been used.

Ranking	Sensitivity To Waste Activity
High	Residential properties/housing, hospitals, clinics, hotels, nursing homes, schools/education establishments, tourist/cultural attractions, pubs with gardens.
Medium	Places of work, commercial/retail premises, playing/recreation fields, greenhouses & nursery, horticultural land, offices.
Low	Waste management facilities, light & heavy industry, outdoor storage, farms, footpaths, cycle paths and roads, nationally and locally designated environmental sites, open access land, ponds and reservoirs.

Figure 3. Receptor Sensitivity Ranking

The sensitivity of the human receptors within 500 m of the site is categorised as:

Receptor	Type	Sensitivity
C1	Storage Yard	Medium
C2	Storage Yard	Medium

[4] Environment Agency 2011. H1 Annex A – Amenity & accident risk from installations and waste activities v 2.1
[5] DEFRA 1999. Waste Management Licensing: Waste Management Licensing. Risk Assessment Inspection Frequencies Operator Pollution Risk Appraisal "OPRA for Waste" A Consultation Paper. Chapter 3.

C3	Salvage Yard	Medium
WM1	ELV ATF	Low
I1	Abattoir	Medium
E1	Mynyddoedd Llangynidr a Llangatwg, Cefn yr Ystrad a Chomin Merthyr SSSI	Low
E2	Merthyr Common North SINC	Low
O1	Open Access Land	Low
U1	STOR Energy	Medium
I2	Automotive Parts Manufacturer	Medium
WM2	Waste Transfer Station	Low
U2	STOR Energy	Medium
C4	Salvage Yard	Medium
WM3	ELV ATF	Low
U4	Reservoir (Underground)	Medium
E3	Blaenmorlais SINC	Low
U5	Reservoir (Above Ground)	Low
C5	Caravan Storage	Medium
P1	Public Right of Way	Low
C6	Furniture Retailer	Medium
C7	Furnishings Retailer	Medium
C8	MOT Centre	Medium
T1	A465 Heads of the Valleys Road	Low
R1	Residential Property	High
C9	Groceries Retailer	Medium
C10	Groceries Retailer and Petrol Station	Medium
C11	Storage Yard	Medium
C12	Carpet Retailer	Medium
C13	Storage Yard and Office	Medium
R3	Residential Property	High
P2	National Cycle Route	Low
C14	Homewares Retailer	Medium
O2	Stables/ Storage/ Allotments	Medium
C15	Flooring/ Furniture Retailer	Medium
C16	Petrol Station	Medium
W3/L1	Pond (Recreational Use)	Medium

Figure 4. Sensitivity to odour of identified receptors within 500m of the site boundary

2.2.6 Pathway

The transport of odour through the air is the primary pathway from source to receptor.

Meteorological conditions will determine to a large extent the locations and times where odour could be noticeable and becomes a nuisance. The most important meteorological parameters governing the atmospheric dispersion of pollutants are:

- wind direction: determines the broad direction of transport of the emission;
- wind speed: affects ground level emissions by determining the initial dilution of pollutants emitted; and

- atmospheric stability: a measure of turbulence.

Movement and dilution of odour will occur as the distance from the source increases and as a consequence, more distant receptors will generally perceive a lower level of odour nuisance than those closer to the source.

In Wales the prevailing wind direction is most frequently in an arc from south west to north west, with an occasional north easterly influence.

Increased humidity in the immediate environment of the waste allows reduces odour by reducing evapouration. As a consequence, rainfall will influence odour generation for wastes tipped or stored outside.

Within distances of 50 m from sources, significant effects from odour may occur, regardless of the prevailing wind direction. At greater distances, the wind direction has a greater influence on the impact; consequently, the score allocated to the pathway takes the orientation of the receptor relative to the source into account only for distances beyond 50 m.

With increasing distance the probability of exposure decreases as air dispersion reduces the concentration of odourous chemicals and compounds. For the purpose of this assessment the reference distances of 50 m, 100 m, 250 m and 350 m have been selected as points where the pathway risk transitions to the next level.

In the case where there is a significant natural obstruction between the source of emissions and the receptor, e.g. a large wooded area, large topographical feature, etc. the probability of exposure would be reduced by one classification. No such feature is present between the site and surrounding receptors.

Distance between source* and receptor	Orientation of receptor relative to source*	Probability of Exposure (Pathway Risk)
Less than 50 m	All directions	High
Between 50 m and 100 m	Downwind	High
Between 50 m and 100 m	Upwind	Medium
Between 100 m and 250 m	Downwind	Medium
Between 100 m and 250 m	Upwind	Low
Between 250 m – 350 m	Downwind	Low
Between 250 m – 350 m	Upwind	Negligible
Greater than 350 m	All directions	Negligible

*Taken to be the site boundary where the distance from a source is not known

Figure 5. Assessment matrix for Probability of Exposure for Human Receptors

The identified receptors within 500 m of the site were further characterised and their probability of exposure established (Figure 6). Source emissions levels of negligiable (S5, S6 and S7) have been excluded from further assessment and any further assessment of risk would result in a negligible risk of odour impact.

Receptor	Type	Direction from Site			
			S1/S2	S3	S4
C1	Storage Yard	S	24m (U)	0m (D)	78m (U)
C2	Storage Yard	SE	29m (U)	38m (D)	74m (U)
C3	Salvage Yard	SE	45m (D)	42m (D)	91m (U)
WM1	ELV ATF	W	60m (U)	33m (U)	77m (U)
I1	Abattoir	E	74m (D)	65m (D)	21m (D)
E1	Mynyddoedd Llangynidr a Llangatwg, Cefn yr Ystrad a Chomin Merthyr SSSI	N / E	92m N 129m NE (D)	71m N (U) 200m NE (D)	32m (U) 89m NE(D)
E2	Merthyr Common North	N	92m N	71m N (U)	32m (U)

	SINC		129m NE (D)	200m NE (D)	89m NE(D)
O1	Open Access Land	N	92m N 129m NE (D)	71m N (U) 200m NE (D)	32m (U) 89m NE(D)
U1	STOR Energy	W	96m (U)	69m (U)	112m (U)
I2	Automotive Parts Manufacturer	SW	112m (U)	80m (U)	169m (U)
WM2	Waste Transfer Station	WNW	114m (U)	86m (U)	123m (U)
U2	STOR Energy	W	163m (U)	135m (U)	183m (U)
C4	Salvage Yard	W	209m (U)	181m (U)	230m (U)
WM3	ELV ATF	SE	322m (D)	313m (D)	290m (D)
U4	Reservoir (Underground)	W	303m (U)	275m (U)	323m (U)
E3	Blaenmorlais SINC	W / N	312m (U)	282m (U)	339m (U)
U5	Reservoir (Above Ground)	W	330m (U)	299m (U)	359m (U)
C5	Caravan Storage	S	361m (U)	340m (U)	311m (U)
P1	Public Right of Way	SW	367m (U)	329m (U)	414m (U)
C6	Furniture Retailer	S	366m (U)	340m (U)	412m (U)
C7	Furnishings Retailer	SW	378m (U)	339m (U)	425m (U)
C8	MOT Centre	S	384m (U)	362m (U)	430m (U)
T1	A465 Heads of the Valleys Road	SW / SE	409m (D)	397m (D)	430m (D)
R1	Residential Property	S	409m (U)	384m (U)	457m (U)
C9	Groceries Retailer	S	405m (U)	373m (U)	462m (U)
C10	Groceries Retailer and Petrol Station	SW	414m (U)	379m (U)	471m (U)
C11	Storage Yard	S	420m (U)	392m (U)	472m (U)
C12	Carpet Retailer	SW	434m (U)	395m (U)	480m (U)
C13	Storage Yard and Office	S	419m (U)	409m	483m
R2	Residential Property	S	438m	414m (U)	485m (U)
P2	National Cycle Route	W / SE	462m (D)	437m (D)	511m (D)
C14	Homewares Retailer	SW	483m (U)	445m (U)	531m (U)
O2	Stables/ Storage/ Allotments	W	491m (U)	458m (U)	524m (U)
C15	Flooring/ Furniture Retailer	SW	518m (U)	480m (U)	564m (U)
C16	Petrol Station	S	530m (U)	503m (U)	580m (U)
W3/L1	Pond (Recreational Use)	NE	525m (U)	531m (U)	450m (U)

*Taken to be the site boundary where the distance from a source is not known. The amenity boundary (boundary of area occupied for large parts of the day) is used for receptors.

Figure 6. Probability of Exposure for human receptors

2.2.7 Risk of Odour Impacts

Each source, pathway and receptor was allocated a score of 0, 1, 3 or 5 depending on whether they were deemed to be negligible, low, medium or high respectively. For each receptor, the scores were multiplied together to give a total odour risk score. A risk category of negligible, low, medium or high was allocated according to the score ranges set out in Figure 7.

Odour	Odour Category Without Mitigation

45 and above	High
5 - 44	Medium
1 - 4	Low
0*	Negligible

Figure 7. Odour risk category without mitigation

Any receptor identified as having a risk of odour impact greater than negligible without mitigation is taken forward for further assessment (Figure 8).

Where a receptor is affected by multiple sources the highest risk of odour impact has been tabulated.

Receptors having a pathway risk of Negligible have been excluded from assessment as a pathway score of 0 would result in a negligible risk of odour impact irrespective of the Source and receptor scores.

Receptor	Source	Pathway	Receptor	Total	Risk
C1 (S1/S2)	3	5	3	45	High
C1 (S3)	3	5	3	45	High
C1 (S4)	5	3	3	45	High
C2 (S1/S2)	3	5	3	45	High
C2 (S3)	3	5	3	45	High
C2 (S4)	5	3	3	45	High
C3 (S1/S2)	3	5	3	45	High
C3 (S3)	3	5	3	45	High
C3 (S4)	5	3	3	45	High
WM1 (S1/S2)	3	3	1	9	Medium
WM1 (S3)	3	5	1	15	Medium
WM1 (S4)	5	3	1	15	Medium
I1 (S1/S2)	3	5	3	45	High
I1 (S3)	3	5	3	45	High
I1 (S4)	5	5	3	75	High
E1 (S1/S2)	3	3	1	9	Medium
E1 (S3)	3	3	1	9	Medium
E1 (S4)	5	5	1	25	Medium
E2 (S1/S2)	3	3	1	9	Medium
E2 (S3)	3	3	1	9	Medium
E2 (S4)	5	5	1	25	Medium
O1 (S1/S2)	3	3	1	9	Medium
O1 (S3)	3	3	1	9	Medium
O1 (S4)	5	5	1	25	Medium
U1 (S1/S2)	3	3	3	27	Medium
U1 (S3)	3	3	3	27	Medium
U1 (S4)	5	1	3	15	Medium
I2 (S1/S2)	3	1	3	9	Medium
I2 (S3)	3	3	3	27	Medium
I2 (S4)	5	1	3	15	Medium
WM2 (S1/S2)	3	1	1	3	Low
WM2 (S3)	3	3	1	9	Medium
WM2 (S4)	5	1	1	5	Medium
U2 (S1/S2)	3	1	3	9	Medium
U2 (S3)	3	1	3	9	Medium
U2 (S4)	5	1	3	15	Medium
C4 (S1/S2)	3	1	3	9	Medium
C4 (S3)	3	1	3	9	Medium
C4 (S4)	5	1	3	15	Medium
WM3 (S1/S2)	3	1	1	3	Low
WM3 (S3)	3	1	1	3	Low
WM3 (S4)	5	1	1	5	Medium

Figure 8. Receptors assessed as having a greater than negligible risk of odour impact without mitigation

3 PROCESS MANAGEMENT

The following section outlines the waste recovery processes operated by MBRC. The monitoring parameters, process controls and records at each stage within the recovery process for the minimisation of the production of odours are provided herein.

3.1 Waste Reception

The following assumes full pre-acceptance and acceptance procedures are followed. On arrival, vehicles are weighed on the site weighbridge and directed to the waste reception area where they unload into the specified area or bay.

Waste Reception			
Potential Odour Issue	**Critical Limits**	**Process Controls**	**Records**
Release of odours during delivery of waste materials.	Presence of odorous materials.	Waste acceptance procedure includes checks for odorous materials. Unacceptably odorous waste rejected. Tipping and pre-sorting area located centrally within site to increase separation from receptors. Waste tipped as it arrives and sorted to minimise quantity in tipped stockpile. Staff suitably trained, sorting/storage area and equipment in place for dealing with waste input. Monitor weather conditions, specifically wind direction and wind speed. Where wind conditions exacerbate the transport of odour towards receptors identified in section 2.2.7 increased vigilance will be exercised and additional monitoring undertaken.	Site Diary/CAR System

3.2 Processing of Wastes

Following the waste acceptance and inspection, active sorting and segregation begins using both mechanical and manual sorting.

Processing of Wastes			
Potential Odour Issue	**Critical Limits**	**Process Controls**	**Records**
Release of odours during sorting and/or shredding of waste materials (mixed wastes).	Odour detected during sorting.	Wastes sorted rapidly following delivery. Sorting areas located centrally within site to increase separation from receptors. Shredding area located to the north east of site away from the majority of	Site Diary/CAR System

		receptors. Separation of wastes within enclosed picking line following fines removal.	

3.3 Contrary and Non-conforming Waste

Contrary, non-conforming wastes are immediately sorted to specific containment. Where odorous or wastes likely to become odorous are discovered they shall be sorted to sealed, leak-proof, labelled containers (skips, or similar).

Contrary Materials			
Potential Odour Issue	**Critical Limits**	**Process Controls**	**Records**
Release from odorous materials.	Odour detected during sorting.	Offending materials moved to storage within sealed container for disposal from site in accordance with EMS	Site Diary/CAR System

3.4 Sorted Wastes

Stockpiled inert wastes should not present an odour source. Odorous wastes or wastes likely to cause odour because of biodegradation are to be immediately sorted to sealed, leak-proof containers, or where appropriate diverted off site to a licensed facility.

Processed Waste Storage			
Potential Odour Issue	**Critical Limits**	**Process Controls**	**Records**
Release from odorous biodegradable materials.	Odour detected following sorting.	Materials diverted from site to other suitably licensed facility and within 48hrs of identification.	Site Diary/CAR System

3.5 Internal Odour Assessment and Monitoring

MBRC will carry out odour checks at three different times each day as part of the daily site monitoring that is conducted by the Site Manager. All findings are recorded on the Daily Site Checklist forms and if necessary actions are taken and recorded in line with our Non-Conformance, Corrective and Preventive Action Procedure.

The odour assessor should not be subject to significant odour in the 30 minutes prior to the assessment. This is to ensure that the assessor is not suffering from odour fatigue and will be sensitive to any abnormal odours.

The inspections shall be undertaken as follows:

- The operational member of staff will walk slowly along the site boundary and breathe normally. If an odour cannot be detected in this way, the inspector will periodically stand still and inhale deeply facing upwind.
- If odour is detected while walking and breathing normally, the intensity will be recorded as 3 (moderate odour). If odour can only be detected whilst standing still and inhaling whilst facing the wind then intensity will be recorded as 2 (faint odour).

- Following the identification of an odour at the site boundary, an on site inspection will be carried out to trace any odour back to source and enable any corrective or preventative action to take place.

All operational staff will be responsible for reporting any odour problems immediately to the Site Manager (or designated responsible person).

Any odours found to be present onsite will be recorded and their source investigated and steps will be taken to mitigate the sources of odours using the strategies to control odour as outlined above.

Weather conditions (including wind speed and direction) shall be assessed and recorded at regular intervals as outlined in Section 1.

Wind conditions where off-site transport occurs will be logged in the site diary.

Observations including time, date, weather conditions, temperature, wind strength, wind direction, intensity, odour type and sensitivity will be recorded in an Internal Odour Report Form (Appendix B). Site operating conditions at the time of survey will also be recorded, enabling the identification of any 'abnormal' site operating conditions such as downtime for refurbishment or maintenance.

Should elevated levels of odour be identified, the TCM (or designated responsible person) will be informed immediately and will initiate the mitigation measures identified in section 5.

The internal monitoring procedure, including a survey of odour reports will be re-assessed annually as part of the Management Review process undertaken in line with our Management Systems or as and when warranted due to the occurrence of odour related incidents.

3.6 Passive Odour Management

Site housekeeping and cleanliness, including end of working day litter picking and sweep of reception area, scraping up remaining areas to minimise, where reasonably practicable, any materials that are left on edges or corners of the site are undertaken daily. We also perform regular internal audits and site inspections, which helps us to identify any problems at the earliest opportunity.

4 CONTAINMENT AND ABATEMENT

The site currently does not employ either containment or abatement systems for the control of odours at the facility.

4.1 Process Containment

The delivery of waste, tipping, inspection and manual pre-sorting of large items, fines separation and shredding of non-hazardous wastes is carried out outside. Sorting of non-hazardous wastes is carried out on an enclosed picking line.

5 PROCEDURES WHEN ODOURS ARISE

The overall responsibility for the site shall remain with the Managing Director. Day to day operational responsibility is maintained by the site's competent persons or COTC holders (Certificate of Technical Competence holders).

5.1 Detection of Odour during Olfactory Surveys

Detection of anything more than a Moderate Odour at the site boundary will initiate a more extensive olfactory survey to determine the extent of the odour plume. The Site Manger or designated responsible person will be notified immediately and an olfactory survey will be undertaken utilizing the Internal Odour Investigation Record (Annex B) in order to attempt to determine the scope and extent of the odour plume.

The Site Manager is responsible for identifying and implementing short-term mitigation measures to minimise the risk of off-site transport of odour and potential complaints arising in accordance with section 5.3. The efficacy of any mitigation measures will be confirmed through further monitoring at the site boundary and external to the site as required.

In the event of a Strong Odour being detected at the site boundary neighbouring sensitive receptors (as identified in 2.2.7) will be contacted and neighbours advised to close windows and doors while the business addresses the source of the odour.

5.2 External Complaints

Complaints relating to odour are to be immediately investigated by the Site Manager. The nature and details of the complaint will be logged on the External Odour Complaints Form (Appendix A), along with the findings of the investigations and any action required.

The Site Manager is responsible for determining the appropriate action to be taken in accordance with section 5.3 and will communicate the nature of the actions to be taken and timescales with the Complainant.

5.3 Corrective Actions

In the event of a complaint being verified as resulting from the operation of the facility the Site Manager is responsible for identifying short-term mitigation measures to address the issue of off-site transport of odour.

Actions to be taken shall be consummate with the nature of the odour problem and will include:

- Immediate identification and rejection of odourous waste from site and further waste banned from the offending site;
- Immediate separation and transfer of odourous waste to sealed containers;
- Materials transferred to a suitably licensed facility for treatment or disposal within 48hrs of identification, or immediately if odour cannot be appropriately contained; and
- Cessation of operations giving rise to odour; and
- Cleansing of contaminated areas.

The efficacy of any mitigation measures will be confirmed through further monitoring at the receptor (subject to the Complainants agreement) or at the relevant position along the site boundary.

If appropriate Natural Resources Wales will be informed of the results of the investigations and of the actions that are to be taken in line with the requirements of our Environmental permit.

5.4 Action Levels

Figure 9 summarises the proposed odour management measures for the site and action levels

Monitoring Method	Monitoring Frequency	Action Level	Control Measure
Olfactory	Continuous & Daily Checks	Moderate Odour identified at site boundary.	Implement Internal Odour Investigation. Site Manager to undertake appropriate steps to stop odour issues escalating.
		Moderate Odour at site boundary sustained over 15 minutes	Establish wind direction and undertake an off-site assessment of odour at nearest human receptor. If greater than Faint odour at nearest human receptors - advise them to close windows and doors while the business addresses the source of the odour.
		Strong Odour at site boundary.	Establish wind direction and undertake an off-site assessment of odour at human receptors upwind of the odour. Contact neighbouring sensitive receptors (as identified in 2.2.4) and neighbours advise to close windows and doors while the business addresses the source of the odour. Cease operations until mitigation measures implemented and/or wind direction/speed reduces.
	Periodic	Repeated odour arising outside of site boundary	Identify and implement additional mitigation measures. Investigate wind conditions and use of odour suppression systems. Establish wind direction/ speed parameters to cease operations if mitigation measures cannot be made effective.
Complaint	On receipt	On receipt	Investigate wind conditions and use of odour suppression systems. Identify and implement additional mitigation measures if dust complaint verified.

Figure 9. Action levels for dust management

5.5 Review of Control Mechanisms

Complaints logs, in combination with meteorological data and site monitoring information will be used to assess any trends. These will be reported at monthly management meetings and appropriate corrective actions will be tabled.

Long-term mitigation measures to minimise the risk of future incidents will be addressed through the submission of a CAR form.

Where necessary this odour management plan will be reviewed for effectiveness and updated accordingly.

6 INCIDENTS AND EMERGENCIES

In accordance with the requirements of Environment Agency's Technical Guidance Note H4, types of failure or abnormal events considered to have the potential to result in an odour impact have been considered. These have been identified as abnormal meteorological conditions and failure of aspects of the site activities during any of the stages previously described. Failure and abnormal event scenarios with response requirements are summarised below.

6.1 Machinery Breakdown

Breakdown of equipment, which may result in a delay in processing the material received or processing of air. Magnitude of impacts will depend on the length of the breakdown, the type and volume of waste received and the prevailing meteorological conditions but could potentially result in elevated odour concentrations at receptor locations.

A- Machinery Breakdown	
Mitigation Measure	The potential failure would be minimised through routine maintenance of equipment, servicing in accordance with manufactures guidelines, provision of adequate spares, and a service level agreements to replace plant (or source hire plant) within 48 hours.

6.2 Staff Absence

Short-term staff shortages (such as a few days illness) will not affect the ability of the site to operate effectively as other staff members can be reassigned to critical operations. Magnitude of impacts will depend on the length of the absence, the number of staff absent at any one time, and the seniority of the staff member, but could potentially result in elevated odour concentrations at receptor locations should process controls not be managed effectively.

B - Staff Absence	
Mitigation Measure	In the event of prolonged absence of staff members, temporary staff will be recruited and appropriately trained to fulfil non-critical roles whilst other more experienced staff members are reassigned. If widespread illness occurs amongst staff members the delivery of waste to the site will be suspended until sufficient staff are present to operate the site. If prolonged, widespread absence occurs, the operators would contact alternative operators, such as other site operators for emergency assistance.

6.3 Flooding

If the site becomes flooded, this will inhibit effective control over deliveries, processing and storage of the waste materials.

C – Flooding	
Mitigation Measure	In a flooding situation no further waste would be brought to site. Priority would be given to ensuring the effective storage and processing of waste. The

	movement of waste to more elevated areas within the site would be undertaken in agreement with NRW.

6.4 Fire

Given the nature of the materials accepted by the site there is a measurable risk of Fire. As with all fires the immediate response would be the responsibility of the Fire Brigade and odour would not be the primary concern.

D – Fire	
Mitigation Measure	Depending on the severity of the fire, site critical equipment may have been damaged and no further reception or processing of waste would be undertaken until agreed with NRW. If equipment will be inoperable for extended periods of time, consideration will be given to the removal of material from site until repairs are effectuated.

6.5 Site at Full Capacity

There is the potential that should new contracts be won for processing wastes the site will be operating close to full capacity. This could lead to stretching of the sites resources during busy periods. The site could generate odours during this period if material is not processed within timescales identified within process controls.

E - Site at Full Capacity	
Mitigation Measure	The site will not accept more waste that it can process effectively at any one time and not above the permitted tonnage per annum. In the event that the site reaches its maximum capacity, the Site Manager will divert any further incoming waste from the sites to neighbouring licensed facilities until such a time as the site can resume operations within its normal operating capacity.

6.6 Odour Incident Management

Table 4 below summarises measures in place for the management of odour incidents and actions to be taken in order of priority by the site operatives and management.

Accident Type	Potential Occurrence	Consequences	Actions
Plant or Equipment failure	Seldom. Stringent preventative maintenance procedures in place to ensure all machinery remains functioning	If waste is not processed for a long period compaction reduces the available oxygen which could lead to odours (from anaerobic decomposition) that will be released	Inform management of equipment failure. Establish time frame for repairs to be undertaken. Maintain supply of spare parts. Hire or source an alternative piece of equipment. If no replacements are available divert waste to another site.

		once the machinery is repaired and processing re-starts.	If diversion is not available cease accepting waste. Inform NRW if necessary. Record and review the incident.
Fire / Flood - contaminated water and polluting smoke	Extremely rare.	Potentially polluting liquids flowing onto hardstanding and leachate collection area where they will have the potential to generate odours. Polluting smoke. Explosion of fuel containers. Wind dispersal of pollutants.	Raise alarm on-site. Ensure personnel evacuated and accounted for from danger area. Ensure all staff are alerted. Call fire service and other emergency services as required. Inform site management. Inform NRW. Post member of staff at entrance to site to direct emergency services. Liaise and follow instructions of emergency team making them aware of any hazards on-site. Consult site register for COSHH if appropriate. Prevent fire waters causing pollution on-site. Excess water should be removed from site to prevent odours. Record and review incident.

Table 4 Odour Incident Management Plan

6.7 Alternative Site

The company has agreements in place to divert waste to other licensed facilities in the event of any significant emergency.

DRAWINGS

Refer to EMS for current Site Drawings

Drawing **10915 – 000 - G** Receptor Plan

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LEGEND

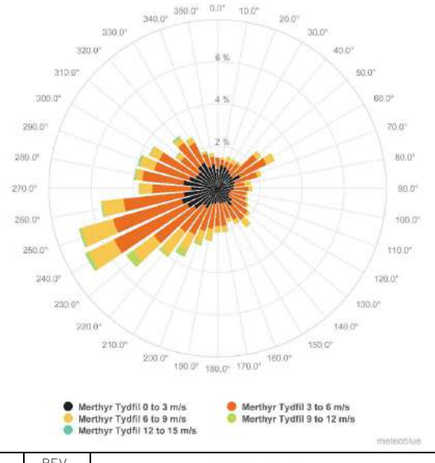
- SITE BOUNDARY
- 1000M/2000M SCREENING BOUNDARIES

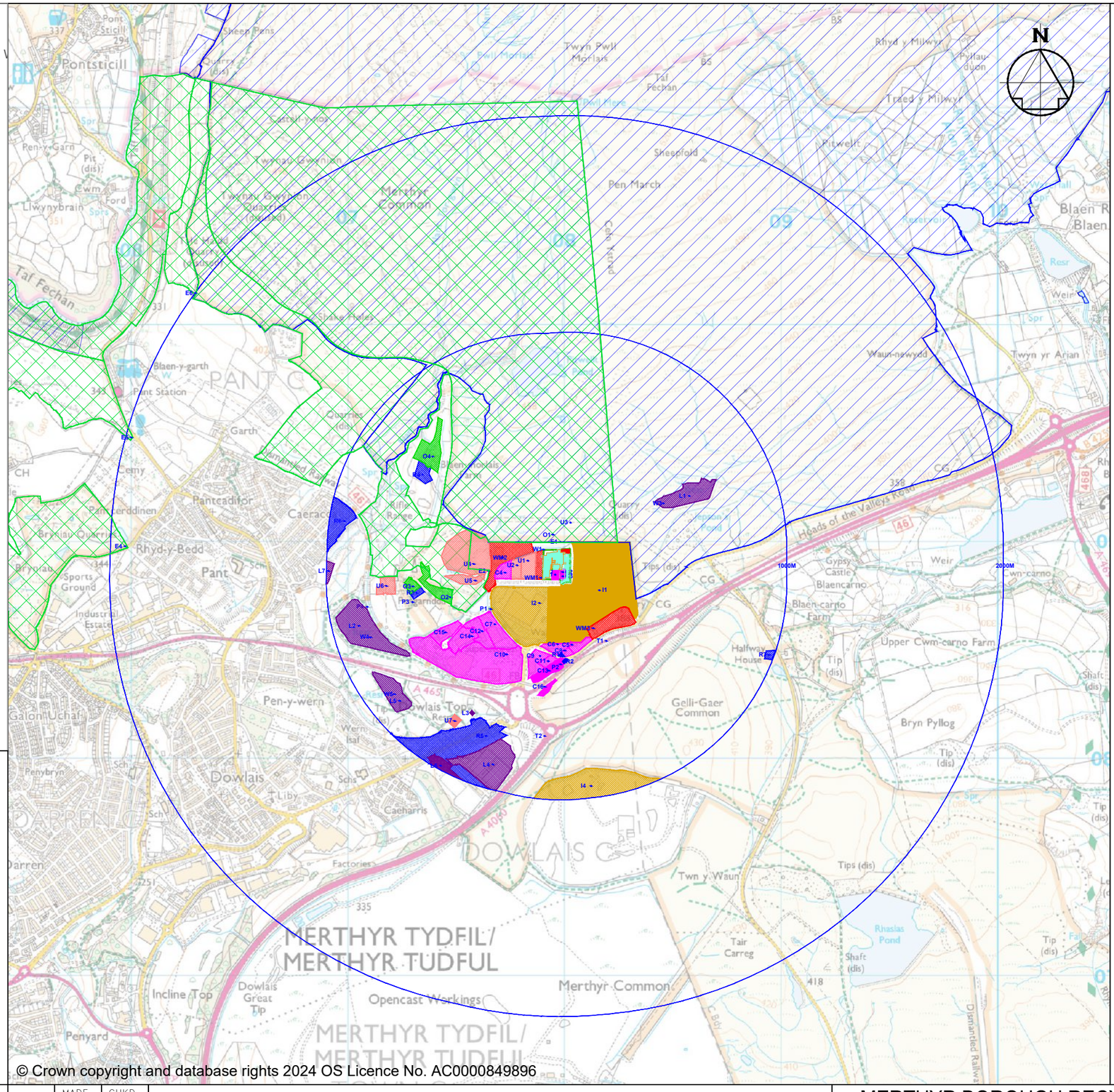
HUMAN RECEPTORS

- R3 RESIDENTIAL
- C3 COMMERCIAL
- I3 INDUSTRIAL
- O3 OTHER
- U3 UTILITY
- L3 LEISURE/RECREATION
- W3 WASTE MANAGEMENT
- T3 KEY TRANSPORT ROUTE
- P3 PUBLIC RIGHT OF WAY
- OPEN ACCESS LAND

ECOLOGICAL RECEPTORS

- E3 SSSI
- E3 SAC
- E3 RAMSAR
- E3 SPA
- E3 NNR
- E3 LNR
- E3 SINC
- W1





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RECEPTOR TYPE

G	0M	GROUNDWATER
C1	0M	STORAGE YARD
C2	0M	STORAGE YARD
C3	0M	SALVAGE YARD
WM1	0M	ELV ATF
W1	2M	WATERCOURSE
I1	8M	ABATTOIR
E1	29M	SSSI
E2	29M	SINC
O1	31M	OPEN ACCESS LAND
U1	34M	STOR ENERGY
I2	36M	AUTOMOTIVE PARTS MANUFACTURER
WM2	45M	WASTE TRANSFER STATION
U2	100M	STOR ENERGY
U3	121M	33KV OVERHEAD POWER LINES
C4	146M	SALVAGE YARD
WM3	221M	ELV ATF
U4	241M	RESERVOIR (UNDERGROUND)
E3	248M	SINC
U5	264M	RESERVOIR (ABOVE GROUND)
C5	264M	CARAVAN STORAGE
P1	276M	PUBLIC RIGHT OF WAY
C6	277M	FURNITURE RETAILER
C7	286M	FURNISHINGS RETAILER
C8	295M	MOT CENTRE
T1	309M	A465 HEADS OF THE VALLEYS ROAD
R1	320M	RESIDENTIAL PROPERTY
C9	326M	GROCERIES RETAILER
C10	326M	GROCERIES RETAILER/PETROL STATION
C11	334M	STORAGE YARD
C12	343M	CARPET RETAILER
C13	357M	OFFICE/STORAGE YARD
R2	348M	RESIDENTIAL PROPERTY
P2	374M	NATIONAL CYCLE ROUTE 46
C14	391M	HOMEWARES RETAILER
O2	416M	STABLES/STORAGE/ALLOTMENTS
C15	428M	FLOORING/FURNITURE RETAILERS
C16	442M	PETROL STATION
W3/L1	445M	POND
R3	549M	RESIDENTIAL PROPERTY
O3	565M	STABLES/STORAGE YARDS
O4	606M	FARM
R4	608M	RESIDENTIAL PROPERTIES
P3	609M	PUBLIC RIGHT OF WAY
U6	682M	ELECTRICITY SUBSTATION
L3	688M	PARK/RECREATION AREA
R5	700M	RESIDENTIAL PROPERTIES
W4/L2	705M	RESERVOIR (ANGLING)
U7	745M	RESERVOIR (UNDERGROUND)
L4	762M	PLAYING FIELDS
W5/L5	816M	RESERVOIR (ANGLING)
P4	820M	PUBLIC RIGHT OF WAY
I5	862M	LANDFILL
R6	878M	RESIDENTIAL PROPERTIES
L6	948M	PLAYING FIELDS
R7	958M	RESIDENTIAL PROPERTY
L7	964M	PLAYING FIELD
E4	1920M	SINC
E5	1967M	SINC
E6	1993M	SINC

AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	REPLACE PREVIOUS RECEPTOR PLAN (FPMP V5 REV 1 – 19/017D 001)	25/07/25	SCW	NB

TECHNIA ENVIRONMENT AND PLANNING LTD
UNIT 1 FOXES LANE, OAKDALE BUSINESS PARK
BLACKWOOD, NP12 4AB
TEL: 02921 900400
EMAIL: PLANNING@TEPL.EU

MERTHYR BOROUGH RECYCLING COMPANY LTD

RECEPTOR PLAN

Drawn	SCW	Scale	1:20,000
Ch'kd	NB		
Appr'd	NB		@A3
Date	25/07/25		

Job No. MBRC Drg No. 10915 - 000 - G

APPENDIX A - EXTERNAL ODOUR COMPLAINT INVESTIGATION RECORD

Time and date of complaint:	Name and address of complainant:
Telephone number of complainant:	

Date of odour:	
Time of odour:	
Location of odour, if not at above address:	
Weather conditions (i.e., dry, rain, fog, snow):	
Temperature (very warm, warm, mild, cold or degrees if known):	
Wind strength (none, light, steady, strong, gusting):	
Wind direction (e.g. from NE):	
Complainant's description of odour: o What does it smell like?	
o Intensity (see below):	
o Duration (time):	
o Constant or intermittent in this period:	
o Does the complainant have any other comments about the odour?	
Are there any other complaints relating to the installation, or to that location? (either previously or relating to the same exposure):	
Any other relevant information:	
Do you accept that odour likely to be from your activities?	
What was happening on site at the time the odour occurred?	
Operating conditions at time the odour occurred (e.g. flow rate, pressure at inlet and pressure at outlet):	
Actions taken:	

Form completed by:	Date	Signed

Intensity (Detectability)
1 No detectable odour
2 Faint odour (barely detectable, need to stand still and inhale facing into the wind)
3 Moderate odour (odour easily detected while walking & breathing normally)
4 Strong odour
5 Very strong odour (possibly causing nausea depending on the type of odour)

APPENDIX B - INTERNAL ODOUR INVESTIGATION RECORD

Test Undertaken by:			**Date:**		
Time of test					
Location of test e.g. street name etc.					
Weather conditions (dry, rain, fog, snow etc.):					
Temperature (very warm, warm, mild, cold, or degrees if known)					
Wind strength (none, light, steady, strong, gusting)					
Wind direction (e.g. from NE)					
Intensity (see below)					
Duration (of test)					
Constant or intermittent in this period					
What does it smell like?					
Location sensitivity (see below)					
Is the source evident?					
Any other comments or observations					

Sketch a plan of where the tests were taken, the potential source(s).



Intensity (Detectability)	**Location sensitivity where odour detected**
1 No detectable odour 2 Faint odour (barely detectable, need to stand still and inhale facing into the wind) 3 Moderate odour (odour easily detected while walking & breathing normally) 4 Strong odour 5 Very strong odour (possibly causing nausea depending on the type of odour	0 not detectable 1 Remote (no housing, commercial/industrial premises or public area within 500m) 2 Low sensitivity (no housing, etc. within 100m of area affected by odour) 3 Moderate sensitivity (housing, etc. within 100m of area affected by odour) 4 High sensitivity (housing, etc. within area affected by odour) 5 Extra sensitive (complaints likely from residents within area affected by odour)

MP4 Fire Prevention and Mitigation Plan

MP4 Fire Prevention and Mitigation Plan

Waste Transfer Station with Treatment

Bespoke Environmental Permit

PERMIT NUMBER EPR/ZP3899FX

Unit 5 Pengarnddu Industrial Estate

Dowlais, Merthyr Tydfil, CF48 2TA

Tel: 01685 370188

Email: mbrc@hotmail.com

Document Revision

Version	Date	Author	Checked / App'd	Revision
5 Rev 1	04/08/22	LR/KB/TW	NB	SUBMITTED VERSION FOR PERMIT VARIATION
6.0	25/07/25	SW	NB	EXTENSIVE CONTENT, FORMAT AND DRAWING UPDATES

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1 INTRODUCTION

1.1 Background

Merthyr Borough Recycling Centre Limited operates under a Tier 3 Bespoke Environmental Permit for a household, commercial and industrial waste transfer station with treatment & asbestos storage at their site located at Unit 5 Pengarnddu Industrial Estate, Dowlais, Merthyr Tydfil, CF48 2TA.

The site currently operates under a Tier 3 Bespoke Environmental Permit number EPR/ZP3899FX.

Activities regulated under the bespoke environmental permit are:

- Hazardous & non-hazardous household, commercial and industrial waste transfer station with treatment and asbestos storage;
- End-of-Life (ELV) storage, depollution & dismantling;
- Inert and excavation waste transfer station with treatment; and
- Dewatering of street sweepings/gully suckings.

The site has a maximum annual throughput of 252,000 tonnes per annum.

Currently, End-of-Life (ELV) storage, depollution & dismantling, and the Dewatering of street sweepings/gully suckings is not carried out on site. This Fire Prevention and Mitigation Plan and the accompanying EMS documents make limited reference to these activities where considered necessary. These documents should be reviewed and updated prior to the commencement of either of these activities.

1.2 Purpose of the FPMP

This Fire Prevention and Mitigation Plan aims to identify fire risks, reduce the risks of a fire occurring and in the unlikely event of a fire, to ensure that the fire is contained and will not spread to other parts of the site. This has been achieved through careful consideration of the storage and processing of waste on site, site infrastructure, staff emergency response.

This Fire Prevention and Mitigation Plan has been developed to reflect Fire Prevention and Mitigation Plan guidance issued by Natural Resources Wales[1] and Waste Industry Safety and Health (WISH) Forum[2]. Copies of the current guidance documents are included in the EMS (**OD2**, **OD3**).

This FPMP is a component of a suite of documents that form the company's Environmental Management System. It is considered a 'live' document and as such has been presented in a way which can be easily amended by adding to, or removing superseded information.

Each change to the plan shall be subject to Natural Resources Wales approval prior to insertion in the document.

1.3 Reference to EMS Documents

Within this Fire Prevention and Mitigation Plan, text highlighted in **Bold Blue** refers to documents that form part of the EMS.

[1] Guidance Note 16, Fire Prevention & Mitigation Plan Guidance – Waste Management v2.0, Natural Resources Wales, August 2017.
[2] Waste Industry Safety and Health Forum WASTE 28 Reducing fire risk at waste management sites, Issue 3–March 2020

1.4 Responsibility for Implementation of the FPMP

The Technically Competent Persons is Nicholas Brannan who holds a WAMITAB Level 4 qualification in accordance with permit requirements. Nicholas is responsible for the FPMP and ensuring it is effective at managing risks from fire.

1.5 Review

This plan shall be reviewed on an annual basis and as a result of any of the following:

- Experiencing a fire incident.
- Where waste streams other than those detailed in this plan are to be accepted on site.
- Where there is an increase in waste volumes accepted.
- Where storage durations are to be extended, or storage arrangements changed
- Where new site infrastructure e.g. buildings are to be constructed or installed.
- Where new equipment or plant is to be installed.

This Fire Prevention and Mitigation Plan shall be updated accordingly and any changes agreed with Natural Resources Wales and South Wales Fire and Rescue Service prior to any changes being implemented.

2 CAUSES OF FIRES, POTENTIAL IMPACTS AND FIRE PREVENTION

2.1 Causes of Fires

UK fire and rescue services attend around 300 significant fires in waste sites each year.

Historic data from one of the major waste management companies analysed its fire report data from a five year period, covering 120 plus sites and more than 300 reports of fires/smoulders[2]. This assessment identified that:

- 38% of fires were likely caused by hot or hazardous materials and items in wastes accepted at sites, such as hot ashes, lithium batteries, gas cylinders, flammable liquids, aerosols etc.;
- 25% of fires were likely caused by self-heating, both in waste reception and storage;
- 5% were likely caused by hot surfaces (direct heat);
- 8% were likely caused by electrical faults;
- 7% were likely caused by hot-works such as welding and grinding;
- 10% were likely caused by mechanical friction;
- 7% were caused a variety of other smaller likely causes

Discarded lithium batteries in particular have become a specific issue over the past few years, being responsible for around 48%[3] of waste fires in 2019-20.

2.2 Potential Impacts of Fire

2.2.1 Potential Impacts of Fire Incidents on Receptors

The impact of a fire may be both immediate and long lasting.

Fires on waste sites are often difficult to extinguish, needing a lot of resources for long periods, and can have serious effects on public health, the environment, safety to firefighters and local communities as a result of:

- **Combustion products:** even those from non-toxic materials release airborne pollutants which can cause both short and long term effects on human health and the environment;
- **Firewater run-off:** this can transport pollutants into drainage systems, rivers and lakes, groundwater and soil, threatening water supplies, public health, wildlife and recreational use;
- **Thermal radiation:** which harms people and the environment and can lead to fire spread;
- **Hazardous waste:** which can be created by the fire and has important ramifications for firefighting;
- **Explosions and projectiles:** which can harm people and spread the fire to unaffected areas; and
- **Harm to people and property:** fire can threaten life and cause property damage.

[3] Cutting Lithium-ion Battery Fires in the Waste Industry, Environmental Services Association, January 2021

3 SITE LOCATION AND OPERATIONS

3.1 Site Location

The Site is located at Unit 5 Pengarnddu Industrial Estate, Dowlais, Merthyr Tydfil, CF48 2TA, approximately 4km northeast of Merthyr Tydfil town centre (drawing **10915- 000- A**). The approximate centre of the site is located at grid reference SO 07961 08897.

The site occupies an area of ~1.6 hectares (~3.96 acres). It is roughly shaped as an inverted "U", and slopes gently downwards from north to south west from 409m AOD to 400m AOD.

The facility is located in an area of historic industrial and minerals use, that has subsequently been redeveloped for commercial and industrial use. The surrounding area is occupied by a mix of commercial and industrial, and agricultural land. Isolated residential properties are located some distance to the south and east of the site.

The facility's immediate neighbours are an End-of-Life Vehicle recycling facility, storage units for construction materials, including a re-use facility, and an abattoir and meat processing facility. There is potential for impact from fires at adjacent sites and these impacts are reviewed in more detail in this plan.

3.2 Site Access

The site is easily accessed from the A465 Heads of the Valleys Road via an unnamed access road to the Pengarnddu Industrial Estate.

The grid reference of the site entrance is SO 07902 08829 and exit SO 07983 08813.

3.3 Site Ownership

The site is owned by Merthyr Borough Recycling Centre Limited.

3.4 Site Layout

The permitted area is shown in drawing **10915 – 000 - B**.

A block plan for the site is shown in drawing **10915 - 000 - C**. The entrance to the site is located in the south western corner of the site. Access to the site is via a pair of 2.0 m high steel palisade fence type gates. A weighbridge and disused containerised office units are located immediately to the north of the site entrance, and to the east an L-shaped portal frame building housing the weighbridge and administrative offices, staff welfare facilities, a large workshop and at its northern extent, a small biomass boiler. To the immediate north of the L-shaped building is a waste processing line comprising screens, a trommel and picking line which is elevated above a series of storage bays. To the immediate west and north of the waste processing line is a storage area for mixed and segregated wastes, to the north east of which is a rectangular portal frame building housing a biomass boiler and drying floor ("Biomass Building 2"). In the centre of the site, immediately to the south of Biomass Building 2, is additional storage. The whole site to the south and west of Biomass Building 2 in impermeably surfaced with a sealed drainage system and is suitable for the storage of non-hazardous and hazardous wastes. To the east of Biomass Building 2 is an area used for the storage of empty skips and a wind turbine. To the south east of the wind turbine, and running parallel with the eastern site boundary, is an area used to store skips containing sorted wastes. To the west of this storage area is a third portal frame building used for vehicle storage, a small containerised biomass plant, and a small concrete manufacturing area containing a cement silo and mixer.

A large bund, approximately 5m high extends along the southern boundary of the site, another bund, approximately 3m high, along the eastern boundary of the site. The site fenced on all sides using a combination of palisade and wire mesh fences 2.0m high.

3.5 Waste Management Operations

Operations taking place at the facility considered by this plan include:

- Delivery of waste in HGVs (chain lift, hook lift, drop-side and articulated vehicles) or PLG vehicles;
- Tipping and inspection of wastes;
- Storage of hazardous and non-hazardous wastes within buildings, covered storage bays or containers, and non-hazardous wastes outside in stockpiles or containers;
- Bulking of hazardous and non-hazardous wastes;
- Repackaging of non-hazardous wastes;
- Manual and automated sorting of non-hazardous mixed wastes to remove recyclable materials;
- Baling of non-hazardous waste;
- Compaction of non-hazardous waste;
- Shredding, baling and wrapping of non-hazardous residual waste to produce Refuse Derived Fuel (RDF);
- Shredding and screening of non-hazardous wood to produce woodchip for panelboard manufacture, animal bedding, mulches and biofuel;
- Crushing and screening of sorted construction, demolition and excavation waste to produce aggregates in accordance with the Aggregates Quality Protocol;
- The use of waste handling equipment to move waste between treatment processes and to/from storage areas within the site; and
- The dispatch of waste and aggregate products in HGVs (hook lift, drop-side and articulated vehicles).

3.6 Site Security

3.6.1 Boundary Security

The whole permitted site is within an enclosed site occupied solely by Merthyr Borough Recycling Limited.

Access to the site is via a pair of 2.0 m high steel palisade fence type gates with a 2.0m security fence enclosing the site boundary on four sides.

The security gates and site boundary are inspected daily as part of the site inspection schedule. The gates are locked at all times when the site is unattended.

In the event of unauthorised intrusion, the circumstances and any subsequent action taken will be entered in the Site Diary.

3.6.2 Equipment Storage

With the exception of large recycling plant and vehicles, all site equipment and machinery shall be securely stored within locked buildings or containers.

3.6.3 CCTV and Lighting

CCTV operates across the site both internally and externally and can be accessed remotely. Video is constantly displayed and monitored by Weighbridge staff and is recorded for a period of at least 7 days.

PIR activated floodlights cover areas of the yard and buildings.

3.6.4 Out of Hours Security

The Site Manager/Owner remotely monitors the site's CCTV and receives alerts via mobile phone. Identified members of staff monitor the site when the Site Manager/Owner is unavailable due to sickness, annual leave or other commitments.

3.7 Hours of Operation

There are no restrictions on the site's planning consent regarding hours of operation.

Normal opening hours are:

Monday – Friday	Saturday	Sunday	Bank/Public Holidays
07:00hrs – 18:00hrs	07:00hrs – 12:00hrs	Closed	Closed

Table 1. Normal opening hours

3.8 Insurance

The company self-insures.

4 TYPES OF WASTE AND STORAGE ARRANGEMENTS

4.1 Waste Inventory

In order to understand the fire risk of the different waste streams that enter these processes, a feedstock inventory has been provided for the various waste types. Table 2 below provides an assessment of each waste type by source of material, identifying the typical and abnormal compositions of those waste types and providing an overall combustion potential of that feedstock taking into account the nature of the waste itself and the likelihood of abnormal compositions being encountered at site. Although some subjective assessment has been required to achieve this, the table has been ordered from top to bottom based on the risk of combustion. Quantities of waste held on-site have not been considered at this stage in the assessment.

4.2 Amount and Type of Waste Received Daily and How it is Managed

The site has a maximum annual throughput of 252,000 tonnes per annum. Based on the OPRA profile submitted with the permit application, this consists of 167,500 tonnes of non-hazardous waste, 10,000 tonnes per annum of hazardous waste and 75,000 tonnes of inert waste.

Currently, End-of-Life (ELV) storage, depollution & dismantling, and the Dewatering of street sweepings/gully suckings is not carried out on site. Considering this effective operational reduction in waste inputs, the maximum amount of waste received each day is:

- non-hazardous waste – 500 tonnes
- hazardous waste – 10 tonnes
- inert waste – 262 tonnes

Table 3 and Table 4 provide details of the types of combustible waste received daily and how they are managed.

All waste arriving at the site is inspected in accordance with the Waste Acceptance Procedure (**Procedure PR9**). Checks are carried out for compliance with waste acceptance criteria and for the presence of heating within combustible loads and contrary materials.

Once accepted, the waste is transferred to internal or external storage. During storage it is monitored in accordance with the requirements of this FPMP. Waste is processed on a first in, first out principle.

4.3 Other Materials

Natural Resources Wales' Fire Prevention and Mitigation Plan Guidance – Waste Management does not apply to the following materials or wastes:

- Flammable (flashpoint of 60ºc or lower)
- Combustible liquids or gases
- Certain hazardous wastes
- Dangerous Substances stored under the Control of Major Accident Hazards Regulations

This FPMP has however considered the presence of these materials and wastes on-site due to their potential to cause or accelerate the spread of fire, or increase the risk of harm to people, property or the environment. Relevant factors considered include:

- Storage of small quantities of flammable liquids, combustible liquids or gases and/or dangerous substances;

- Plant and vehicles on-site hold small quantities of fuel in tanks; and
- There may be small quantities of these materials within waste as contrary materials, but at concentrations that are unlikely to cause significant harm. Routine sampling for the presence of these materials is not carried out.

The presence of these materials is indicated on the site emergency plan (drawing **10915 – 000 - J**).

Waste Type	Waste Source	Typical Composition	Abnormal Composition	Likelihood	Combustion Risk
Batteries 20 01 34 16 06 04 16 06 05	Source segregated and sorted wastes from Domestic, C&I and C&D.	Non-hazardous alkaline, lithium or lithium-ion batteries.	Loads may contain contrary materials, notably hazardous Ni-Cd batteries	High	High. Medium. Li and Li-ion batteries (and WEEE containing these batteries) can catch fire violently when damaged during handling or processing. Batteries could ignite other combustible waste as a result of short-circuiting during handling or processing. Batteries (and WEEE containing Li/Li-ion batteries) to be stored in lockable metal containers away from the building and combustible wastes. Properly stored wastes are unlikely to be at risk of self-ignition. For wastes of normal composition, stored for appropriate durations, risks are largely limited to external ignition.
Mixed Municipal 20 03 01	Domestic/ domestic-type mixed residual "black bag" waste from residential or C&I sources	Predominantly mixed paper, cardboard, plastics, glass, metals.	Loads may contain contrary materials, typically food wastes.	High	Medium. Properly stored wastes are unlikely to be at risk of self-ignition. Wastes such as Li-Ion batteries that can catch fire when damaged may be present. For wastes of normal composition, stored for appropriate durations, risks are largely limited to external ignition.
Mixed C&D 17 09 04	Domestic (DIY) and C&D "skip" waste	Predominantly inert fractions mixed with wood, plastic, glass, green and metal.	Loads may contain contrary materials, typically green or food wastes.	High	Medium. Properly stored wastes are unlikely to be at risk of self-ignition. Wastes such as Li-Ion batteries that can catch fire when damaged may be present. For wastes of normal composition, stored for appropriate durations, risks are largely limited to external ignition.
Green 20 02 01 02 01 03 02 01 07	Source segregated and sorted wastes from Domestic, C&I and C&D	Uncontaminated green waste (woody and green vegetation from forestry, landscaping, site clearance, gardens and parks)	Loads may contain contrary materials.	High	Medium. Properly stored wastes are unlikely to be at risk of self-ignition. Chipping or high moisture content green waste (grass/leaves) increases self-ignition risk. Avoid waste being stored for extensive periods. For wastes of normal composition, stored

					for appropriate durations, risks are largely limited to external ignition.
Kitchen and Canteen (Food) 20 01 08	Source segregated and sorted wastes from Domestic and C&I	Uncontaminated food from kitchens and canteens	Loads may contain contrary materials, typically plastics, cardboard and paper packaging.	High	Medium to Low. Properly stored wastes are unlikely to be at risk of self-ignition. For wastes of normal composition, stored for appropriate durations, risks are largely limited to external ignition.
Food processing waste 02 02 03	Source segregated wastes from C&I	Uncontaminated food processing waste from animal, fruit, vegetable, sugar, beverage and diary processing	Loads may contain contrary materials.	Low	Low. Properly stored wastes are unlikely to be at risk of self-ignition. High moisture content food processing may be at increased risk self-ignition risk. Avoid waste being stored for extensive periods (odour would also be an issue). For wastes of normal composition, stored for appropriate durations, risks are largely limited to external ignition and then, predominantly when dry.
WEEE (Non-Hazardous) 20 01 36 16 02 14	Source segregated and sorted wastes from Domestic, C&I and C&D	Small WEEE: Toys, Microwaves, Radios Large domestic appliances (LDA): white goods (washing machines, Vented and condenser tumble dryers, dishwashers and cookers), LED and incandescent lighting	Loads may contain contrary materials. Loads likely to contain batteries.	High	Medium. Waste containing batteries or charged capacitors could catch fire as a result of mechanical damage and/or ignite other wastes due to short-circuiting during handling or processing. Other wastes do not pose a general risk of self-ignition and risks are limited to external ignition.
WEEE (Hazardous or POPs) 20-01-35* 16 02 11*	Source segregated and sorted wastes from Domestic, C&I and C&D.	Screens, circuit boards, batteries, cables or any plastic parts containing hazardous chemicals or POPs. Cathode ray tube (CRT),	Loads may contain contrary materials. Loads likely to contain batteries.	High	Medium. Waste containing batteries or charged capacitors could catch fire as a result of mechanical damage and/or ignite other wastes due to short-circuiting during handling or processing.

21 01 23* 20 01 35* 16 02 13*		flatscreen (plasma or LCD), fridges, freezers, chillers, air-conditioning units, heat pump tumble dryers, linear fluorescent tubes, compact fluorescent lamps			Other wastes do not pose a general risk of self-ignition and risks are limited to external ignition.
Post-Sorting Residues/ Residual Waste 19 12 12	Commercial and Industrial, Construction and Demolition	Residual waste materials that have resulted from the mechanical treatment of waste.	Loads may contain significant organic fractions.	Medium to High	Medium to Low – properly processed, handled and stored wastes are unlikely to be at risk of self-ignition. For wastes of normal composition, stored for appropriate durations, risks are largely limited to external ignition.
Batteries 16 06 01* 20 01 33*	Source segregated and sorted wastes from Domestic, C&I and C&D.	Lead acid vehicle and domestic batteries, nickel-cadmium batteries, mercury containing batteries	Loads may contain contrary materials, notably lithium/lithium-ion and/or non-hazardous batteries	Medium	Batteries could ignite other combustible waste as a result of short-circuiting during handling or processing. Properly stored wastes are unlikely to be at risk of self-ignition. For wastes of normal composition, stored for appropriate durations, risks are largely limited to external ignition.
Mixed Packaging 15 01 06	Packaging waste from Domestic and C&I sources	Mixtures of paper, cardboard, plastic, wood, metal and glass packaging.	Loads may contain contrary materials.	Medium	Low. Properly stored wastes are unlikely to be at risk of self-ignition. For wastes of normal composition, stored for appropriate durations, risks are largely limited to external ignition.
Wood 15 01 03 17 02 01 19 12 07 20 01 38	Source segregated and sorted wastes from Domestic, C&I and C&D	Untreated and treated wood, wooden packaging, wood offcuts.	Loads may contain sawdust and contrary materials, typically plastic and metal fixings and packaging materials..	Low	Low. Properly stored wastes are unlikely to be at risk of self-ignition. Wood will not be stored in chipped format (which would increase self-ignition risks). For wastes of normal composition, stored for appropriate durations, risks are largely limited to external ignition.

Wood 17 02 04* 19 12 06* 20 01 37*	Source segregated and sorted wastes from Domestic, C&I and C&D	Wood treated with chromated copper arsenate (CCA) or other hazardous compounds. Includes railway sleepers, telegraph poles and creosote treated wood. Demolition wood from pre-2007 buildings including barge boards, external fascia, soffit boards, external joinery, external doors, roof timber, tiling cladding, tiling battens, timber frames and timber joists if tested and shown to be hazardous.	Loads may contain contrary materials.	Low	Low. Properly stored wastes are unlikely to be at risk of self-ignition. Wood will not be stored in chipped format (which would increase self-ignition risks). For wastes of normal composition, stored for appropriate durations, risks are largely limited to external ignition.
Textiles 19 12 08 20 01 10 20 01 11	Source segregated and sorted wastes from Domestic, and C&D	Carpets, occasional clothing	Loads may contain contrary materials.	Low	Low. Properly stored wastes are unlikely to be at risk of self-ignition. For wastes of normal composition, stored for appropriate durations, risks are largely limited to external ignition.
Paper/Card 15 01 01 19 12 01 20 01 01	Source segregated and sorted wastes from Domestic, C&I and C&D	Uncontaminated paper and/or cardboard waste stockpiled or baled.	Loads may contain contrary materials, typically plastic, glass and metal.	Low	Low. Properly stored wastes are unlikely to be at risk of self-ignition. Avoid waste becoming wet and being stored for extensive periods. For wastes of normal composition, stored for appropriate durations, risks are largely limited to external ignition.
Plastic Film 15 01 02 17 02 03 19 12 04 20 01 39	Source segregated and sorted wastes from Domestic, C&I and C&D	Uncontaminated plastic waste stockpiled or baled by type (LDPE film, PP Film, etc.).	Loads may contain contrary materials, typically paper or cardboard.	Low	Low. Properly stored wastes are unlikely to be at risk of self-ignition. For wastes of normal composition, stored for appropriate durations, risks are largely limited to external ignition.

Rigid Plastics 15 01 02 17 02 03 19 12 04 20 01 39	Source segregated and sorted wastes from Domestic, C&I and C&D	Uncontaminated plastic waste stockpiled or baled by type (uPVC (windows/doors), HDPE utility pipe, mixed hard plastic).	Loads may contain contrary materials, typically glass and metal.	Low	Low. Properly stored wastes are unlikely to be at risk of self-ignition. For wastes of normal composition, stored for appropriate durations, risks are largely limited to external ignition.
Domestic Seating 20 03 07	Source segregated and sorted wastes from Domestic and C&I	Sofas, sofa beds, armchairs, kitchen and dining room chairs, stools and foot stools, home office chairs, futons, bean bags, floor, and sofa cushions.	Upholstered and soft furnishings may contain POPs. Loads unlikely to contain contrary materials.	Low	Low. Properly stored wastes are unlikely to be at risk of self-ignition. For wastes of normal composition, stored for appropriate durations, risks are largely limited to external ignition.
Bulky Waste 20 03 07	Source segregated and sorted wastes from Domestic and C&I	Bulky household waste including mattresses, gas fuelled domestic appliance, non-upholstered furniture e.g. bed frames, etc,	Loads unlikely to contain contrary materials.	Low	Low. Properly stored wastes are unlikely to be at risk of self-ignition. For wastes of normal composition, stored for appropriate durations, risks are largely limited to external ignition.
Metals 15 01 04 17 04 07 19 12 02 19 12 03 20 01 40	Source segregated and sorted wastes from Domestic, C&I and C&D	Fe and non-Fe scrap, plumbing pipe and fittings, decorative trim, furniture,	Loads may contain contrary materials, typically plastics.	Low	Low. Wastes of normal composition would not pose a fire risk. Oxidising metal powder (that can generate significant heat and could ignite combustible materials if in contact) is unlikely to be present within loads. Appropriate storage should be used depending on the metals.
Tyres 16 01 03	Sorted from Domestic, C&I and C&D	Car/Truck Tyres	Waste removed from incoming loads is generally free of contamination.	Low	Low. Wastes stored as whole tyres (not chipped that would increase self-ignition risk). Whole tyres do not pose a risk of self-ignition. Risks are limited to external ignition.

Process (Trommel) Fines 19 12 12	Small waste particles screened from mixed waste	Aggregates, food, wood, gypsum, etc.	N/A.	Low	Low. Largely composed of non-combustible waste (LoI <10%). Negligible risk of self-ignition.
Oil Filters 16 01 07*	Sorted from Domestic and C&I	Vehicle and plant oil filters	Waste may contain oil residues.	Low	Low. Properly stored wastes are unlikely to be at risk of self-ignition. For wastes of normal composition, risks are largely limited to external ignition.
Brake pads 16 01 11*	Sorted from Domestic and C&I	Vehicle brake pads containing asbestos	Waste removed from incoming loads is generally free of contamination.	Low	Low. For wastes of normal composition, risks are largely limited to external ignition.
Quarantine Various	Non-conforming wastes	Various incidental hazardous wastes picked from mixed loads following acceptance	N/A	Low	Low. May contain flammable or reactive compounds. May contain hazardous wastes. Items stored in suitable containers and ventilated as required.

Table 2. Assessment of combustion potential from waste inventory..

Waste	EWC Code	Description	Management	Tonnes per Day
Wood Waste	17 02 04*	glass, plastic and wood containing or contaminated with hazardous substances (wood only)	Stored and sent off-site for disposal (incineration)	8.25
	19 12 06*	wood containing hazardous substances		
	20 01 37*	wood containing hazardous substances		
Lead Batteries	16 06 01*	lead batteries	Stored and sent off-site for recovery (reprocessing)	0.2
TVs and monitors	20 01 35*	discarded electrical and electronic equipment other than those mentioned in 20 01 21 and 20 01 23 containing hazardous components	Stored and sent off-site for recovery (reprocessing)	0.3
Fridges/freezers	16 02 11*	discarded equipment containing chlorofluorocarbons, HCFC, HFC	Stored and sent off-site for recovery (reprocessing)	1
	20 01 23*	discarded equipment containing chlorofluorocarbons		
Other WEEE	16 02 13*	discarded equipment containing hazardous components other than those mentioned in 16 02 09 to 16 02 12	Stored and sent off-site for recovery (reprocessing)	0.2
	20 01 35*	discarded electrical and electronic equipment other than those mentioned in 20 01 21 and 20 01 23 containing hazardous components (6)		
Oil filters	16 01 07*	oil filters	Stored and sent off-site for recovery (reprocessing)	0.025
Brake pads	16 01 11*	brake pads containing asbestos	Stored and sent off-site for recovery (reprocessing)	0.025

Table 3. Amount and type of hazardous combustible waste received daily and how it is managed.

Waste	EWC Code	Description	Management	Tonnes per Day
Mixed Waste	15 01 06	mixed packaging	Stored, sorted manually or using automated equipment into separate fractions. Separate fractions sent off-site for recovery. Residual combustible fraction shredded and baled as RDF and sent off-site for energy recovery. Non-recoverable fraction sent for disposal (landfill).	275
	17 09 04	mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03		
	20 03 01	mixed municipal waste		
Cardboard/Paper Waste	15 01 01	paper and cardboard packaging	Stored, baled and sent off-site for recovery (paper reprocessing)	40
	19 12 01	paper and cardboard		
	20 01 01	paper and cardboard		
Plastic Waste	12 01 05	plastics shavings and turnings	Stored, baled and sent off-site for recovery (further sorting (where required) and compounding into pellet)	50
	15 01 02	plastic packaging		
	17 02 03	plastic		
	19 12 04	plastic and rubber		
	20 01 39	plastics		
	02 01 04	waste plastics (except packaging)		
Metallic Waste	15 01 04	metallic packaging	Stored, may be baled, and sent off-site for recovery (metal reprocessing)	80
	17 04 07	mixed metals		
	19 12 02	ferrous metal		
	19 12 03	non-ferrous metal		
	20 01 40	metals		
	02 01 10	waste metal		
	12 01 01	ferrous metal filings and turnings		
	12 01 03	non-ferrous metal filings and turnings		
	12 01 13	welding wastes		
	17 04 01	copper, bronze, brass		

	17 04 02	aluminium		
	17 04 03	lead		
	17 04 04	zinc		
	17 04 05	iron and steel		
	17 04 06	tin		
	17 04 11	cables other than those mentioned in 17 04 10		
Green Waste	20 02 01	biodegradable waste	Stored and sent off-site for recovery (composting)	12
	02 01 03	plant-tissue waste		
	02 01 07	wastes from forestry		
	20 03 02	waste from markets		
Wood Waste	03 01 01	waste bark and cork	Stored, shredded to produce chip for and sent off-site for recovery (panelboard manufacture, animal bedding, mulches) or disposal (biofuel).	25
	03 01 05	sawdust, shavings, cuttings, wood, particle board and veneer other than those mentioned in 03 01 04		
	03 03 01	waste bark and wood		
	15 01 03	wooden packaging		
	17 02 01	wood		
	19 12 07	wood other than that mentioned in 19 12 06		
	20 01 38	wood other than that mentioned in 20 01 37		
Kitchen and canteen (food) waste	20 01 08	biodegradable kitchen and canteen waste	Stored/bulked and sent off-site for recovery (anaerobic digestion)	0.5
Unsold Small Domestic	20 01 36	discarded electrical and electronic equipment other than those mentioned in 20 01 21, 20 01 23 and 20 01 35	Stored and sent off-site for reuse or recovery (reprocessing)	0.2

Appliances (sWEEE)				
Cartons	15 01 05	composite packaging	Stored and sent off-site for recovery (reprocessing)	0.2
Unsold clothes and textiles	20 01 10	clothes	Stored and sent off-site for reuse or recovery (reprocessing)	0.2
Carpets	04 02 21	wastes from unprocessed textile fibres	Stored and sent off-site for recovery (reprocessing) or disposal (incineration)	3.5
	04 02 22	wastes from processed textile fibres		
	19 12 08	textiles		
Tyres	16 01 03	end-of-life tyres	Stored, may be baled, and sent off-site for recovery (retreading/ use in construction)	1
Bulky Waste	20 03 07	bulky waste	Stored and sent off-site for disposal (incineration)	2.0
Used clothes and textiles	19 12 08	textiles	Stored and sent off-site for recovery (reprocessing)	0.2
	20 01 11	textiles		
	15 01 09	textile packaging		
Refuse Derived Fuel	19 12 10	combustible waste (refuse derived fuel)	Received baled or loose (shredded) from other waste management facilities, stored, baled/re-baled (if required), wrapped and sent off-site for energy recovery.	2.5
Residual Waste	19 12 12	other waste (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 19 12 11	Received loose from other waste management facilities. Stored, baled, wrapped as RDF and sent off-site for energy recovery.	5.0
WEEE	16 02 14	discarded equipment other than those mentioned in 16 02 09 to 16 02 13	Stored and sent off-site for recovery (reprocessing)	1.5
	16 02 16	components removed from discarded equipment other than those mentioned in 16 02 15		

Li-ion batteries	20 01 34	batteries and accumulators other than those mentioned in 20 01 33	Stored and sent off-site for recovery (reprocessing)	0.05
Other batteries	16 06 04	alkaline batteries (except 16 06 03)	Stored and sent off-site for recovery (reprocessing)	0.15
Other Combustible Wastes	02 06 02 03 03 07 03 03 08 03 03 10 04 01 08 04 01 09 09 01 07 09 01 08 09 01 10 09 01 12 10 03 02 10 03 18 10 03 24 10 03 26 10 03 28 10 03 30 10 04 10 16 03 06 18 01 04	Other combustible waste (received infrequently in small volumes)	Stored/bulked and sent off-site for recovery. Non-recoverable fraction sent for disposal (incineration or landfill).	1

Table 4 Amount and type of non-hazardous combustible waste received daily and how it is managed.

4.4 Waste Storage

Waste shall be stored in designated areas of the facility. Areas used for waste storage are shown on the Storage Plan (drawing **10915 – 000 - E**).

Storage and treatment locations, surfacing and drainage for waste is summarised in Table 5.

Waste	Surfacing and Drainage
Activities Currently Carried Out On Site	
Hazardous Waste	All hazardous waste (exc. asbestos) shall be stored in designated areas: • In enclosed, leak and weather proof storage containers in a building on impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer; or • In enclosed, leak and weather proof storage containers in a covered storage bay on impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. Asbestos and asbestos containing waste shall be stored: • Double-bagged in enclosed, leak and weather proof lockable storage containers on impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. There shall be no treatment of hazardous waste except for: • Bulking up and shredding of hazardous waste wood – on impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. • Bulking up for onward transfer only of waste electronic and electrical equipment, waste batteries and/or accumulators and asbestos waste – on impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. In addition: • Lead acid batteries shall be stored in secure containers that are leak-proof with an impermeable, acid resistant base, and in closed containers or under cover to prevent the accumulation of rainwater. • Liquids shall be stored in/on secondary containment bunds.
Non-hazardous Waste	All non-hazardous waste shall be stored in designated areas, either in stockpiles or in skips/containers: • In a building on impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt

	trap and class 1 full-retention interceptor before discharging to foul sewer; or • On impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. Non-hazardous waste shall be treated in designated areas, either in stockpiles or in skips/containers: • In a building on impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer; or • On impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. Following treatment, non-hazardous wood (treated and untreated) and hard plastics may be stored on hardstanding with surface run-off discharging to ground via infiltration. In addition: • Lithium Ion batteries (and WEEE containing lithium or Lithium Ion batteries) shall be stored in 60 litre UN 3480/UN 3090 approved safety barrels with pressure relief valve, and filled with impact absorbing buffer/filler material (vermiculite or custom filler). • Liquids shall be stored in/on secondary containment bunds.
Aggregates and Soils	Aggregates and Soils shall be stored in designated areas in stockpiles: • On impermeable surface with surface run-off passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer; or • On handstand with surface run-off discharging to ground via infiltration.
Quarantine/Non-Conforming Waste Storage	Quarantine/Non-Conforming Waste shall be stored in dedicated waste quarantine areas for temporary storage prior to rejection, or whilst it is being assessed: • Where there is a risk of contaminated runoff from the quarantined waste, on impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump; or • Where there is no risk of contaminated runoff from the quarantined waste, on impermeable surface with surface run-off passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer; and in addition • Where there is a risk of fugitive emissions, in a building or in closed or covered containers.

Activities Not Currently Carried Out On Site	
End-of-Life (ELV) storage, depollution & dismantling	All hazardous and non-hazardous waste shall be stored in designated areas: • On impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. Depollution shall take place in a designated area: • On impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. Depolluted vehicles may be stored in a designated area: • On impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer; or • On handstand with surface run-off discharging to ground via infiltration. All hazardous and non-hazardous waste[4] shall be treated in designated areas: • On impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer. In addition: • Lead acid batteries shall be stored in secure containers that are leak-proof with an impermeable, acid resistant base, and in closed containers or under cover to prevent the accumulation of rainwater. • Liquids shall be stored in/on secondary containment bunds.
Dewatering of street sweepings/gully suckings	Street sweepings/gully suckings shall be stored and treated in designated areas in stockpiles: • On impermeable surface with sealed drainage system with surface run-off discharging to a sealed sump or passing through a silt trap and class 1 full-retention interceptor before discharging to foul sewer.

Table 5 Site surfacing and drainage.

Wastes deemed to be products following processing in line with approved protocols will be separated and labelled as such and their location shown upon the site plan as appropriate.

4.5 Site Design, Surfacing and Drainage

Site surfacing and drainage details are shown in drawing **10915 – 000 – D**.

[4] Treatment of hazardous waste is limited to bulking up for onward transfer only of waste batteries and/or accumulators, brake pads containing asbestos and hazardous waste.

4.5.1 WTS Buildings

The Waste Transfer Station Buildings to the north of the site comprise a number of steel portal frame structures covered in trapezoidal formed steel cladding.

The floors comprises an impermeable reinforced concrete surface 200mm thick on sub-base laid to a minimum depth of 200 mm.

The building floors are graded to channel surface run-off to a central location within the building from where spill kits can be used to remove any liquids.

Roof water from the Waste Transfer Station Buildings is directed through gutters, downpipes onto the surrounding concrete surface from where it flows across the site and discharges to the foul sewer in the highway to the south of the site.

4.5.2 Depollution/Workshop Building

The existing Depollution/Workshop building comprises a steel portal frame construction covered in trapezoidal formed steel cladding.

The existing floor comprises an impermeable reinforced concrete surface >150mm thick.

A fall towards the centre of the slab ensures the containment of any liquid on the impermeable floor.

Roof water from the Depollution/Workshop building is directed via the surface drainage system to surface water sewer.

4.5.3 Yard Areas

The majority of the site comprises a large open yard nominally divided into three areas for the different waste activities.

The yard areas are surfaces in fibre reinforced concrete 200mm – 300m thick or hard standing constructed from clean hardcore or crushed stone laid to a minimum depth of 200mm. The hardstand area will ultimately be replaced by concrete surfacing.

In general the three connected yard areas are graded to channel surface run-off towards the centre of each area and then to fall by gravity towards cut-off drains located at the southern edge of each area. From here it flows into silt settlement and storage tanks, then through a Class I full retention interceptor before being discharged to sewer. In places the concrete slabs are kerbed to ensure containment of surface run-off.

The western, central and north eastern areas of the site (used for the storage of waste) discharge to foul sewer. The central and north eastern areas achieve this using a pump that transfers water from the central interceptor outlet chamber to a foul sewer connection in the south west of the site and is capable of delivering a flow rate of >2,605 l/s (the peak flow during a 1 in 100yr plus 40% Climate Change rainfall event).

The eastern part of the site to the south of the wind turbine, which is only used to store plant, equipment, empty containers/skips and AQP-compliant product (not waste) discharges to surface water sewer.

Periodic inspection of each interceptor is used to determine when each interceptor requires emptying.

4.5.4 Office/Welfare Facilities

Self-contained welfare and toilet facilities are located in the main office building adjacent to the weighbridge.

Roof water from the building is directed through gutters and downpipes and onwards through the surface drainage system to surface water sewer.

4.6 Stockpile Sizes and Storage Duration

Based on the Storage Plan (drawing **10915 – 000 - E**), the amount of combustible waste stored onsite will be approximately 860 tonnes.

Table 6 summarises the nature and location of wastes within the facility and typical storage durations during normal operations. The table also provides information regarding maximum stockpile sizes and storage durations for each waste type based on current NRW FPMP Guidance[1], and taking into account the nature of the wastes involved and that firefighting access is typically only available from one side.

No waste is stored for periods >3 months.

The storage duration prior to receipt shall be established for any wastes received from other waste management facilities. Maximum storage durations shall include any prior storage time.

Ref.	Waste	Location	Type	Hazardous	Combustible	Pile Size (l x w x h)	Volume (m^3)	Number of Piles	Estimated Weight (Tonnes)	Max. Storage Duration
A	**Incoming Waste** (mixed and source segregated)	Central storage yard	Stockpile	No	Yes	8m x 8m x 4m	256.0	1	500.0	7 days
B	**Rigid Plastics**	Central storage yard	RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	3.1	3 months
C	**Plastic Film**		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	1.8	3 months
D	**Mixed Metals**		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	11.3	3 months
E			RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	3.8	3 months
F	**Paper & Cardboard**		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	2.6	3 months
G	**Gypsum**		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	7.7	3 months
H	**Tyres**		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	5.8	3 months
I	**uPVC**		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	3.1	3 months
J	**Green**		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	4.4	1 month
K	**Mixed (Sorted Heavy Fraction)**	Central storage yard	Stockpile	No	Yes	8m x 8m x 4m	256.0	1	55.8	3 months
L	**Mixed (Sorted Light Fraction)**	North eastern storage yard	Stockpile	No	Yes	20m x 20m x 4m	1600.0	1	195.4	3 months
M	**Refuse Derived Fuel (RDF)**		Stockpile	No	Yes	10m x 10m x 4m	400.0	1	100.0	1 month
N	**Unprocessed Wood**	Western storage yard	Stockpile	No	Yes	15m x 15m x 4m	900.0	1	98.0	3 months
O	**Woodchip**		Stockpile	No	Yes	15m x 12.5m x 4m	750.0	1	123.8	3 months
P	**Wood**		RoRo Skip	Yes	Yes	6.1m x 2.4m x 2.6m	38.1	1	4.1	3 months
Q	**Asbestos**		Enclosed Container	Yes	No	6.1m x 2.4m x 2.6m	38.1	1	3.9	3 months
R	**Mixed (Sorted Light Fraction)**	Centre of site below screen and picking line	Cage	No	Yes	4m x 3m x 3m	36.0	1	4.4	3 months
S	**Process Fines**		Stockpile	No	Yes	10m x 4.55m x 4m	182.0	1	22.2	1 month
T	**Process Fines**		Stockpile	No	Yes	10m x 4.55m x 4m	182.0	1	22.2	1 month
U	**Ferrous Metal**		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	11.3	3 months
V	**Plastics**		Bay	No	Yes	10m x 5.5m x 4m	220.0	1	18.2	3 months
W	**Paper & Cardboard**		Bay	No	Yes	10m x 5.7m x 4m	228.0	1	15.8	3 months
X	**Wood**		Bay	No	Yes	10m x 6.0m x 4m	240.0	1	26.1	3 months
Y	**Non-Ferrous Metal**		Bay	No	Yes	10m x 6.6m x 4m	264.0	1	26.5	3 months
Z	**Process Fines**	Central storage yard	Bay	No	Yes	10m x 10m x 4m	400.0	1	48.8	1 month
AA	**Waste Quarantine**		Covered Bay	Yes	Yes	10m x 6m x 4m	240.0	1	26.1	3 months
AB	**Non-Conforming Waste**		RoRo Skips	Potentially	Yes	6.1m x 2.4m x 2.6m	38.1	2	8.3	7 days

Table 6. Location of combustible wastes.

4.7 Baled Wastes

The site shall not receive baled waste. The only bales on site shall be cardboard, paper, plastic and RDF bales that the Operator produces and stores itself.

Stacks of bales shall be carefully managed to ensure they are stable and that sufficient fire breaks are maintained where required.

Bales shall be labelled and managed in accordance with 4.11.

4.7.1 Square/Rectangular Bales

Bales shall be stored by interlacing/use of a flat sided pyramid stacking system. Pyramid/terraced storage of bales is intended to increase stack stability and lessen the risk of a bale falling during a fire resulting in fire spread. This structure also has the benefit of changing the angle of the planes of radiated heat. A schematic drawing showing the bale stacking is shown in Figure 1.

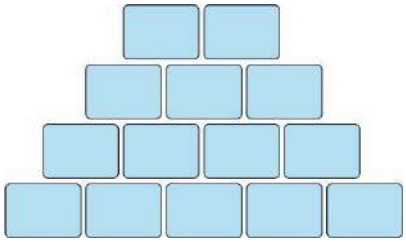


Figure 1. Storage of square/rectangular bales

Bales shall be stored a maximum of four high to reduce risks to staff and firefighters from stack collapse.

Any bale stockpiles are shown in drawing **10915 – 000 - E** and are based on the assumption that a bale has dimensions of 1.2m (l) x 1.0m (w) x 0.8m (h).

4.8 Wastes Stored Within a Building

Wastes stored within buildings are stored in accordance with the following provisions:

- Appropriate precautions to prevent the spread of fires are taken.
  - Wastes are stored in concrete bays in accordance with section 4.9.
  - For the open face of the concrete storage bays, wastes stacks are separated from other wastes and plant by appropriate fire breaks[5].
- No heating is used within the WTS Building.
- Escape routes, fire exits, alarm call points, fire hoses and fire extinguishers shall be kept clear and free from waste at all times.
- Electrical equipment shall be kept free from waste, including dust and packaging materials; and
- Waste storage areas are compartmented away from office areas.

The buildings are accessed by roller shutter doors. These provide a means of clearing smoke from the building, and to aid firefighting.

[5] Sorting skips within the building in some cases are located within the indicated fire breaks. These skips shall be emptied at the end of the day to ensure the fire breaks are clear of combustible wastes during out of hours periods when the site is unoccupied.

4.9 Use and Design of Bays and Walls

Bays and walls are used to enclose a number of the stacks. These are detailed in drawing **10915 – 000 - E**.

To enable waste stockpiles to be isolated from adjacent stockpiles, bays are constructed from concrete blocks or panels that provide a fire resistance period of at least 120 minutes. This specification is demonstrated either by testing to an appropriate standard, or by heat transfer (finite element) modelling based on the physical characteristics of the construction materials used. Blocks and panels are installed in accordance with the manufacturer's recommended installation requirements, including the sealing of joints where required to prevent bridging via flame ingress.

Bays and walls are designed with a freeboard height of at least 1m above the top of any waste stacks they enclose/separate, and/or are at a height that ensures radiant heat is screened from any exposed upper portion of a building (on, or off-site).

Bays and walls shall be marked internally with a level line and text indicating "maximum waste height".

4.10 Wastes Stored in Containers

Wastes stored in containers are positioned so that each one is accessible on at least one side to enable any fire inside to be extinguished.

Procedure **PR2** (APPENDIX C) details the procedure for moving containers in the event of a fire.

4.11 Stack Management

4.11.1 Labelling and Recording of Stacks

Each stack of waste shall be labelled to indicate the date of first arrival and the type of waste. The maximum storage duration is based on the date of first arrival.

Wrapped RDF bales shall be individually marked to indicate the date of production and type of waste. Markings shall be made using either a permanent market pen of contrasting colour to the wrap, or using a weatherproof label.

Stacks are monitored as part of the daily checks to ensure that stored wastes are correctly marked and in good condition, that the height of stored wastes is not exceeding the maximum permitted level indicator and that storage quantities do not exceed the maximum quantity permitted.

Monthly checks shall be carried out to confirm that wastes are moving in accordance with the principles of FIFO. Any discrepancies shall be recorded and managed in accordance with the company's Corrective and Preventative Action Procedure **PR15**.

4.11.2 Stock Rotation

Stock management is based on the First In, First Out (FIFO) principle. This ensures that older waste materials are processed or transferred before newer stock, preventing degradation that could result in an inability to pursue recovery options and/or increased littering due to breakdown into smaller pieces, or in more extreme cases, could lead to self-combustion.

To ensure that the FIFO principle is followed, daily and weekly stock rotation records (APPENDIX A and B) shall be used to record waste stock, including timestamps of when waste enters and exits storage.

4.11.3 Monitoring of Stacks

Stacks are monitored as part of the daily checks to ensure that stored wastes are correctly marked and in good condition, and that the height of stored wastes is not exceeding the maximum permitted level indicator. Daily inspection activities include checks for evidence of heating (steam, heat when touched), with particular attention given to bales stored externally and exposed to full or partial sun in warm weather conditions.

The core temperature of wastes at risk of self-combustion (green, wood and wood products, paper and paper products, general/mixed waste including residual waste, RDF and process fines, tyres, smaller size or graded materials) shall be checked on a weekly basis with a thermal probe. The core temperature of at least 10% of wrapped RDF bales will be sampled. Bales shall be selected throughout the stack, ensuring that the sample is representative of longer and more recently added bales.

Monthly checks shall be carried out to confirm that wastes are moving in accordance with the principles of FIFO. Any discrepancies shall be recorded and managed in accordance with the company's Corrective and Preventative Action Procedure **PR15**.

4.11.4 Turning of Stacks

Any wastes exhibiting temperatures of 50ºC (the trigger temperature) or greater shall be moved to the fire quarantine area to be turned and allowed to cool, or be quenched. Firefighting equipment, such as hoses, shall be on hand when moving stacks as the process may introduce sufficient oxygen to the waste to result in a fire.

Bales with core temperatures exceeding the trigger temperature shall be opened and spread to allow the waste to cool.

Wastes shall not be returned to the storage area, or re-baled and/or wrapped, until the temperature has reduced to ambient temperature. Temperature monitoring of these wastes shall be carried out of a daily basis thereafter and they shall be removed from site to their end destination within a maximum of 2 weeks.

4.12 Seasonality and Waste Stack Management

The facility receives higher volumes of combustible waste during the spring, summer and autumn months due to increased construction, tourism and outdoor activity such as gardening. Waste volumes also increase to a lesser degree during school holidays.

Steps to manage stacks and accommodate seasonality are discussed in the following sections.

4.12.1 Forward Planning

Incoming waste data from previous years will be used to predict seasonal trends and forecast likely input tonnages. Storage capacity, processing activities and staffing levels will be anticipated and appropriate resources allocated. Where required, temporary reorganisation of stockpiles, sourcing additional containers and pre-arranged deliveries to recovery and disposal outlets will be used to ensure wastes continue to be removed from site and on a FIFO basis.

4.12.2 Outlet Certainty

Contracts shall be established with a number of suppliers to ensure alternative outlets are available in the event of supplier failure, or inability to receive waste.

4.12.3 Contingency Measures

Where the Operator is unable, or likely to be unable to safely manage the increased volumes of waste, they shall take appropriate measures to address the situation. These will include:

- Arrangements made to transport waste to alternative waste management facilities in the local area (Bryn Recycling Limited, Pritchard Recycling Limited, or Derwen Recycling Limited).
- Customers contacted and advised to make alternative arrangements for the short-term storage, recovery or disposal of their waste.
- Waste will no longer be accepted when the site reaches its storage capacity.

4.13 Storage of Combustible Non-Waste Substances

Table 7 summarises the location of non-waste substances that are combustible, flammable or can cause explosive atmospheres.

Substance	Location	Hazardous	Combustible	Special Precautions
White Diesel	Locked, bunded 10,000 litre tank situated adjacent to the weighbridge	Yes	Yes- flammable, vapour can cause explosive atmospheres	Storage in bunded fuel tank.
Petrol	5l or 10l fuel containers stored in metal cabinet within workshop.	Yes	Yes- flammable, vapour can cause explosive atmospheres	Storage in a locked metal cabinet.
Oils and lubricants	Stored at high level in the main workshop building (1000 litres max).	Yes	Yes	
Acetylene	Stored in cylinders in the main workshop buildings	Yes	Yes- flammable, explosive	
Cleaning chemicals, lubricants, paints, etc.	In metal cabinet within workshop.	Yes – potentially hazardous, caustic	Yes – potentially flammable	Only small volumes necessary to the operation of the business to be stored.

Table 7. Location of combustible substances.

4.13.1 Plant, Equipment and Vehicles

The following plant, equipment and vehicles are located within the site:

- Materials recovery equipment incorporating screens, blowers and picking lines
- Crushing and screening equipment
- Shredding and chipping equipment
- Baling equipment
- Mobile lifting and waste handling equipment – excavators, front loading shovels, telehandlers and forklift trucks, etc.
- A range of waste collection vehicles
- Fuel oil storage tanks
- Weighbridge

The plant, equipment and vehicles are maintained in accordance with the manufacturers' instructions. Maintenance Procedure **PR11** (and associated records) contains details of how the site maintains its maintenance schedules and records.

Checks are carried out at the beginning of each day for leaks of hydraulic oils, lubricating oils and other fluids to prevent the trailing of any fluids around the site.

In the event of a breakdown, additional plant will be hired unless the problem can be fixed within a short timescale.

At the end of each working day mobile plant and vehicles will be parked in a secure area in front of the workshop buildings. Vehicles will be parked at least 6m away from any combustible wastes.

A Fire Watch (6.1.7) will make specific checks to ensure that vehicle exhausts are not in contact with combustible wastes and are free from dust and debris that may ignite.

5 FIRE PREVENTION MEASURES

5.1 Potential Causes of a Fire

For a fire to start it is necessary to have fuel, a source of ignition (heat) and oxygen. If any one of the components of the fire triangle is missing, a fire cannot start. Taking measures to avoid the three coming together will reduce the chances of a fire occurring.

Table 8 summarises the primary causes of fire at waste facilities and the measures that will be taken to reduce risks from these factors.

Source	Measures to Reduce Risks
Visitors and Contractors	• Visitors' book completed by visitors and contractors and register of on-site staff maintained to ensure visibility of site occupation at all times. • Visitors accompanied at all times by a member if staff. • Site induction for visitors and contractors includes safety, escape routes, fire prevention and emergency response. • Signage around building to show escape routes. • Job-specific RAs for contractors consider fire risk from works.
Batteries Within Waste Deposits	• Reference to lithium-ion battery identification, handling and storage included in waste acceptance procedure. • Sorting procedures and staff training to include lithium-ion battery identification, handling and storage. • Battery storage away from buildings.
Arson or Vandalism	• Fenced and gated site. • CCTV covers key areas within the site and shall be remotely monitored by the Owner/Site Manager or other competent staff.
Self-Combustion	• Robust waste acceptance procedures in place. • Employees trained in waste acceptance procedures and permitted and non-permitted wastes. • Stock rotations and FIFO approach. • Maximum storage duration of 3 months. • With the exception of small quantities of wood and RDF shredded on demand for loading into HGVs, combustible wastes are not stored in chipped/shredded format where self-combustion risks increase. • Daily inspection of stockpiles for evidence of heating (steam, heat when touched). • Inspection of bales of combustible materials to ensure processes are producing high quality outputs (i.e. with little contamination). • Rigorous maintenance of storage duration and rotation of stock to ensure that waste is not stored on-site for longer than allowed by NRW in fire guidance
Discarded Smoking Materials	• Site operates a strict no smoking policy (except in the designated Smoking Area outside of the main entrance gates of the site).
Cylinders Stored at the Site	• Contrary cylinders stored in cage in covered storage bay. • Staff advised of locations of cylinders when present. • Oxygen and Acetylene cylinders stored in suitable frames away from traffic circulation areas when in use.
Reactions between Wastes	• Robust waste acceptance and inspection procedures. • Any wastes with potential to react are placed in Quarantine area.
Leaks and Spillages of Oils and Fuels	• Staff trained in the use of refuelling equipment. • Vehicles serviced and maintained as per the manufacturers' requirements to ensure reliability and to reduce the possibility of failure. • Daily driver inspection checks. • Spill procedure in place and spill kits available on-site. • Safe disposal of used spill kits after use. • Ventilation increased (where safe to do so) and evacuation of site if large volume of fuel spilled.
Hot Loads Deposited at the Site	• Robust waste acceptance and dispatch procedures. • Loads shall be quarantined if they show evidence of heating – warm to touch, smell of burning or are smoking. • Hot loads shall be moved immediately to the fire quarantine area and quenched to reduce heat. • If load is tipped (when exposure to oxygen would feed the combustion process) staff shall attend with firefighting equipment where safe to do so.
Plant or Equipment Failure	• Staff remain vigilant for trapped waste in equipment that could friction heat or fall into electrical systems (which are correctly designed with guards fitted). Waste removed when discovered. • Plant and equipment serviced and maintained as per the manufacturers' requirements to ensure reliability and to reduce the possibility of failure. • Dragging/pushing of buckets along concrete surfaces shall be kept to a minimum. • Site yard brush and contract sweeper used to maintain site cleanliness rather than scraping with a loading bucket.

	• Methods for spark reduction to be investigated should sparking become a noted problem during the operation of equipment. • Daily inspections carried out by trained plant operatives with any defects being reported by no later than the end of the working day. • Separation zones observed to maintain distances between installed/parked plant and combustible waste. • Provisions in place for back-up plant and equipment to ensure failed plant or equipment can be replaced within a reasonable timescale.
'Tramp' Metal	• Pre-sorting and magnetic separation of metals. • Daily equipment inspections for build-up of 'Tramp' metal.
Plant and Hot Exhausts	• Where possible, all loading of plant or equipment takes place away from the exhaust system. • Separation zones used to maintain distances between installed/parked plant and combustible waste. • Exhaust systems checked daily as part of maintenance routine and cleaned when required. • Ongoing/routine visual checks by staff throughout the day. • Fire Watch/Visual Checks prior to locking up each evening.
Neighbouring Properties	• Staff remain vigilant for smoke or fire on adjacent site.
Electrical Faults	• Electrical cables to be tested and isolated prior to the start of work. • Use of mobile power tools and power supplies to be limited to essential maintenance only. • All electrical equipment to be PAT tested where required. • Firefighting equipment suitable for electrical fires to be available on site.
Hot Works	• Hot works within 6 metres of any combustible or flammable materials only carried out under a permit to work. • Specific procedures for dealing with Hot Works including two persons present at all times. • Contractors made aware of site fire prevention and mitigation measures. • Suitable firefighting equipment available on site. • Fire watch carried out for at least 2 hours following hot works and at the end of the day.
Build-up of Loose Combustible Waste, Dust and Fluff	• Weekly inspection for build-up of other loose combustible waste, dust and fluff. Immediate removal of offending materials. • Daily inspections and site cleansing at end of the day. Includes removal of wind-blown waste (inc. combustible waste) from within and outside of the site.
Damaged or Exposed Electrical Cables	• Site electrics shall be certified by a qualified electrician. • All electrical cables shall be isolated before any works can begin. • Weekly inspections shall be undertaken to check for damage to electrical installations. • Firefighting equipment suitable for electrical fires shall be available in appropriate locations around the site.
Ignition Sources	• No fires permitted on-site. • Site rules and induction programme for staff. • Disciplinary procedure to make specific reference to burning of waste – gross misconduct. • Any sources of ignition (except vehicle exhausts) kept 6m away from combustible and flammable waste/materials.
Industrial Heaters	• No industrial heaters shall be used on-site without first undertaking a risk assessment based on their type, location and operation, and any requisite updates being made to this FPMP and approved by NRW.

Table 8. Potential sources of ignition and mitigation measures.

6 FIRE DETECTION, CONTROL AND MANAGEMENT MEASURES

6.1 Fire Detection

6.1.1 Waste Acceptance Inspections

All waste arriving at the site is inspected in accordance with the Waste Acceptance Procedure (Procedure **PR9**) to determine if there is any evidence of smoke or heating. In the event of a hot load being discovered it shall be moved to the Fire Quarantine Area (if safe to do so), and the load quenched or smothered.

6.1.2 Staff Vigilance

Throughout the working day all staff are trained to be vigilant and in the event of any minor fire, staff will try to extinguish it (where safe to do so) using on-site fire extinguishers. In the event of a larger fire then the Fire and Rescue service shall be called immediately in accordance with section 8.3 of this FPMP.

6.1.3 Fire Detection and Alarm System

All members of staff are trained to be vigilant to the signs of fire and to report any incidents to the Site Manager or Director. Staff members will use the fire bell to ensure all members of staff are aware of the fire.

Smoke detectors are present in the reception area and on the upstairs landing of the office building and would alert staff to fires.

6.1.4 CCTV

CCTV operates across the site both internally and externally and can be accessed remotely. Video is constantly displayed and monitored by Weighbridge staff during office hours.

The Site Manager/Owner remotely monitors the site's CCTV and receives alerts via mobile phone. Identified members of staff monitor the site when the Site Manager/Owner is unavailable due to sickness, annual leave or other commitments.

CCTV video is recorded for a period of at least 7 days.

6.1.5 Site Inspections

The Site Manager carries out site inspections at least twice per day. Visual inspection of the site, stockpiles and bale stacks shall be undertaken with a view to identifying evidence of fire or potential fire risks. Wastes at risk of self-combustion shall be checked for evidence of heating (steam, heat when touched) as detailed in 4.11.3.

Any risks are recorded on the daily inspection sheet, remedial action identified and implemented.

6.1.6 End of Shift Inspection

At the end of their shift, staff will inspect their work areas to ensure that potential sources of ignition and any combustible materials are removed/appropriately separated. Toolbox talks are used to provide staff with suitable training to carry out this task.

The Site Manager will conduct an end of shift inspection to confirm work areas have been left in an appropriate state.

6.1.7 Fire Watch

The Site Manager (or a designated member of staff) will undertake a fire-watch approximately 1 hour after site operations cease. This is extended to 2 hours when hot works have been carried out on site.

Any risks shall be recorded on the daily inspection sheet, concerns logged (e.g. dust/fluff from processing operations that could settle onto hot exhausts and engine parts), remedial action identified and implemented.

6.2 Measures to Reduce the Risk of Fire Spreading

Once a fire has started, it can spread to adjacent materials through direct contact, conduction or radiation or through sparks or airborne embers falling onto other combustible materials. Minimising the risk of fire spreading within or from the site is achieved through a combination of physical infrastructure and fire control measures.

6.2.1 Stockpile Size

Waste stockpiles are kept small reducing the likelihood of fire spreading to an adjacent stockpile through radiation, and ensuring that if a fire were to start, it will be easier to bring under control and extinguish.

6.2.2 Fire Breaks

Appropriate separation distances (fire breaks) between stockpiles are maintained to reduce the likelihood of fire spreading to adjacent stockpiles and to facilitate access for firefighting equipment. These are based on Figure 1 and Figure 2 of the published FPMP guidance[1] and detailed on the accompanying Storage Plan (**10915 - 000 – E**).

The open face of storage bays within buildings are also separated from other stockpiles and plant by appropriate fire breaks. Sorting skips in some cases are located within the indicated fire breaks due to space constraints and operational practicality. These skips shall be emptied at the end of the day to ensure the fire breaks are clear of combustible wastes during out of hours periods when the site is unoccupied.

6.2.3 Bays and Walls

Bays and walls are used to enclose a number of the stacks and prevent fire spreading from one stockpile to another by radiation or conduction. These are discussed in detail in 4.9.

6.2.4 Fire Spread to Adjacent Sites

To the east, south and west of the site there are no immediate neighbouring buildings.

The closest building to any waste storage area is the depollution building within the adjacent ELV ATF, a minimum of 30.4m from combustible waste stockpiles M and N, and significantly further than the stockpile to building fire break distance.

Areas along the boundary of the ELV ATF are used to store a range of equipment and wastes made from combustible materials (including tyres). The storage areas are located a minimum of 8.0m from waste stockpile N and 9.3m from waste stockpile M, further than the stockpile to stockpile fire break distance.

6.3 Fire Control Measures

The facility is equipped with a number of fire control measures. These are described in the following sections. The site emergency plan (**10915 – 000 – J**) indicates the location of these measures.

6.3.1 Fire Hoses

Fire extinguishers and fire hoses are available for use as a first response measure to suppress fires.

Fire hoses are linked to adjacent water storage tanks (6.4.2.1.1) and fed by petrol fuelled water pumps, are also located in the vicinity of combustible waste stockpiles. The hoses provide a flow of up to 705l/min based on their use with 30m long, 100mm diameter couplings and fire hoses.

As a first response measure, the use of fire hoses and fire extinguishers (6.3.2) will enable small fires in combustible waste piles to be extinguished or managed while waiting for the Fire and Rescue Service to arrive.

6.3.2 Portable Fire Extinguishers

The facility is equipped with fire extinguishers of a type, size, location, and number appropriate to the risk present on-site. Each fire extinguisher shall be fully charged and ready for use at all times. On-site signage indicate the location of these appliances.

The following types of fire extinguisher are available:

- Dry Powder Fire Extinguisher
- Water Fire Extinguisher
- Carbon Dioxide
- Foam

Each extinguisher shall be inspected on an annual basis and recharged as necessary. A qualified service company will perform these inspections, and all extinguishers will display a current inspection tag. Inspection and recharging shall be performed following each use.

All operating plant that is used to handle the waste is also fitted with Fire Extinguishers, which can be used to suppress small fires.

6.3.3 Inert Stockpiles

Soil and other inert materials that are free of organic materials is helpful in extinguishing fires. Soil absorbs heat and suffocates a fire and can be used as a useful suppressant when fighting waste fires. Approximately 250m^3 of soil/inert material will be stockpiled adjacent to the Residual Waste storage area (K) for use as a fire suppressant.

A further 250m^3 of soil/inert material shall be stockpiled adjacent to the opening in the central section of the site for use to construct fire water containment bunds to direct fire water into the temporary firewater containment booms (if required) as discussed in 7.2.2.

6.3.4 Removal of Waste

Fire Quarantine areas have been identified (see 6.5) and enable combustible materials to be moved away from burning materials to prevent the fire spreading and/or to separate burning material from the fire to quench it with hoses or in pools of water.

A telehandler with bucket and bale handling attachments, and an excavator and grab shall be available on site at all times. Both vehicles have enclosed cabs and are fitted with heat-protected hydraulic systems.

A number of hook-lift vehicles are available to remove containers in the event of a fire. Should additional vehicles be required to move waste containers to a secure location, reciprocal emergency arrangements to provide vehicles to site are in place with Bryn Recycling Limited, Pritchard Recycling Limited, or Derwen Recycling Limited.

Procedure **PR2** (APPENDIX C) details the procedure for moving containers in the event of a fire.

6.4 Water Supply

6.4.1 Water Requirement

Residual Waste (K) destined for off-site transfer as shredded RDF is the largest stockpile of combustible waste with a volume of 1,600m^3. The water requirement has been calculated based on the volume of this stockpile.

Based on FPMP guidance[1] indicating that a 300m^3 stack of combustible material requiring an average water supply of at least 2,000 litres a minute for a minimum of 3 hours the water requirement would be:

(1600/300)*2000*(3*60) = 1,920,00 litres = 1,920 m^3

6.4.2 Water Supplies

6.4.2.1 Assessment of Immediately Available Supplies

6.4.2.1.1 On-site Water Storage

5 no. water storage tanks, holding a total of 218,000 litres shall be installed on-site; 2 no. 64,000 litre steel tanks to the north east and south east of the RDF stockpile (M), 1 no. 30,000 litre HDPE tank to the north east of the incoming mixed waste stockpile (A), and 2 no. 30,000 litre HDPE tanks to the east of the wood stockpiles (N,O). These supplies provide an immediately available supply to extinguish small fires, or to control fires while awaiting the arrival of the fire and rescue service.

With the exception of the area immediately surrounding the site offices, there is no mains water available across the site that could enable the provision of automatic water level control. Water levels within the tanks will be monitored as part of the site inspection checks (**FR1**) and topped-up manually using a mobile bowser and pump when levels drop below 1% of the maximum capacity of the tanks.

6.4.2.1.2 Fire Hydrants

The closest fire hydrants are located at grid reference E307982 N208799 and E307787 N208802. South Wales Fire and Rescue Service previously advised the hydrant meets British Standard (BS 750) and is able to deliver a flow rate of 2,000 litres per minute to a device.

6.4.2.1.3 Surface Water

Watercourses shown on the 1:25,000 OS map to the north of the site boundary are land drains of limited depth without permanently running water. These cannot be relied upon to provide an adequate water supply.

A number of reservoirs and ponds are present within 1km of the site to the west, north and north east. The closest of these is a surface reservoir located approximately 280 west of the site entrance. There has been extensive work just to the north of the surface reservoir to construct a 9 million litre underground reservoir (adjacent and to the west of the existing circular reservoir) following a loss of supply event in February/March 2018.

A further two surface reservoirs, known as Penywern Ponds – Top and Middle, are located approximately 750m and 850m south west of the site.

The reservoirs maintain a suitable water depth throughout the year and could be relied upon to provide a backup water supply to refill attending bowsers. Due to their distance and accessibility, it is likely to be impractical to pump water to site from these locations.

6.4.2.1.4 F&RS Tenders and Water Bowsers

The Fire and Rescue Service have indicated that each tender will carry up to 1,800 litres of water. As the number of tenders attending site cannot be guaranteed, any onboard capacity has not been relied upon when considering the immediate availability of firewater.

There are 3 bowsers available within the local area carrying up to 9,000 litres each. These may not be available in the event of a fire and have not been relied upon when considering the immediate availability of firewater.

6.4.2.1.5 Recirculation

It may be possible for the fire and rescue service to recirculate water back onto the fire by pumping it from the site's drainage system and/or containment areas. As this cannot be guaranteed due to possible contamination, this plan makes no provision for recirculation within the calculation of water supplies required.

6.4.2.1.6 Conclusion

Based on a flow rate of 2,000 litres per minute of water provided by the closest fire hydrant, it would take 16 hours to extinguish a fire in the largest waste stockpile.

Recirculation of water back onto the fire by pumping it from the site's drainage system and/or containment areas may be possible, along with additional supplies brought to site by the F&RS and/or secured from local surface water sources would increase the effective flow rate and reduce the time required to bring a fire under control.

6.5 Designated Fire Quarantine Areas

The aim of the quarantine areas are twofold.

- To enable any burning materials to be spread out in an open area to aid extinguishing the materials.
- To move combustible materials away from burning materials to prevent the fire spreading.

The location of the designated quarantine areas are shown on Drawing **10915 - 000 - J**.

Three quarantine areas (A, B and C) are identified.

Quarantine area A is 9.0m x 17m, B is 9.5m x 21.0m and C is 15m x 25m in size. All have 6m fire breaks on all sides. Assuming a waste is tipped into the quarantine area and is spread to form a frustrum (flat-topped pyramid) with a height of 2m to enable waste to be quenched, quarantine area A holds 349m^3 of waste, B holds 487m^3 of waste, and C holds 817m^3 of waste. Based on a requirement to hold 50% of the largest combustible waste stockpile (residual waste - stockpile L) the quarantine area(s) must hold 800m^3 of combustible waste. This may be achieved using Quarantine Areas A and B together, or Area C alone (subject to removal of the empty storage skips immediately to the east). If using area C for quenching of burning waste, a bund must be constructed to the south of the quarantine area to contain fire water and stop it reaching the surface water sewer (via the silt trap and class I full-retention interceptor to the south).

6.6 Fire Marshalls

The Site Manager (and several deputies) will be trained as Fire Marshalls. They will also be responsible for implementing response plans and coordinating with the emergency services (and NRW) in the event of a fire.

6.7 Staff Training and Fire Exercises

Most fire deaths are not caused by burns, but by smoke inhalation. Often smoke incapacitates so quickly that people are overcome and are unable to reach an otherwise accessible exit. Synthetic materials that are commonplace today produce especially toxic gases when burnt.

In addition to producing smoke, fire can incapacitate or kill by reducing oxygen levels, either by consuming the oxygen, or by displacing it with other gases. Heat is also a respiratory hazard, as superheated gases burn the respiratory tract.

It is incumbent on the company to ensure that these risks are understood and that staff are appropriately trained to ensure that they can maintain their own safety in the event of a fire.

6.7.1 Staff Training

Training of on-site personnel in fire safety, firefighting techniques, fire prevention, response, and the fire protection aspects of the site is provided on an annual basis. Personnel are familiar with the use and limitations of firefighting equipment available onsite. Records of this training are made within staff training files.

6.7.2 Fire Exercises

An Annual Fire Exercise shall be carried out to test the effectiveness of the Fire Prevention Plan[6].

The exercise shall be based on a simulated fire occurring in an area of the site and will enable management to assess the knowledge and competence of staff in dealing with the fire. The nature of the exercise will be determined by the Site Manager in consultation with the site's Fire/H&S Advisor, the local F&RS and NRW. Key aspects of the activation plan, including the selection and use of appropriate fire control measures, closure of the penstock valve and moving waste shall form part of any simulation.

In addition to NRW, the Fire and Rescue Service shall be invited to participate and provide feedback. This will help them to understand the site fully and to formulate plans for dealing with fires.

Following the exercise all staff shall be de-briefed by the Site Manager and issues arising shall be discussed. Any improvements and training shall be identified in a summary report to be provided NRW within 14 days of the exercise, and will include timescales for actions to be implemented.

[6] A simple fire evacuation drill does not fulfil the requirement of a Fire Exercise.

7 ASSESSMENT OF POTENTIAL IMPACT ON RECEPTORS

In considering the potential Impacts of Waste Fires we have reviewed the EA document "The Impact of Waste Fires", Howard Davidson, 27 November 2013 and also considered the location of local receptors including critical infrastructure such as schools, hospitals, residential areas, workplaces, protected habitats, rivers (and other surface water features) and coastal waters within a 1km radius of the site. These are considered likely to be at greatest risk of impact in the event of a fire, predominantly as a result of smoke plumes or fire water run-off, but also from thermal radiation and hazardous residues.

7.1 Receptors

The following receptors have been considered in preparing this FPMP:

- Human receptors - including hospitals, nursing homes, schools, residential areas, places of work, transport networks.
- Environmental receptors - including source protection zones, surface waters, potable abstractions, groundwater, protected habitats, fisheries

A Receptor Plan highlighting human and ecological receptors within the vicinity of the site is presented as Drawing **10915 - 000 - G**.

Within 1000m of the site boundary there are:

- No highly sensitive receptors (schools, hospitals, nursing homes);
- A number of residential, commercial, ecological, transport and other receptors.
- No source protection zones, potable abstractions, protected habitats or fisheries.
- There surface waters groundwater

There is 1 statutory designated site within 1000m of the site:

- Mynyddoedd Llangynidr a Llangatwg, Cefn yr Ystrad a Chomin Merthyr SSSI – 29m north

There are 2 locally designated SINC environmental sites within 1000m of the site.

- Merthyr Common North – 29m north
- Blaenmorlais – 248m west

7.2 Potential Impacts on Receptors and Response Measures

7.2.1 Toxic Smoke Plumes and Ash Deposition

Air emissions from uncontrolled waste fires have been shown to be more toxic than those from controlled combustion sources (i.e., waste to energy facilities, cement kilns, etc.). These emissions contain contaminants that may include: oxides of nitrogen or Sulphur (NOx, SOx), Carbon Monoxide (CO), volatile organic compounds (VOCs) and various metal compounds. Depending on the length and degree of exposure, these emissions may cause irritation of the skin, eyes, mucous membranes and cause respiratory effects.

As the smoke plume is most likely to impact the local residents, local shops and local work places, the quick management and control of a fire is an important factor in minimising impacts on receptors.

The pathway by which plumes may impact upon receptor locations is a result of atmospheric dispersion. In general, high wind speeds lead to a plume being more rapidly dispersed and diluted due to turbulence, and low

wind speeds inhibit dispersion. Although this will be heavily influenced by the wind conditions and plume dynamics at the time, the heaviest deposition of ash occurs close to the fire (generally of larger particles and within 100m), with smaller particles depositing within a few hundred meters. Smaller lighter particles of ash (e.g. fine soot) may rise to hundreds of meters above the fire where higher wind speeds can cause them to deposit over much larger distances (hundreds or thousands of miles).

Damage to property may be at the source of the fire, or through secondary fires from burning wind-blown particles.

To manage the impacts of smoke once released from a fire it is essential that information regarding the direction of the smoke released is identified and that the plume is monitored to establish its extent and likely dispersion radius.

A wind rose based on 10 years data historic wind frequency simulation data for Merthyr Tydfil is presented in Figure 2. It is evident that winds from the west south west predominate in the area, with winds from the north west to south tending to be less frequent and characterised by lower wind speeds. Very low wind speeds (<3.1m/s) occur for 37.3%% of time each year.

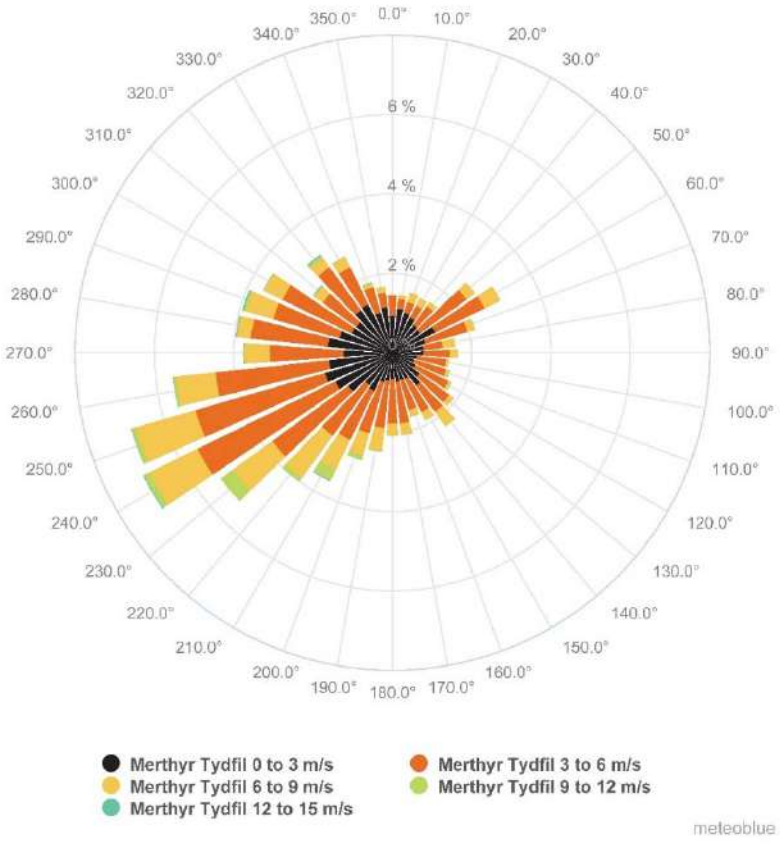


Figure 2. Historic wind frequency simulation data for Merthyr Tydfil for the years 2015 to 2024 at 10m height.

With a prevailing wind direction showing a strong tendency to come from the west south west it is more likely that any fire effects will be experienced by receptors located to the east north east of the site (albeit the wind direction may be in a different direction at the time of a fire).

Within 1000m to the east north east of the site the following receptors are present:

- Land to the north of the abattoir offices (C1b) – the offices and northern part of the processing building are likely to be occupied by staff during office hours, although a large area of land to the north is generally unoccupied.
- Mynyddoedd Llangynidr a Llangatwg, Cefn yr Ystrad a Chomin Merthyr SSSI/Merthyr Common North SINC (E1) /Open Access Land (O1) – transient use by people, used for livestock grazing.
- Jepson's Pond (W3/L1) – generally transient use by walkers and wild swimmers, possible infrequent use by anglers as the pond is generally not considered to be a good fishing location due to low fish stocks and very limited species variety.

Within 1000m of the site in other directions there are a number of industrial, commercial, ecological, and other receptors. The closest permanently occupied human receptor (defined as being potentially occupied for large parts of the day or night) are the neighbouring abattoir (C1a-d) to the east, and an End-of-Life Vehicle ATF located immediately to the west of the site. Smoke plumes at this distance are likely to be substantial and increase the risk of harm to people at these receptors.

The closest occupied residential receptors are a house located 320m to the south east (R1) and two properties just beyond this at 346m (R2) and 348m (R3) from the site.

In the event of a fire, coupled with a wind from the north east, it is likely that the fire and rescue service would need to close the industrial estate access road, and in high winds from the north east to north west, the smoke plume reaching the A465 Heads of the Valleys Roads may also result in reduced speed limits needing to be imposed or closure of the A465 due to a reduction in visibility.

Measures to minimise the impact of fire on people present at receptors within 1000m of the site (for major fire events) has been considered as part of the fire emergency response. Specific response measures for nearby receptors are detailed in the Emergency Fire Response procedure (APPENIDX C) and specifically, in Table 1.

7.2.2 Fire Water Run-Off

Fire water run-off has the potential to contain harmful combustion by-products, or un-combusted waste materials washed from other areas of the site. The volume of water involved and the subsequent dilution of these compounds will vary based on the scale and nature of any fire.

The yard areas are surfaced in fibre reinforced concrete 200mm – 300m thick or hard standing constructed from clean hardcore or crushed stone laid to a minimum depth of 200mm. The eastern part of the site to the south of the wind turbine, which is only used to store plant, equipment, empty containers/skips and AQP-compliant product (not waste) is concrete surfaced in the north, with a small area of hardstand surface to the south in the vicinity of the site exit.

Without containment, fire water would follow the route of rainfall-dependent run off, falling by gravity towards the centre of each area and continuing towards cut-off drains located at the southern edge of each area. From here it flows into silt settlement and storage tanks, then through a Class I full retention interceptor before being discharged to foul sewer (western, central and north eastern areas), or surface water sewer (the eastern area to the south of the wind turbine).

The FPMP seeks to control firewater run-off by installing temporary firewater booms in areas where there is the potential for run-off to breach the site boundary. Depending on the location of the fire, these will include:

- Between the workshop building and weighbridge to the north of the cut-off drain serving the western part of the site;
- Across the gate/opening in the southern boundary in the central area of the site, to the north of the silt trap/storage tank and interceptor;
- Across the concrete surfaced area of the eastern area of the site to the north of the biomass building; and/or
- To the north of the silt trap/storage tank and interceptor serving the eastern part of the site.

The boom positions are shown on the Emergency Plan (drawing **10915 – 000 – J**), although these may change based on the operational requirements of the Fire and Rescue Service. 250m^3 of soil/inert material shall be stockpiled adjacent to the opening in the central section of the site for use to construct fire water containment bunds to direct fire water into the temporary firewater containment boom (if required).

Firewater will be removed constantly during (if logistically viable) and after a fire event via vacuum tanker to a suitably licensed facility.

7.2.3 Thermal Radiation

Heat from a fire may burn human or fauna/flora receptors or be absorbed by other combustible materials causing them to heat up and ignite. The main principle of radiation is that the closer the material is to the fire the more radiated heat it will receive.

The emergency response plan included in section 8.3 takes steps to remove people and objects to a safe distance from the fire and gives consideration to nearby land usage and the potential for secondary fires as a result of thermal radiation. In addition, the inclusion of fire breaks wherever possible within the stockpiles will reduce the potential for any fire spreading into nearby stockpiles as well as allowing unimpeded access around the stockpiles by the emergency services.

7.2.4 Combustion Residues

Residues from fires have the potential to cause environmental damage if not correctly managed following a fire. Residues in some circumstances may be considered hazardous and require specific management controls to ensure recovery or disposal is undertaken to minimise any potential for environmental damage.

As part of this FPMP the impact of residual wastes from waste fire has also been considered and is covered in more detail in section 11. In general residues will be sampled and characterised before being removed from site for recovery/disposal at suitably licensed facilities.

7.2.5 Explosions and Projectiles

Fire and explosion can result in catastrophic consequences, causing serious injuries or death of workers and others, as well as significant damage to property. Projectiles can cause damage to other structures and set fires at great distances from the initial blast.

Materials including solvents, paints, varnishes, flammable gases, liquefied petroleum gas (LPG), dusts from machining and sanding operations, and dusts from foodstuffs if not properly controlled, can cause harm to people as a result of a fire, explosion or similar incident, such as an uncontrolled chemical reaction.

This FPMP considers potentially explosive materials, their presence within waste feedstocks (e.g. gas canisters, aerosols) or their location with respect to a potential fire (gas cylinder/fuel storage). The primary mechanism for reducing the risk from explosions and projectiles is through robust waste acceptance procedures and the location of potentially explosive objects and materials (gas cylinders/fuels) away from combustible waste storage areas.

7.2.6 Summary of Potential Impacts

A summary of the potential impacts on receptors is presented in Table 9.

Receptor Reference	Type	Distance from Site Boundary	Direction	Potential Impact	Likelihood
G	Groundwater	0m	Independent	Groundwater contamination from pollutants in fire water run off	Site largely impermeably surfaced, although firewater could enter groundwater through an area of hardstand surfacing to south east of site, or to a lesser extent from ash deposition and mobilisation of contaminants following rain.
C1	Storage Yard	0m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments Business would be impacted by restrictions on customer and staff movement/evacuation. Bund would stop firewater reaching receptor. Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely. Possible secondary fire risks due to combustible materials in yard. Wall between the sites reduces risks.	Possible smoke-related impacts - not normally in line with prevailing winds.
C2	Salvage Yard	0m	South East	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments Business would be impacted by restrictions on customer and staff movement/evacuation. Bund would stop firewater reaching receptor. Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely. Possible secondary fire risks due to combustible materials in yard. Wall between the sites reduces risks.	Possible smoke-related impacts - not normally in line with prevailing winds.
C3	Salvage Yard	0m	South East	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments Business would be impacted by restrictions on customer and staff movement/evacuation. Bund would stop firewater reaching receptor. Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely. Possible secondary fire risks due to combustible materials in yard. Wall between the sites reduces risks.	Possible smoke-related impacts - not normally in line with prevailing winds.
I1	ELV ATF	0m	West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments Business would be impacted by restrictions on customer and staff movement/evacuation. Topography would stop firewater reaching receptor. Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely. Possible secondary fire risks due to combustible materials in yard. Wall between the sites reduces risks.	Possible smoke-related impacts - not normally in line with prevailing winds.
W1	Watercourse	2m	North West	Not impacted by smoke. Topography would stop firewater reaching receptor.	Not likely

				Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	
E1	Mynyddoedd Llangynidr a Llangatwg, Cefn yr Ystrad a Chomin Merthyr SSSI Merthyr Common North SINC	29m	North	A large area of mostly upland common land located to the south of Llangynidr, south west of Crickhowell and north of Tredegar and Ebbw Vale. It covers an area of 7212.87 hectares. The SSSI is closest to the Site at its south western extremity. The site is of special interest for 56 different features, including its geology interest (Non-marine Devonian outcrops, Dinantian of southern England and South Wales, Westphalian outcrops, Karst and Cave), its habitat interest (including blanket and raised bog, acid fen/valley bog, wet and dry dwarf shrub heath, acid and base-rich spring-fed mire, dystrophic standing water, calcareous grassland) and its species interest (vascular plants, bryophytes, lichens, fungi, invertebrates, birds and bats). Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Topography would stop firewater reaching receptor. Possible land contamination from ash deposition and mobilisation of contaminants following rain. Possible smothering of flora by ash. Long-term effects unlikely.	Possible smoke-related impacts - generally transient use, although more prolonged use by people tending livestock/walking is possible - not normally in line with prevailing winds and people can easily move away from any smoke plume.
O1	Open Access Land	31m	North	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. People can easily move away from any smoke plume Topography would stop firewater reaching receptor. Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - generally transient use, although more prolonged use by people tending livestock/walking is possible - not normally in line with prevailing winds and people can easily move away from any smoke plume.
C4a	Abattoir (Offices)	33m	East	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Business would be impacted by access restrictions on customers and staff. Smoke and ash may force operations to cease due to animal stress and food hygiene considerations. Possible requirement for decontamination, particularly if hazardous materials are involved in the fire. Topography would stop firewater reaching receptor. Bund between the Site and Abattoir reduces secondary fire risks. Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - not normally in line with prevailing winds.
U1	STOR Energy	34m	West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Topography/intervening highway drains would stop firewater reaching receptor (risk to Bleanmolais SINC due to firewater entering surface water drain, see below). Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - generally transient use, although more prolonged use by staff maintaining generators possible - not normally in line with prevailing winds..
I2	Automotive Parts Manufacturer	35m	South West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Business would be impacted by access restrictions on customers and staff.	Possible smoke-related impacts - not normally in line with prevailing winds.

				Topography/intervening highway drains makes pollution risk (to receptor) from firewater negligible (risk to Bleanmolais SINC, see below). Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	
C4b	Abattoir (Security Office)	37m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Business would be impacted by access restrictions on customers and staff. Smoke and ash may force operations to cease due to animal stress and food hygiene considerations. Possible requirement for decontamination, particularly if hazardous materials are involved in the fire. Topography/intervening highway drains makes pollution risk (to receptor) from firewater negligible (risk to Bleanmolais SINC, see below). Bund between the Site and Abattoir reduces secondary fire risks. Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - not normally in line with prevailing winds.
C5	Waste Transfer Station	45m	West North West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Business would be impacted by restrictions on customer and staff movement/evacuation. Topography/intervening highway drains makes pollution risk (to receptor) from firewater negligible (risk to Bleanmolais SINC, see below). Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - not normally in line with prevailing winds.
C4c	Abattoir (Food Packaging)	64m	South East	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Business would be impacted by access restrictions on customers and staff. Smoke and ash may force operations to cease due to animal stress and food hygiene considerations. Possible requirement for decontamination, particularly if hazardous materials are involved in the fire. Business would be impacted by access restrictions on customers and staff. Smoke and ash may force operations to cease due to animal stress and food hygiene considerations. Possible requirement for decontamination, particularly if hazardous materials are involved in the fire. Topography makes pollution risk from firewater negligible. Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - not normally in line with prevailing winds.
U2	STOR Energy	100m	West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Topography/intervening highway drains would stop firewater reaching receptor (risk to Bleanmolais SINC due to firewater entering surface water drain, see below). Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - generally transient use, although more prolonged use by staff maintaining generators possible - not normally in line with prevailing winds..

U3	33kV O/H Power Lines	121m	North	Not impacted by smoke, ash, firewater.	Not likely at this distance.
C6	Salvage Yard	146m	West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Business would be impacted by restrictions on customer and staff movement/evacuation. Topography/intervening highway drains makes pollution risk (to receptor) from firewater negligible (risk to Bleanmolais SINC, see below). Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - not normally in line with prevailing winds.
I3	ELV ATF	221m	South East	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Significant impact to business trading unlikely. Topography/intervening highway drains makes pollution risk (to receptor) from firewater negligible (risk to Bleanmolais SINC, see below). Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - not normally in line with prevailing winds.
U4	Reservoir (Underground)	241m	West	Not impacted by smoke, ash, firewater.	Not likely at this distance.
E2	Blaenmorlais SINC	248m	West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Highway drains on industrial estate access road to south of Site discharge surface water to a small watercourse to the south of the SINC. - pollution risk from firewater possible were it to enter the surface water sewer via the site drainage system, or exit site and enter the surface water sewer via the highway drains. Possible land contamination from ash deposition and mobilisation of contaminants following rain. Smothering of flora by ash unlikely at this distance due to dispersion and reduced deposition rates. Long-term effects unlikely.	Possible smoke-related impacts - generally transient use, although more prolonged use by people tending livestock/walking is possible - not normally in line with prevailing winds and people can easily move away from any smoke plume. Possible pollution from firewater if not contained.
U5	Reservoir (Above Ground)	264m	West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Topography/intervening highway drains makes pollution risk (to receptor) from firewater negligible (risk to Bleanmolais SINC, see above). Possible water/land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - generally transient use, although more prolonged use by staff possible - not normally in line with prevailing winds.
C7	Caravan Storage	264m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Significant impact to business trading unlikely. Topography/intervening highway drains makes pollution risk (to receptor) from firewater negligible (risk to Bleanmolais SINC, see above).	Possible smoke-related impacts - generally transient use, although more prolonged use by staff and customers possible - not normally in line with prevailing winds.

				Possible water/land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	
C8	Furniture Retailer	277m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Significant impact to business trading unlikely. Topography/intervening highway drains makes pollution risk (to receptor) from firewater negligible (risk to Bleanmolais SINC, see above). Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - not normally in line with prevailing winds.
C9	Furnishings Retailer	286m	South West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Significant impact to business trading unlikely. Topography/intervening highway drains makes pollution risk (to receptor) from firewater negligible (risk to Bleanmolais SINC, see above). Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - not normally in line with prevailing winds.
P1	Public Right of Way	293m	South West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Topography/intervening highway drains makes pollution risk (to receptor) from firewater negligible (risk to Bleanmolais SINC, see above). Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - transient use,- not normally in line with prevailing winds and people can easily move away from any smoke plume.
C10	MOT Centre	295m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Significant impact to business trading unlikely. Topography/intervening highway drains makes pollution risk (to receptor) from firewater negligible (risk to Bleanmolais SINC, see above). Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - not normally in line with prevailing winds.
T1	A465 Heads of the Valleys Road	309m	South East to South West	Human receptors using this road would be exposed to smoke plumes for short periods. Reduction in driver visibility due to smoke. No impacts from other factors.	Smoke-related impacts – unlikely. In the presence of a large fire, with high wind speeds blowing towards the receptor, it is possible that smoke will cause a loss of visibility on the dual carriageway.
R1	Residential Property	320m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.
C11	Groceries Retailer	326m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.

				No significant impacts from other factors.	
C12	Groceries Retailer and Petrol Station	326m	South West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.
C13	Storage Yard	334m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts – generally transient use by staff - not normally in line with prevailing winds. Topography and dispersion would reduce impact.
C14	Carpet Retailer	343m	South West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.
R2	Residential Property	346m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.
R3	Residential Property	348m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.
C15	Storage Yard	357m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts – generally transient use by staff - not normally in line with prevailing winds. Topography and dispersion would reduce impact.
P2	National Cycle Route	374m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts – transient use by cyclists - not normally in line with prevailing winds. Topography and dispersion would reduce impact.
C16	Homewares Retailer	391m	South West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.
O2	Stables/ Storage/ Allotments	416m	West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.
C17	Flooring/ Furniture Retailer	428m	South West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.
C18	Petrol Station	442m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.
W3/L1	Pond (Leisure Use)	445m	North East	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.

				No significant impacts from other factors.	
R4	Residential Property	549m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.
O3	Stables/Storage Yards	565m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.
O4	Farm	606m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.
R5	Residential Properties	608m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.
P3	Footpath	609m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts – transient use - not normally in line with prevailing winds. Topography and dispersion would reduce impact.
U6	Electricity Substation	682m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts – generally short-term use by maintenance staff - not normally in line with prevailing winds. Topography and dispersion would reduce impact.
L3	Park/ Recreation Area	688m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts – not normally in line with prevailing winds. Topography and dispersion would reduce impact.
R6	Residential Properties	700m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.
W4/L2	Reservoir (Angling)	705m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts – not normally in line with prevailing winds. Topography and dispersion would reduce impact.
U7	Reservoir (Underground)	745m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.
L4	Playing Fields	762m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts – not normally in line with prevailing winds. Topography and dispersion would reduce impact.
W5/L5	Reservoir (Angling)	816m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments.	Possible smoke-related impacts – not normally in line with prevailing winds. Topography and dispersion would reduce impact.

				No significant impacts from other factors.	
I5	Landfill	862m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts – not normally in line with prevailing winds. Topography and dispersion would reduce impact.
R7	Residential Properties	878m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.
L6	Playing Fields	948m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts – not normally in line with prevailing winds. Topography and dispersion would reduce impact.
R8	Residential Property	958m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.
L7	Playing Fields	964m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts – not normally in line with prevailing winds. Topography and dispersion would reduce impact.

Table 9. Potential Impacts on Receptors

8 FIREFIGHTING STRATEGY, EMERGENCY FIRE RESPONSE AND ACTIVATION PLAN IN CASE OF FIRE

8.1 Firefighting Strategy

Firefighting methods for burning solid waste include quenching the waste using water or foam, smothering the waste using inert materials and/ or separating burning material from other waste.

The Site Supervisor or available staff may attempt to extinguish a fire using on-site equipment if:

- It is safe to do so;
- It is a small fire that can be managed by the on-site staff (e.g. a smouldering waste, overheating/smouldering electrical equipment, small isolated area of waste);
- Staff and Visitors have been moved from the danger area and an evacuation has commenced;
- The fire brigade has been called; and,
- The person using the extinguisher or other fire control equipment has been trained in its use.

If a fire occurs on a vehicle or piece of equipment, the equipment operator will bring the vehicle or equipment to a safe stop. If personal safety will allow, the vehicle shall be parked on any concrete surfaced area within the site away from fuel supplies, uncovered solid wastes, and other vehicles. The engine shall be shut off and the brake engaged to prevent movement of the vehicle or piece of equipment.

If it is unsafe to attempt to control a fire, or immediate response equipment (such as fire hoses and fire extinguishers) have failed to control the fire, all staff will vacate the area and await further instruction and/or attendance by the emergency services. On arrival, the emergency services shall be informed of the location and nature of the waste involved (particularly the location of flammable liquids, which could potentially be on/catch fire or explode). This will enable them to formulate the best strategy for dealing with the fire.

Separation of burning or smouldering waste from other combustible materials will reduce the likelihood of fire spreading. A number of fire quarantine areas have been identified allowing wastes to be relocated for spreading and quenching.

With the design of the site and the management techniques to prevent a fire spreading, it is not envisaged that a fire would involve all areas of the site at the same time.

8.2 Emergency Fire Response

Following consultation with South Wales Fire and Rescue the following fire response actions were established:

- Merthyr Tydfil Fire Station which is the closest fire station to the site would be the first to respond and would arrive approximately 12 minutes after an emergency call has been made. The number of Fire Stations in attendance would be dependent on an assessment of the severity of the fire.
- The first Fire Station in attendance would decide on the number of additional appliances, water bowsers and aerial platforms needed based on the severity of the fire.
- The level of response will also be dependent on the number of appliances available and whether they are already responding to another fire.
- If required, appliances from Rhymney Fire Station would arrive shortly after, followed by appliances from Hirwaun, Tredegar, Aberdare and Ebbw Vale Fire Stations.
- When the Fire Service arrives on site the Site Manager/Supervisor is required to meet the Fire Service and indicate the location of the fire, size of the fire, number of persons unaccounted for within the

building and whether there are any items/chemicals (e.g. fuel) on site that could intensify the fire, produce noxious fumes or explode and their location.

- The Fire Service would use the water supply onboard each appliance whilst installing pumps top access the nearest available water supply. Each pump would be capable of releasing 1,800 litres of water per minute.
- The main priorities the Fire Service consider when responding to and tackling a fire would be:
    1. Danger to life
    2. Danger to property
    3. Danger to the environment
- Depending on the severity of the fire the Fire Service may close the industrial estate access road. Vehicles requiring access to the ELV ATF and Abattoir would need to be temporarily rerouted to a holding location as there is no alternative access to these properties.
- If safe to do so the Fire Service may allow site personnel to move valuable items such as excavators, front loading shovels and telehandlers off site if this was not possible previously.

8.3 Activation Plan

Procedure **PR2** (Emergency Incident Procedure - Fire & Explosion) provides detailed instructions to be followed when fire or smoke is suspected or discovered (APPENDIX C).

8.4 Out of Hours Response

Key holders (i.e. Director, Site Manager and other staff members) will be able to reach the Site within ten minutes and can therefore provide a prompt response should a fire be detected on the Site. Once on Site, key holders will be able to open the Site and buildings. Key holders will be able to make use of the mobile plant to move combustible materials and employ active firefighting measures, prior to the arrival of emergency services. The emergency services will enter the Site by force if they arrive prior to the key holder and the Site is locked.

9 ACCESS AND TRAFFIC MANAGEMENT PLAN FOR EMERGENCY SERVICES

The site has an emergency access plan which shows the emergency access and egress routes, key locations and routes within the site (drawing **10915 – 000 – I**). This plan shall be communicated to the emergency services upon arrival at site. All emergency routes will remain clear of obstructions at all times for unimpeded use by the emergency services.

9.1.1 Emergency Services Access

The site is easily accessed from the A465 Heads of the Valleys Road via an unnamed access road to the Pengarnddu Industrial Estate. The grid reference of the site entrance is SO 07902 08829 and exit SO 07983 08813 (drawing **10915 – 000 - I**).

Access to the site will need to be gained through the locked gates if staff are not/have not arrived on site. In necessary, the F&RS will gain access using bolt cutters. The access gates are 6.5m wide and can accommodate any of the vehicles the Fire and Rescue Service may use. There are no height restrictions to impede access.

9.1.2 Emergency Grab Pack

A box holding an emergency grab pack is affixed to the wall of the office building to the right of the main entrance security gate (SO 07911 08831). The grab pack contains a copy of the Fire Prevention Plan, contact names and numbers and a set of drawings to provide information regarding the drainage system, layout of the site, the location of wastes (including hazardous wastes, waste potentially containing POPs, combustible wastes and other wastes), hazards to firefighters (e.g. compressed gases, etc.) and receptor locations. This will enable the fire service to assess the site more effectively and safely, and to implement pollution prevention measures more effectively if the site is unoccupied.

10 FIRE WATER RUN OFF MANAGEMENT PLAN

10.1 Objective

The objective of the firewater run-off management plan is to ensure that in the event of a fire:

- all reasonable steps are taken to ensure that firewater run-off is contained on-site; and
- reasonable steps are taken to reduce the likelihood of pollution offsite.

10.2 Existing Constraints

The following site-specific constraints have been taken into account when preparing this section of the FPP:

- Non-hazardous combustible waste storage is only stored in areas of the site of impermeable surface with a sealed drainage system. Site topography results in firewater initially being directed to foul sewer. In the event of firewater flows >780 l/min being required, the maximum flow rate of the foul sewer would be exceeded and firewater would run from the site, onto the industrial estate access road and into the surface water sewer system.
- Hazardous waste is stored within a covered storage bay on impermeable surface with a sealed sump. In the event of a fire, firewater would fill the sump, flushing any liquids and residue from burning waste into the wider yard. Firewater would enter the surface water drainage system and initially be discharged to foul sewer. As above, were flow rates to exceed 780l/s, the firewater would exit the site if not contained.
- Firewater may contaminate any aggregate and soils stored in the southern part of the central area of the site.
- In the area to the south of the wind turbine, surface run-off discharges to surface water sewer. This area is not used for the storage of waste, however a fire in the workshop or biomass plant could result in firewater entering the surface water sewer system and being discharged to a watercourse to the south west of the site.

The containment of firewater is a key consideration in this plan.

10.3 Minor Fire

The fire water run-off management strategy for a minor fire is to provide local capacity for containing fire water run-off such that it can be captured and tankered off-site for treatment.

In the event of a fire, site staff will use the on-site store of soil to construct a fire water containment bund(s) around the area of the fire. Fire water within the bund may be recirculated back onto the fire by any attending SWF&RS appliance if suitable to do so.

Where unsafe to create a bund to retain fire water in the immediate vicinity of the bund the containment measures identified in 10.4 should be followed.

Once extinguished the water will be tankered from site for treatment at a suitably licensed facility.

10.4 Major Fire

The fire water run-off management strategy for a major fire is to provide capacity for containing fire water run-off initially in the same way as for a minor fire, but, prior to the storage capacity becoming overwhelmed, to provide further storage capacity within the boundary of the site and/or to tanker away fire water run-off for treatment at a suitably licensed facility where safe to do so.

Staff will use the on-site store of soil to construct local fire water containment bund(s) in the vicinity of the fire, followed by deploying temporary firewater containment booms at the locations shown on drawing **10915 - 000 - J**. Where required, soil will be used to create small bunds to direct the flow of firewater into the containment boom. Fire water within the boom will be recirculated back onto the fire by any attending SWF&RS appliances.

Local tankering providers will be called to site to empty the boom of excess fire water in the event of it approaching capacity. Fire water will be tankered away from site for treatment at a suitably licensed waste facility.

Were there any issues experienced with this service, flexible storage tanks (bladders) are carried by the fire and rescue service, allowing firewater to be pumped from the bund and stored elsewhere within the site.

Once extinguished, any remaining fire water will be tested and tankered from site for treatment at a suitably licensed facility.

11 POST-INCIDENT MEASURES

11.1 Safety Assessment

Following a fire, and prior to any clearance and decontamination of the site the Operator shall arrange for a structural stability assessment of buildings and any other structures.

Testing shall be undertaken to confirm whether heavy metals, hydrocarbons, and other pollutants may have contaminated the impermeable concrete or hardstand areas within the buildings and yard. This will guide measures needed to protect staff and/or contractors.

Where issues are identified, a remediation plan shall be developed and agreed with NRW. All works shall be carried out without delay and to the satisfaction of NRW.

No operational staff shall be allowed to return to site until it has been confirmed that it is safe to do so.

11.2 Removal of Fire Waste

Any residual fire waste shall be removed off site for recovery or disposal. The considerations relating to these wastes are listed below:

- Where possible, all fire waste shall be kept separate and quarantined.
- All fire waste shall be assessed to ensure it no longer poses a fire risk and that no heat sources remain within the waste mass. This shall be achieved by turning the waste material when it is safe to do so to check for sources of heat and smoke. The site management and Fire Marshall will sign-off the disposal of all fire waste before it leaves site to confirm they have inspected the waste and that no heat sources remain.
- Possible contamination could make the waste hazardous. All fire waste must be tested and classified in accordance with Waste classification technical guidance WM3. The outcome of this assessment will determine the type of facility the waste is to be sent to for treatment or disposal. All fire waste will only be sent to suitably licensed waste management facilities.
- All fire waste shall be removed from site when it is safe to do so, but no later than 7 days after it has been extinguished or 7 days from its last reported sign of heat or smoke.

11.3 Firewater

Firewater contained with the bunded yard and drainage system shall be tested, appropriately classified and tankered from site for treatment at a suitably licensed facility.

11.4 Decontamination

11.4.1 Surface Cleansing

High pressure washing, and/or any other appropriate measures shall be carried out in accordance with the approved decontamination plan.

At a localised level, spill response materials for oil, chemicals, or hazardous residues will be used where necessary.

Cleansing residues shall be tested, appropriately classified and removed from site for treatment at a suitably licensed facility.

11.4.2 Hardstand and Soil Bunds

Where soil sampling (and if required, groundwater sampling) have confirmed contamination of the hardstand area, bunds, and/or adjacent land, identified remediation measures shall be carried out.

11.4.3 Recommissioning of the Drainage System

The drainage system should be cleaned and any silt and other residues removed and disposed of to suitably licensed waste management facilities.

Any bunds or booms shall remain in place until all necessary steps have been taken to decontaminate the site and drainage system.

All surface run-off, including rainfall-dependent run-off shall be tankered from site until no further risks from pollution exist.

11.4.4 Recommencement of Operations

NRW shall be notified of the completion of works to clear and decontaminate the site.

Any updates to accident plans and management systems documents, training requirements for staff and remedial measures (including further fire reduction measures and new procedures) shall be implemented prior to the site reopening.

NRW shall be notified of the recommencement of operations at least 48 hours prior to reopening of the facility.

DRAWINGS

Refer to the Drawings section of the EMS for current Site Drawings and Plans

Drawing **10915 – 000 - A** Permitted Area Plan

Drawing **10915 – 000 - B** Site and Surrounding Area Plan

Drawing **10915 – 000 - C** Site (Block) Plan

Drawing **10915 – 000 - D** Drainage Plan

Drawing **10915 – 000 - E** Storage Plan

Drawing **10915 – 000 - F** Satellite Image

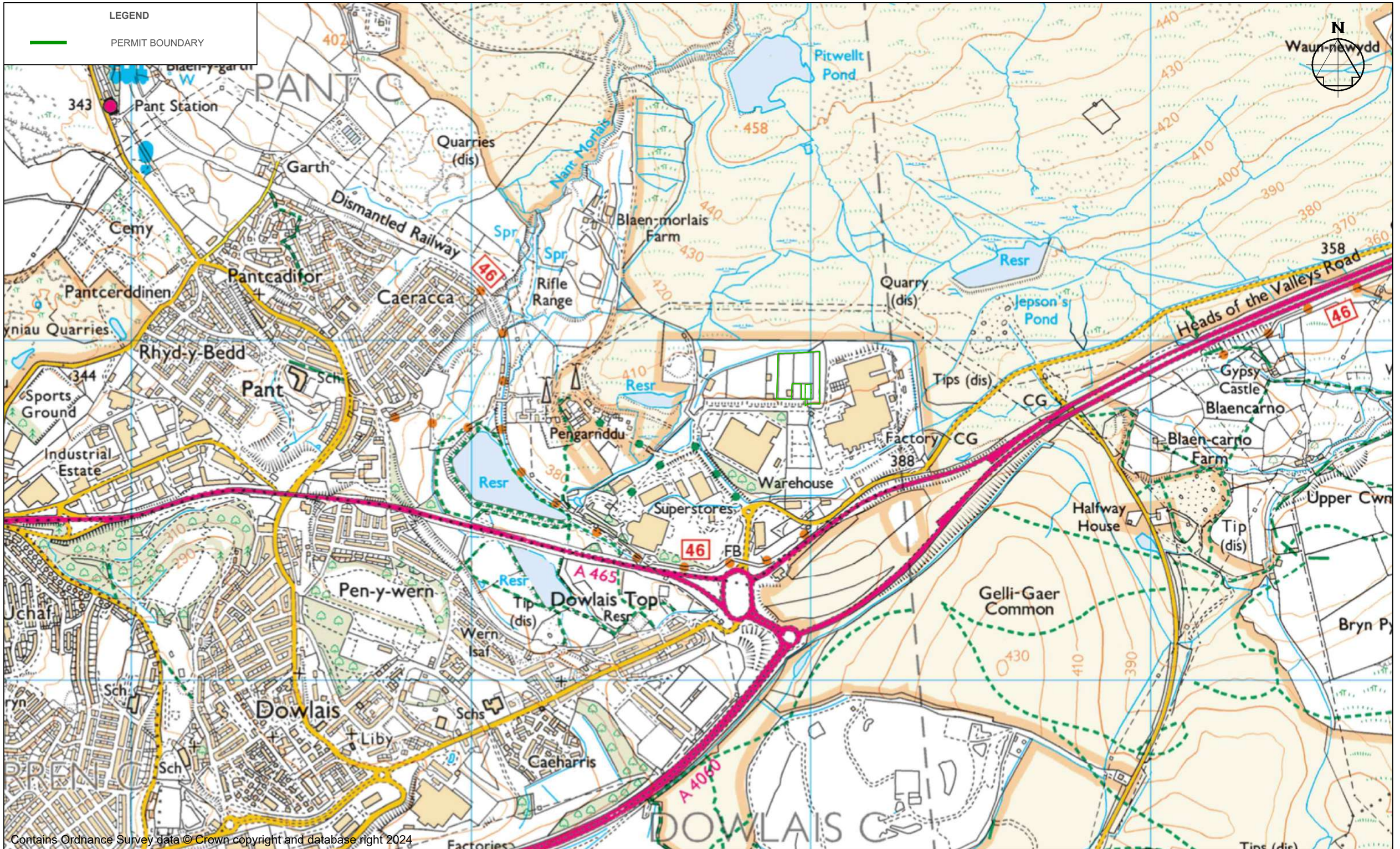
Drawing **10915 – 000 - G** Receptor Plan

Drawing **10915 – 000 - I** Emergency Access Plan

Drawing **10915 – 000 - J** Emergency Plan

Drawing **10915 – 000 - K** Receptor Plan (Fire Response)

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AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	UPDATE BASE MAP	04/07/22	SCW	NB
B	UPDATE BASE MAP	24/04/23	SCW	NB
C	UPDATE BASE MAP	25/07/25	SCW	NB

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LOCATION PLAN

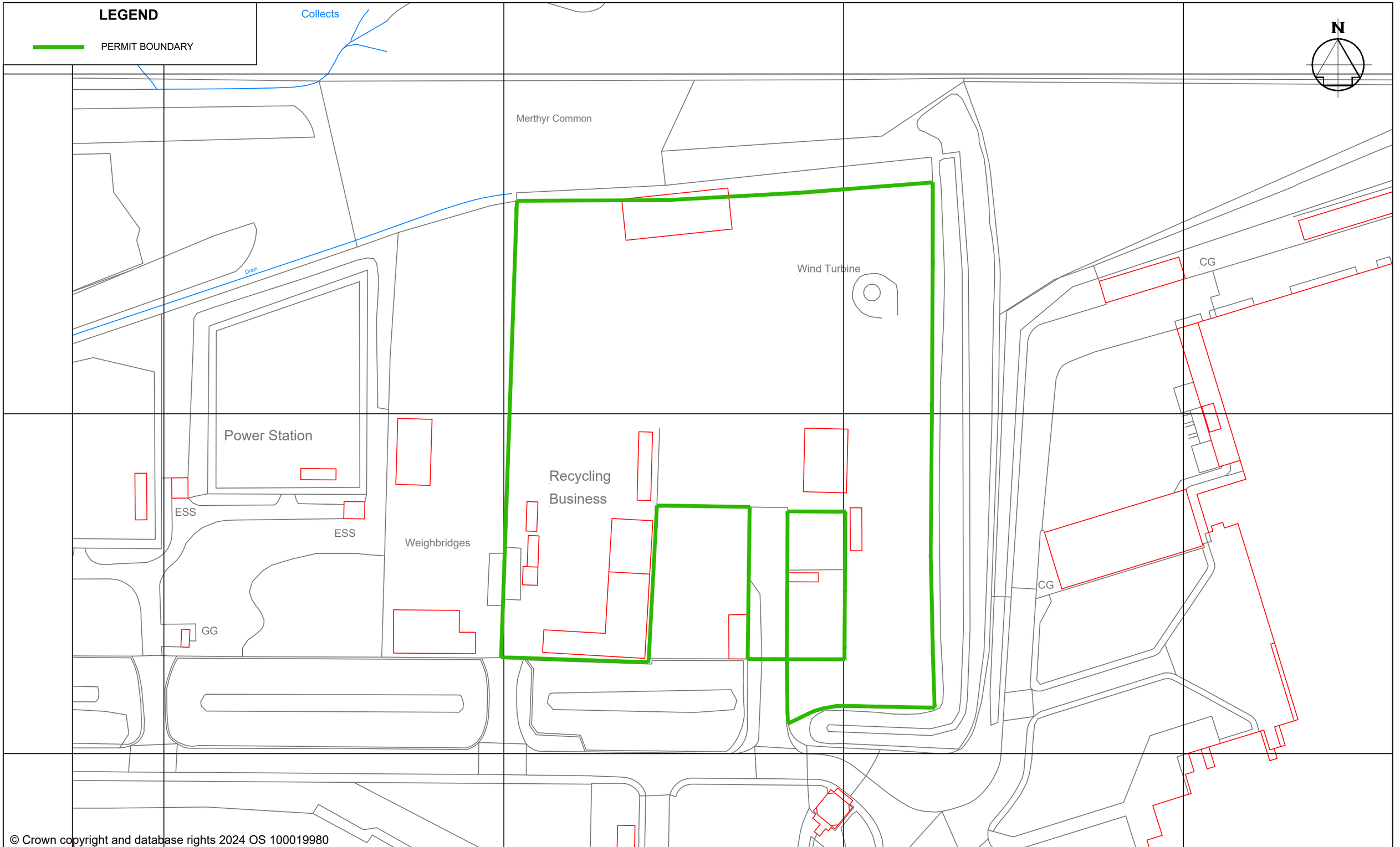
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Appr'd	NB	@A3
Date	25/07/25	

Job No. MBRC Drg No. 10915 - 000 - A

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LEGEND

PERMIT BOUNDARY



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AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	UPDATE BASE MAP	24/04/23	SCW	NB
B	UPDATE BASE MAP	25/07/25	SCW	NB

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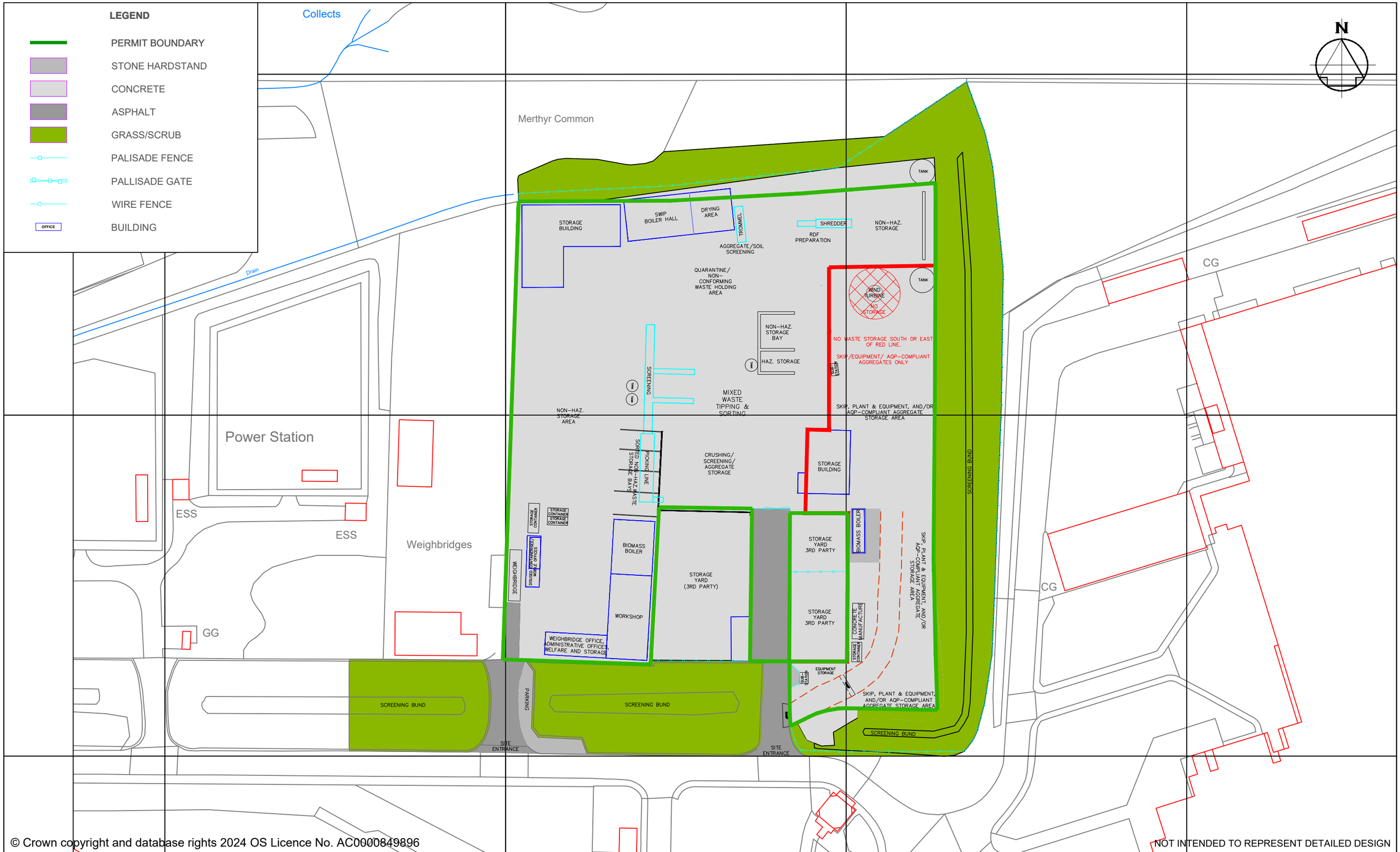
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SITE PLAN

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AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	UPDATE LAYOUT	19/12/21	SCW	NB
B	UPDATE LAYOUT	24/04/23	SCW	NB
C	UPDATE BASE MAP, UPDATE LAYOUT	25/07/25	SCW	NB

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SITE LAYOUT

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LEGEND

- PERMIT BOUNDARY
- STONE HARDSTAND
- CONCRETE
- ASPHALT
- GRASS/SCRUB
- BUILDING (OFFICE)

SURFACE WATER DRAINAGE (COLOUR MATCHES CATCHMENT AREA)

- DRAINED AREAS
- FALL
- GULLEY
- BELOW GROUND PIPEWORK (TO SEWER)
- CUT-OFF DRAIN
- SILT TRAP/STORAGE TANK/ INTERCEPTOR
- SILT TRAP
- INTERCEPTOR

Collects
Merthyr Common
Power Station
ESS
ESS
Weighbridges
GG
CG
CG
N
STORAGE BUILDING
SWIP BOILER HALL
DRYING AREA
TROMMEL
SHREDDER
RDF PREPARATION
NON-HAZ. STORAGE
AGGREGATE/SOIL SCREENING
TANK
TANK
WATER
QUARANTINE/ NON-CONFORMING WASTE HOLDING AREA
WIND TURBINE
NO STORAGE
NON-HAZ. STORAGE BAY
NO WASTE STORAGE SOUTH OR EAST OF RED LINE.
SKIP EQUIPMENT/ AQP-COMPLIANT AGGREGATES ONLY
SURFACE WATER DRAINED ACROSS IMPERMEABLE SURFACE TO SILT TRAP /INTERCEPTOR TO SEWER
NON-HAZ. STORAGE BAY
SURFACE WATER DRAINED ACROSS IMPERMEABLE SURFACE TO SILT TRAP /INTERCEPTOR TO SEWER
SCREENING
MIXED WASTE TIPPING & SORTING
SKIP, PLANT & EQUIPMENT, AND/OR AQP-COMPLIANT AGGREGATE STORAGE AREA
SORTED NON-HAZ STORAGE BAYS
PICKING LINE
CRUSHING/ SCREENING/ AGGREGATE STORAGE
INTERCEPTOR OUTLET TO SEWER BLOCKED OFF
STORAGE BUILDING
PUMP DISCHARGE TO FOUL SEWER
PUMP
SILT TRAP/ HOLDING TANK
CLASS 1 FULL-RETENTION INTERCEPTOR
CLASS 1 FULL-RETENTION INTERCEPTOR
KERB
SILT TRAP/ HOLDING TANK
CUT-OFF DRAIN
BIOMASS BOILER
STORAGE YARD 3RD PARTY
BIOMASS BOILER
SURFACE WATER DRAINED ACROSS IMPERMEABLE SURFACE TO SILT TRAP/INTERCEPTOR TO SEWER
SKIP, PLANT & EQUIPMENT, AND/OR AQP-COMPLIANT AGGREGATE STORAGE AREA
STORAGE CONTAINER
STORAGE CONTAINER
STORAGE CONTAINER
CLASS 1 FULL-RETENTION INTERCEPTOR
WEIGHBRIDGE
STORAGE YARD (3RD PARTY)
STORAGE YARD 3RD PARTY
RAISED KERB
WORKSHOP
CONCRETE MANUFACTURE
WEIGHBRIDGE OFFICE, ADMINISTRATIVE OFFICES, WELFARE AND STORAGE
EQUIPMENT STORAGE
PUMP STATION
CHANNEL
SCREENING BUND
SCREENING BUND
SCREENING BUND
PARKING
SITE ENTRANCE
SITE ENTRANCE
SILT TRAP/ HOLDING TANK
EXISTING DISCHARGE TO FOUL SEWER
EXISTING DISCHARGE TO SURFACE WATER SEWER

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AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	UPDATE LAYOUT AND DRAINAGE DETAILS	19/12/21	SCW	NB
B	ADD SILT TRAP PROPOSAL	04/07/22	SCW	NB
C	UPDATE LAYOUT	24/04/23	SCW	NB
D	UPDATE SURFACING AND INTERCEPTOR DETAILS	02/11/23	SCW	NB
E	UPDATE BASE MAP, UPDATE DRAINAGE FOLLOWING DCWW SURVEY	25/07/25	SCW	NB

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DRAINAGE PLAN

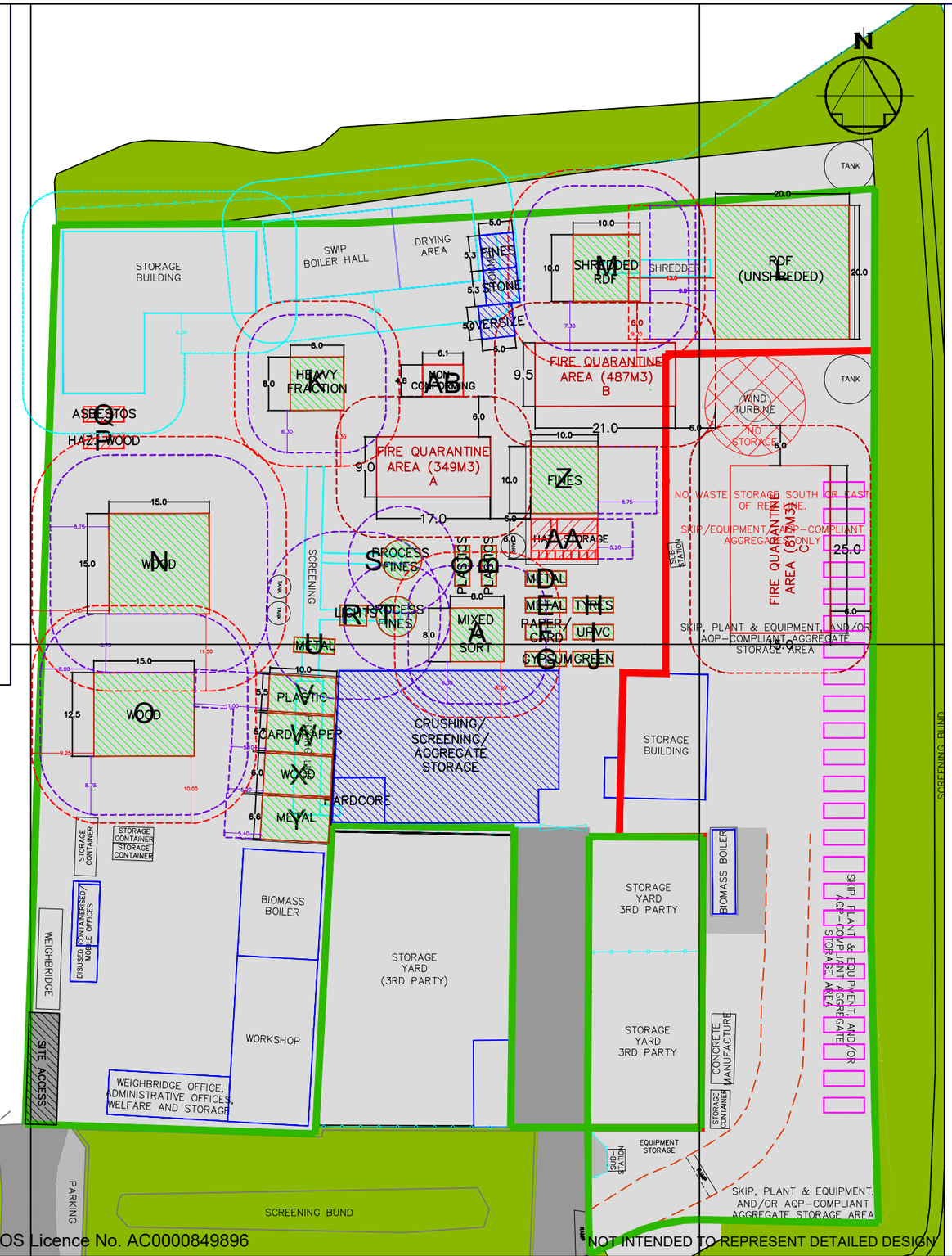
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Appr'd	NB		@A3
Date	25/07/25		

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LEGEND

- PERMIT BOUNDARY
- STONE HARDSTAND
- CONCRETE
- ASPHALT
- GRASS/SCRUB
- PALISADE FENCE
- PALLISADE GATE
- WIRE FENCE
- BUILDING
- HAZARDOUS WASTE STORAGE
- NON-HAZARDOUS (COMBUSTIBLE) WASTE STORAGE
- NON-HAZARDOUS (INERT) WASTE STORAGE
- STOCKPILE TO STOCKPILE FIRE BREAK
- STOCKPILE TO BUILDING FIRE BREAK
- FIRE QUARANTINE



A	Incoming Waste (mixed and source segregated)	Central storage yard	Stockpile	No	Yes	8m x 8m x 4m	256.0	1	55.8	7 days
B	Rigid Plastics	Central storage yard	RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	3.1	3 months
C	Plastic Film		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	3.8	3 months
D	Metals		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	11.3	3 months
E			RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	3.8	3 months
F	Paper & Cardboard		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	2.6	3 months
G	Gypsum		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	7.7	3 months
H	Tyres		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	5.8	3 months
I	uPVC		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	3.1	3 months
J	Green		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	4.4	1 month
K	Mixed (Sorted Heavy Fraction)	Central storage yard	Stockpile	No	Yes	8m x 8m x 4m	256.0	1	55.8	3 months
L	Mixed (Sorted Light Fraction)	North eastern storage yard	Stockpile	No	Yes	20m x 20m x 4m	1600.0	1	195.4	3 months
M	Refuse Derived Fuel (RDF)		Stockpile	No	Yes	10m x 10m x 4m	400.0	1	48.8	3 months
N	Unprocessed Wood	Western storage yard	Stockpile	No	Yes	15m x 15m x 4m	900.0	1	98.6	1 months
O	Woodchip		Stockpile	No	Yes	15m x 12.5m x 4m	750.0	1	123.8	3 months
P	Wood		RoRo Skip	Yes	Yes	6.1m x 2.4m x 2.6m	38.1	1	4.1	3 months
Q	Asbestos		Enclosed Container	Yes	No	6.1m x 2.4m x 2.6m	38.1	1	3.9	3 months
R	Mixed (Sorted Light Fraction)	Centre of site below screen and picking line	Cage	No	Yes	4m x 3m x 3m	36.0	1	4.4	3 months
S	Process Fines		Stockpile	No	Yes	10m x 4.55m x 4m	182.0	1	22.2	1 month
T	Process Fines		Stockpile	No	Yes	10m x 4.55m x 4m	182.0	1	22.2	1 month
U	Ferrous Metal		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	11.3	3 months
V	Plastics		Bay	No	Yes	10m x 5.5m x 4m	220.0	1	38.2	3 months
W	Paper & Cardboard		Bay	No	Yes	10m x 5.7m x 4m	228.0	1	15.8	3 months
X	Wood		Bay	No	Yes	10m x 6.0m x 4m	240.0	1	26.1	3 months
Y	Non-Ferrous Metal		Bay	No	Yes	10m x 6.6m x 4m	264.0	1	28.5	3 months
Z	Process Fines	Central storage yard	Bay	No	Yes	10m x 10m x 4m	400.0	1	48.8	1 month
AA	Waste Quarantine		Covered Bay	Yes	Yes	10m x 6m x 4m	240.0	1	26.1	1 months
AB	Non-Conforming Waste		RoRo Skips	No	Yes	6.1m x 2.4m x 2.6m	38.1	2	8.3	7 days

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A	UPDATE LAYOUT	19/12/21	SCW	NB
B	UPDATE LAYOUT	24/04/23	SCW	NB
C	UPDATE BASE MAP, UPDATE STORAGE ARRANGEMENTS	25/07/25	SCW	NB

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STORAGE PLAN

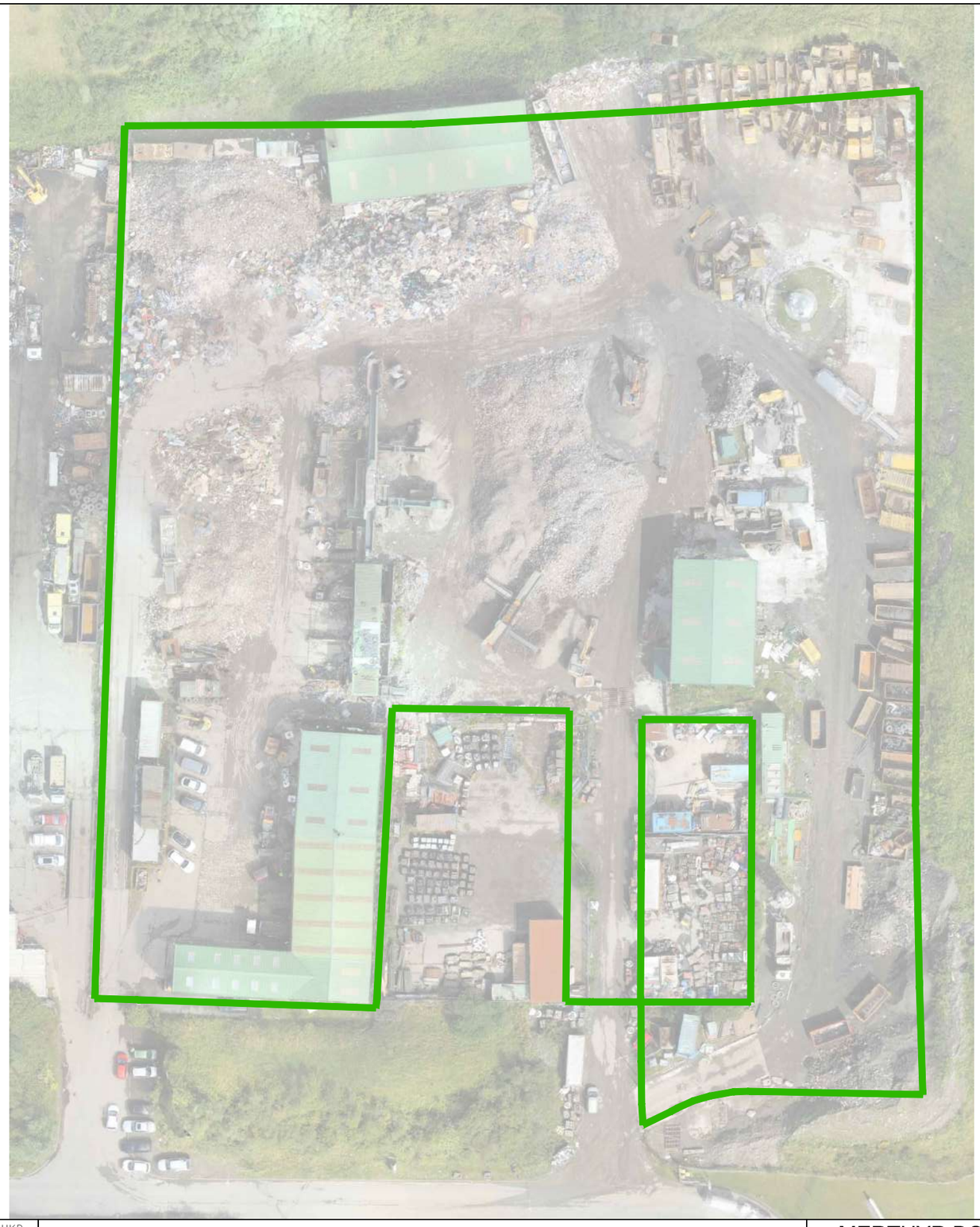
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LEGEND

PERMIT BOUNDARY



N

AMENDMENTS	REV REF	DETAILS	DATE	MADE BY	CHKD BY
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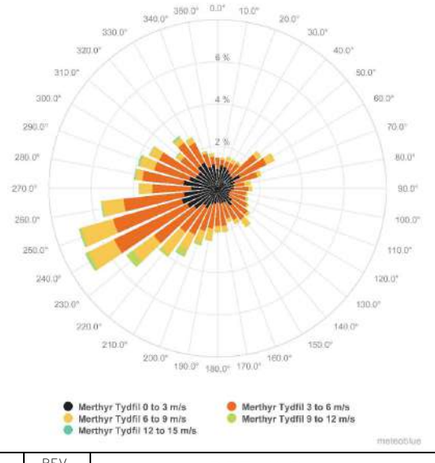
- SITE BOUNDARY
- 1000M/2000M SCREENING BOUNDARIES

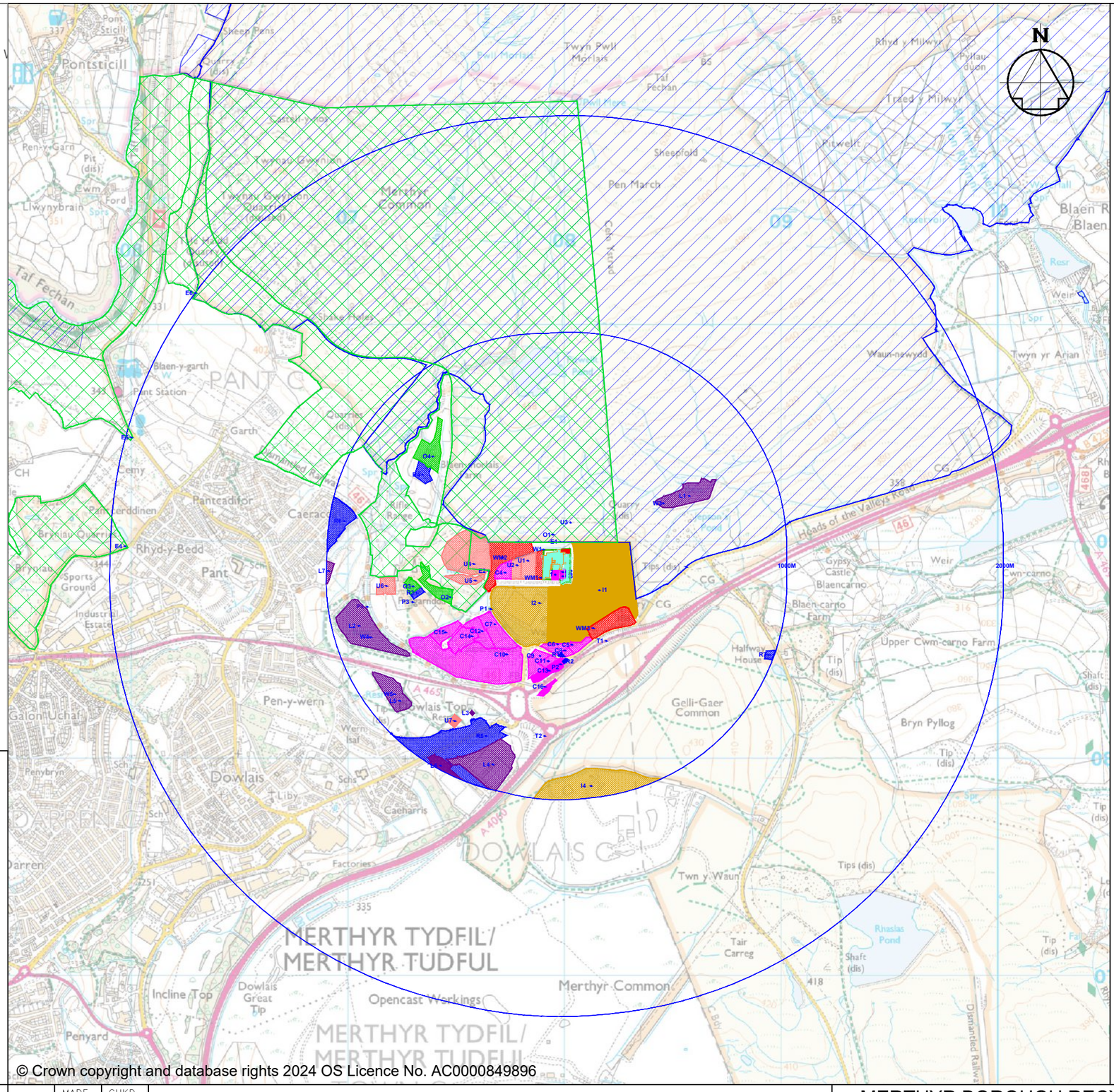
HUMAN RECEPTORS

- R3 RESIDENTIAL
- C3 COMMERCIAL
- I3 INDUSTRIAL
- O3 OTHER
- U3 UTILITY
- L3 LEISURE/RECREATION
- W3 WASTE MANAGEMENT
- T3 KEY TRANSPORT ROUTE
- P3 PUBLIC RIGHT OF WAY
- OPEN ACCESS LAND

ECOLOGICAL RECEPTORS

- E3 SSSI
- E3 SAC
- E3 RAMSAR
- E3 SPA
- E3 NNR
- E3 LNR
- E3 SINC
- W1





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RECEPTOR TYPE

G	0M	GROUNDWATER
C1	0M	STORAGE YARD
C2	0M	STORAGE YARD
C3	0M	SALVAGE YARD
WM1	0M	ELV ATF
W1	2M	WATERCOURSE
I1	8M	ABATTOIR
E1	29M	SSSI
E2	29M	SINC
O1	31M	OPEN ACCESS LAND
U1	34M	STOR ENERGY
I2	36M	AUTOMOTIVE PARTS MANUFACTURER
WM2	45M	WASTE TRANSFER STATION
U2	100M	STOR ENERGY
U3	121M	33KV OVERHEAD POWER LINES
C4	146M	SALVAGE YARD
WM3	221M	ELV ATF
U4	241M	RESERVOIR (UNDERGROUND)
E3	248M	SINC
U5	264M	RESERVOIR (ABOVE GROUND)
C5	264M	CARAVAN STORAGE
P1	276M	PUBLIC RIGHT OF WAY
C6	277M	FURNITURE RETAILER
C7	286M	FURNISHINGS RETAILER
C8	295M	MOT CENTRE
T1	309M	A465 HEADS OF THE VALLEYS ROAD
R1	320M	RESIDENTIAL PROPERTY
C9	326M	GROCERIES RETAILER
C10	326M	GROCERIES RETAILER/PETROL STATION
C11	334M	STORAGE YARD
C12	343M	CARPET RETAILER
C13	357M	OFFICE/STORAGE YARD
R2	348M	RESIDENTIAL PROPERTY
P2	374M	NATIONAL CYCLE ROUTE 46
C14	391M	HOMEWARES RETAILER
O2	416M	STABLES/STORAGE/ALLOTMENTS
C15	428M	FLOORING/FURNITURE RETAILERS
C16	442M	PETROL STATION
W3/L1	445M	POND
R3	549M	RESIDENTIAL PROPERTY
O3	565M	STABLES/STORAGE YARDS
O4	606M	FARM
R4	608M	RESIDENTIAL PROPERTIES
P3	609M	PUBLIC RIGHT OF WAY
U6	682M	ELECTRICITY SUBSTATION
L3	688M	PARK/RECREATION AREA
R5	700M	RESIDENTIAL PROPERTIES
W4/L2	705M	RESERVOIR (ANGLING)
U7	745M	RESERVOIR (UNDERGROUND)
L4	762M	PLAYING FIELDS
W5/L5	816M	RESERVOIR (ANGLING)
P4	820M	PUBLIC RIGHT OF WAY
I5	862M	LANDFILL
R6	878M	RESIDENTIAL PROPERTIES
L6	948M	PLAYING FIELDS
R7	958M	RESIDENTIAL PROPERTY
L7	964M	PLAYING FIELD
E4	1920M	SINC
E5	1967M	SINC
E6	1993M	SINC

AMENDMENTS

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A	REPLACE PREVIOUS RECEPTOR PLAN (FPMP V5 REV 1 – 19/017D 001)	25/07/25	SCW	NB

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- NON-COMBUSTIBLE WASTE
- EMERGENCY VEHICLE ACCESS/EGRESS
- REFER TO STORAGE PLAN FOR DETAILS OF WASTES

N

STORAGE BUILDING
SWIP BOILER HALL
DRYING AREA
FINES
SCREENING
SHREDDED RDF
SHREDDER
RDF PREPARATION
RDF (UNSTORED)
NON-HAZ. (UNSTORED)
AGGREGATE/SOIL SCREENING
HEAVY FRACTION
QUARANTINE/ NON-CONFORMING WASTE HOLDING AREA
Wind Turbine
WIND TURBINE
NO STORAGE
TANK
ASBESTOS
HAZ. WOOD
NON-HAZ. STORAGE BAY
NO WASTE STORAGE SOUTH OR EAST OF RED LINE.
SKIP/EQUIPMENT/ AQP-COMPLIANT AGGREGATES ONLY
WOOD
SCREENING
PLASTICS
LIGHTS
METALS
MIXED WASTE TIPPING & SORTING
METAL
METAL
TYRES
PAPER/ CARD
UPVC
GYPSUM
GREEN
SUB-STATION
NON-HAZ. STORAGE AREA
SKIP, PLANT & EQUIPMENT, AND/OR AQP-COMPLIANT AGGREGATE STORAGE AREA
Power Station
WOOD
PLASTIC
CARD/PAPER
METAL
SORTED NON-HAZ WASTE STORAGE BAYS
CRUSHING/ SCREENING/ AGGREGATE STORAGE
Recycling Business
STORAGE BUILDING
SCREENING BUND
STORAGE CONTAINER
STORAGE CONTAINER
STORAGE CONTAINER
DISUSED CONTAINERISED/ MOBILE OFFICES
WEIGHBRIDGE
BIOMASS BOILER
STORAGE YARD (3RD PARTY)
WORKSHOP
STORAGE YARD 3RD PARTY
BIOMASS BOILER
SKIP, PLANT & EQUIPMENT, AND/OR AQP-COMPLIANT AGGREGATE STORAGE AREA
ESS
ESS
Weighbridges
CG
GG
EMERGENCY GRAB PACK FIXED TO OUTSIDE WALL
WEIGHBRIDGE OFFICE, ADMINISTRATIVE OFFICES, WELFARE AND STORAGE
ACCESS MAY BE RESTRICTED
CONCRETE MANUFACTURE
STORAGE CONTAINER
EQUIPMENT STORAGE
SUB-STATION
SKIP, PLANT & EQUIPMENT, AND/OR AQP-COMPLIANT AGGREGATE STORAGE AREA
SCREENING BUND
SCREENING BUND
PARKING
SCREENING BUND
SCREENING BUND
SITE ENTRANCE
SITE ENTRANCE
SITE ENTRANCE FROM PENGARNDDU IND. EST. (GRID REF. SO 07900 08803)
SITE ENTRANCE FROM PENGARNDDU IND. EST. (GRID REF. SO 07978 08800)

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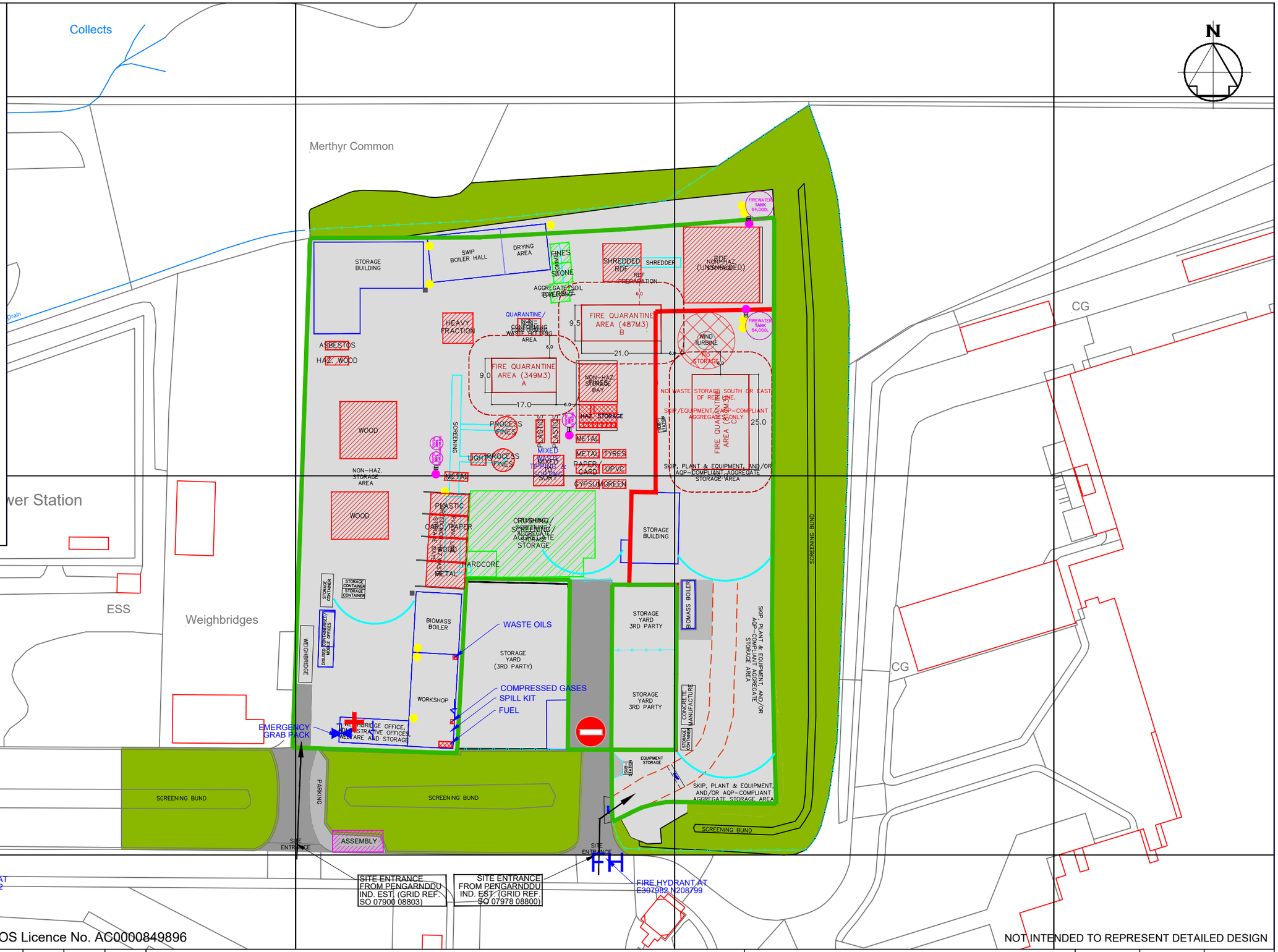
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- FE — FIRE ESCAPE
- ASSEMBLY — FIRE ASSEMBLY POINT
- FIRE EXTINGUISHER
- FIRE HOSE
- TANK — FIREWATER TANK
- IBC WATER TANK
- FIRST AID KIT
- MAIN ELECTRICAL BREAKER
- MAINS WATER STOPCOCK
- FIRE QUARANTINE AREA
- FIREWATER CONTAINMENT BOOM

REFER TO STORAGE PLAN FOR DETAILS OF WASTES



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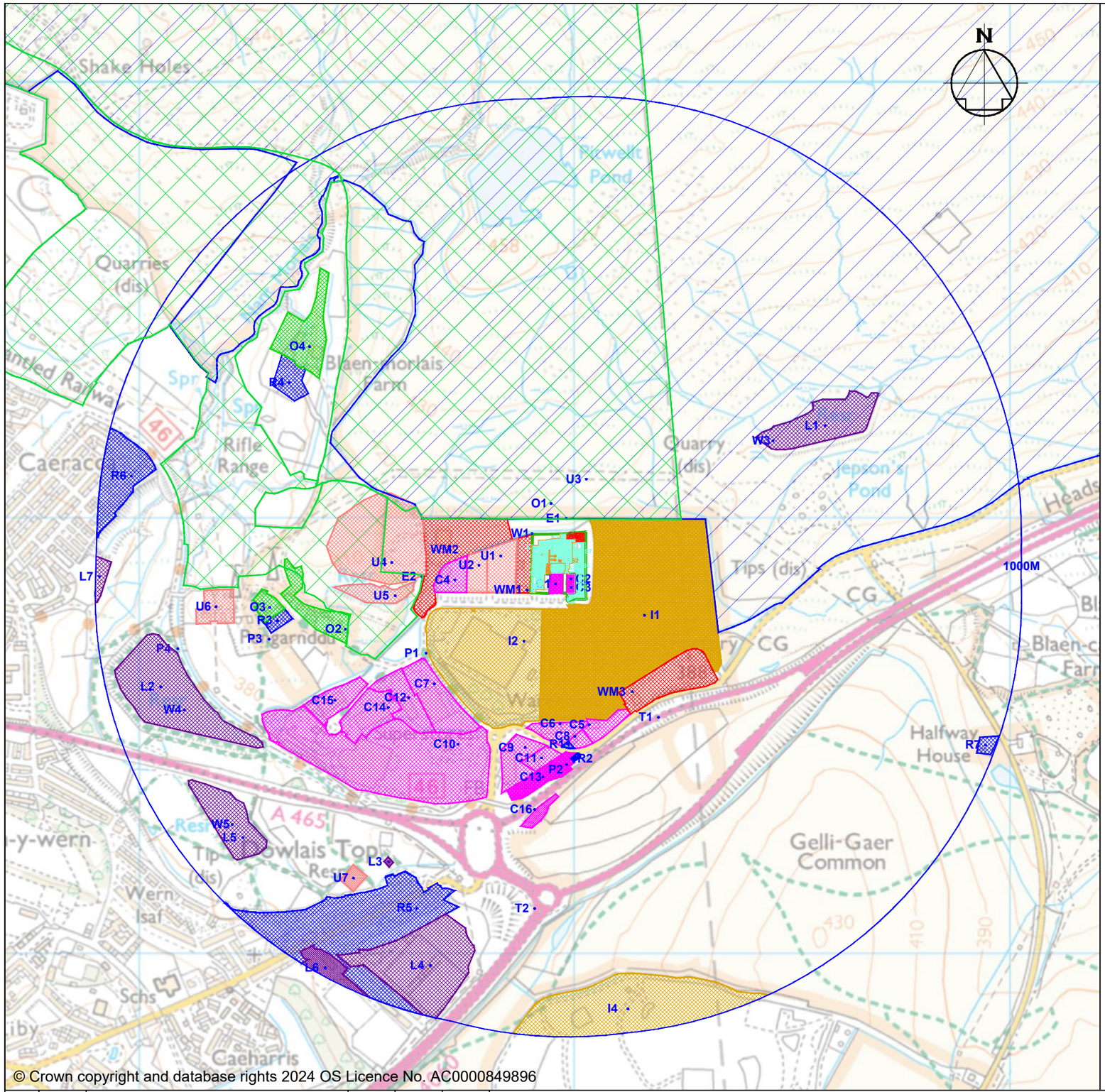
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		RECEPTOR TYPE	PROPERTY/ORGANISATION	CONTACT NUMBER
G	0M	GROUNDWATER	GROUNDWATER	NO CONTACT NUMBER
C1	0M	STORAGE YARD	PAUL BROGDAN	NO CONTACT NUMBER
C2	0M	STORAGE YARD	UNKNOWN	NO CONTACT NUMBER
C3	0M	SALVAGE YARD	MERTHYR RECLAMATION	07702 399711
WM1	0M	ELV ATF	ABBA SCRAP METALS	01685 722758
W1	2M	WATERCOURSE	WATERCOURSE	NO CONTACT NUMBER
I1	8M	ABATTOIR	ST MERRYN/KEPAK	01685 354800
E1	29M	SSSI	MYNYDDOEDD LLANGYNIDR A LLANGATWG	NO CONTACT NUMBER
E2	29M	SINC	MERTHYR COMMON NORTH	NO CONTACT NUMBER
O1	31M	OPEN ACCESS LAND	GELIGAER AND MERTHYR COMMON	NO CONTACT NUMBER
U1	34M	STOR ENERGY	CONRAD ENERGY	01235 427290
I2	36M	AUTOMOTIVE PARTS MANUFACTURER	TENNECO WALKER UK	01495 711211
WM2	45M	WASTE TRANSFER STATION	HAMPSHIRE DEMOLITION AND RECYCLING	01685 725000
U2	100M	STOR ENERGY	PULSE CLEAN ENERGY	01675 437777
U3	121M	33KV OVERHEAD POWER LINES	NATIONAL GRID	0800 096 3080
C4	146M	SALVAGE YARD	MERTHYR SALVAGE	01685 375406
WM3	221M	ELV ATF	HEADS OF THE VALLEYS SALVAGE	01685 386649
U4	241M	RESERVOIR (UNDERGROUND)	DWR CYMRU WELSH WATER	0800 052 0145
E3	248M	SINC	BLAENMORLAIS	NO CONTACT NUMBER
U5	264M	RESERVOIR (ABOVE GROUND)	DWR CYMRU WELSH WATER	0800 052 0145
C5	264M	CARAVAN STORAGE	ROBINS CARAVAN STORAGE	01685 384264
P1	276M	PUBLIC RIGHT OF WAY	PUBLIC ACCESS ROUTE	NO CONTACT NUMBER
C6	277M	FURNITURE RETAILER	COMFORTZONE	01685 377880
C7	286M	FURNISHINGS RETAILER	DUNELM	01685 490043
C8	295M	MOT CENTRE	BLAKEY'S MOT CENTRE	01685 384264
T1	309M	A465 HEADS OF THE VALLEYS ROAD	SOUTH WALES TRUNK ROAD AGENT (SWTRA)	0300 123 1213
R1	320M	RESIDENTIAL PROPERTY	BLAKEY'S MOT CENTRE	01685 384264
C9	326M	GROCERIES RETAILER	LIDL	020 3966 5566
C10	326M	GROCERIES RETAILER/PETROL STATION	ASDA	01685 379981
C11	334M	STORAGE YARD	PINNACLE CONSTRUCTION	07494 446260
C12	343M	CARPET RETAILER	CARPETRIGHT	01685 707080
C13	357M	OFFICE/STORAGE YARD	PENGARNDDU HIGHWAYS	NO CONTACT NUMBER
R2	348M	RESIDENTIAL PROPERTY	STATION HOUSE	NO CONTACT NUMBER
P2	374M	NATIONAL CYCLE ROUTE 46	WALK WHEEL CYCLE TRUST	0117 926 8893
C14	391M	HOMEWARES RETAILER	B&M HOME STORE	0330 838 9521
O2	416M	STABLES/STORAGE/ALLOTMENTS	CASTLE ROW, PENGARNDDU	NO CONTACT NUMBERS
C15	428M	FLOORING/FURNITURE RETAILERS	CARPET & BED CO, TRADE PRICE SOFAS, FLOOR GIANTS	01685 388340
C16	442M	PETROL STATION	TEXACO, VALLEY HEIGHTS	01685 374792
W3/L1	445M	POND	JEPSON'S POND (MERTHYR TYDFIL ANGLING ASSOCIATION)	01685 723520
R3	549M	RESIDENTIAL PROPERTY	CASTLE ROW, PENGARNDDU	NO CONTACT NUMBER
O3	565M	STABLES/STORAGE YARDS	CASTLE ROW, PENGARNDDU	NO CONTACT NUMBERS
O4	606M	FARM	BLAEN-MORLAIS FARM	NO CONTACT NUMBER
R4	608M	RESIDENTIAL PROPERTIES	BLAEN-MORLAIS FARM	NO CONTACT NUMBER
P3	609M	PUBLIC RIGHT OF WAY	FOOTPATH	NO CONTACT NUMBER
U6	682M	ELECTRICITY SUBSTATION	DOWLAIS GRID STATION (NATIONAL GRID)	NO CONTACT NUMBER
L3	688M	PARK/RECREATION AREA	PLAYGROUND	NO CONTACT NUMBER
R5	700M	RESIDENTIAL PROPERTIES	DOWLAIS TOP	NO CONTACT NUMBERS
W4/L2	705M	RESERVOIR (ANGLING)	PENYWERN POND - TOP POND (MTAA)	07931 512483
U7	745M	RESERVOIR (UNDERGROUND)	DOWLAIS TOP RESERVOIR (DCWW)	0800 052 0145
L4	762M	PLAYING FIELDS	DOWLAIS RFC AND PLAYGROUND	01685 382322
W5/L5	816M	RESERVOIR (ANGLING)	PENYWERN POND - MIDDLE POND (MTAA)	07931 512483
P4	820M	PUBLIC RIGHT OF WAY	FOOTPATH	NO CONTACT NUMBER
I5	862M	LANDFILL	BIFFA, TRECATTI LANDFILL	0800 307307
R6	878M	RESIDENTIAL PROPERTIES	CAERACCA, PANT	NO CONTACT NUMBERS
L6	948M	PLAYING FIELDS	DOWLAIS RFC	01685 382322
R7	958M	RESIDENTIAL PROPERTY	HALFWAY HOUSE	NO CONTACT NUMBER
L7	964M	PLAYING FIELD	CAERACCA PLAYING FIELDS	NO CONTACT NUMBER
E4	1920M	SINC	BLAENMORLAIS	NO CONTACT NUMBER
E5	1967M	SINC	BRYNIAU	NO CONTACT NUMBER
E6	1993M	SINC	TYLE HAIDD	NO CONTACT NUMBER

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MP5 Aggregate Quality Protocol - Factory Control System

MP5 Aggregates Factory Production Control Manual

Waste Transfer Station with Treatment

Bespoke Environmental Permit

PERMIT NUMBER EPR/ZP3899FX

Unit 5 Pengarnddu Industrial Estate

Dowlais, Merthyr Tydfil, CF48 2TA

Tel: 01685 370188

Email: mbrc@hotmail.com

Document Revision

Version	Date	Author	Checked / App'd	Revision
1.0	10/11/14	SW	NB	RELESE VERSION
1.1	01/10/18	SW	NB	MINOR UPDATES FOR CONSISTENCY WITH EMS
1.2	25/07/25	SW	NB	EXTENSIVE CONTENT, FORMAT AND DRAWING UPDATES

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1 INTRODUCTION

This Aggregates Factory Production Control System Manual has been prepared by Merthyr Borough Recycling Centre Limited and is a component of a suite of documents that form the company's Environmental Management System for managing recycling activities at their facility at Unit 5 Pengarnddu Industrial Estate, Dowlais, Merthyr Tydfil, CF48 2TA.

Reference is made throughout this document to processes and procedures within the EMS and in particular to a Corrective Action Response (CAR) Procedure (**PR15**) which details how the company will deal with any deficiencies identified during a scheduled or unscheduled system audit/check or justified customer/resident/staff complaint.

Within this EMS Plan, text highlighted in **Bold Blue** refers to documents that form part of the EMS.

One of the fractions received or separated at the facility is inert construction and demolition waste which when crushed, can be sold as a product in accordance with the Aggregates Quality Protocol. Quality control is required for the production of aggregates from waste in order to ensure customer satisfaction and to enable Merthyr Borough Recycling Centre Limited to demonstrate that their waste has been fully recovered. This Aggregates Factory Production Control System Manual details the company's approach to recovering aggregates from waste in accordance with the Aggregates Quality Protocol.

2 PRODUCTION SITE

2.1 Site of Production

The aggregates Factory Production Control (FPC) system has been developed for the production of recycled aggregates by Merthyr Borough Recycling Centre Limited at Unit 5 Pengarnddu Industrial Estate, Dowlais, Merthyr Tydfil, CF48 2TA.

2.2 Environmental Permit

Merthyr Borough Recycling Centre Limited operates under a Tier 3 Bespoke Environmental Permit for a household, commercial and industrial waste transfer station with treatment & asbestos storage at their site located at Unit 5 Pengarnddu Industrial Estate, Dowlais, Merthyr Tydfil, CF48 2TA.

The site currently operates under a Tier 3 Bespoke Environmental Permit number EPR/ZP3899FX.

Activities regulated under the bespoke environmental permit are:

- Hazardous & non-hazardous household, commercial and industrial waste transfer station with treatment and asbestos storage;
- End-of-Life (ELV) storage, depollution & dismantling;
- Inert and excavation waste transfer station with treatment; and
- Dewatering of street sweepings/gully suckings.

The site has a maximum annual throughput of 252,000 tonnes per annum. This is nominally broken down as consisting of 167,500 tonnes of non-hazardous waste, 10,000 tonnes per annum of hazardous waste and 75,000 tonnes of inert waste.

Currently, End-of-Life (ELV) storage, depollution & dismantling, and the Dewatering of street sweepings/gully suckings is not carried out on site.

2.3 Waste Carrier's License

Merthyr Borough Recycling Centre Limited holds a Waste Carrier's Licence number CBDU015236.

2.4 Products

The recycled aggregate products produced at the site are as follows:-

- Granular Sub Base (GSB)
  An unbound 40mm down to dust granular sub-base material. Normally used as the main load-bearing layer for highway and pavement construction.
- 6F5
  This aggregate is used as a granular fill material and is mainly 80mm down with a <50% recycled asphalt content. Commonly used as a capping layer, for trench fill, temporary roads and oversite fill.

3 MANAGEMENT AND OPERATIONAL STAFF

3.1 Administration and Responsibilities

The following staff will have duties under the aggregates FPC system:

- Nicholas Brannan Site Manager and CoTC Holder
- Weighbridge Manager
- Site operatives

Nicholas Brannan is responsible for overseeing the Quality System and ensuring the aggregates FPC system is implemented.

Nicholas Brannan will undertake an annual review of the aggregates FPC system and in response to changes in aggregate specifications, legislation, and use of new plant or production techniques. The purpose of the review is to ensure that the aggregates FPC system is operating effectively with the production of a consistent quality recycled product. In addition there will be 6 monthly internal audits by the Site Manager which will include the review of all test result data. Records of reviews and audits shall be kept in the Site Office.

All members of staff involved in any stage of the production of recycled materials will be fully conversant with the contents of the aggregates FPC system and Aggregates Quality Protocol (AQP).

Any sub contractors involved in the production process will be supplied with a copy of the AQP and must comply with the aggregates FPC system as relevant to their work.

Nicholas Brannan will ensure that any up dates or reviews of the aggregates FPC system and/or AQP are communicated to all staff and contractors involved in the production of the recycled aggregate products. A full and up to date copy of the aggregates FPC Manual and AQP will be kept in the main office at all times.

The Weighbridge Manager will be responsible for maintaining all records relating to the production of recycled aggregate covering:

- Waste Transfer Notes
- Weighbridge Tickets
- Register of Deliveries
- Rejection Notices
- Test Sampling and Result Records
- Mobile plant maintenance and inspection records

3.2 Training

All personnel involved in the process will be trained to conform with the aggregates FPC system and other relevant legislation. Site staff will be given training by the Site Manager in respect of their duties under the aggregates FPC system and will be responsible for implementing the aggregates FPC system as relevant to their daily work activities.

All training records will be kept and maintained at the general office. Only suitably qualified and trained staff will be allocated assigned tasks in the Protocol.

4 RESOURCES

4.1 Transfer Station

4.1.1 Site Location

The Site is located at Unit 5 Pengarnddu Industrial Estate, Dowlais, Merthyr Tydfil, CF48 2TA, approximately 4km northeast of Merthyr Tydfil town centre (drawing **10915 - 000 - A**). The approximate centre of the site is located at grid reference SO 07961 08897.

The site occupies an area of ~1.6 hectares (~3.96 acres). It is roughly shaped as an inverted "U", and slopes gently downwards from north to south west from 409m AOD to 400m AOD.

The facility is located in an area of historic industrial and minerals use, that has subsequently been redeveloped for commercial and industrial use. The surrounding area is occupied by a mix of commercial and industrial, and agricultural land. Isolated residential properties are located some distance to the south and east of the site.

The facility's immediate neighbours are an End-of-Life Vehicle recycling facility, storage units for construction materials, including a re-use facility, and an abattoir and meat processing facility.

4.1.2 Site Access

The site is easily accessed from the A465 Heads of the Valleys Road via an unnamed access road to the Pengarnddu Industrial Estate.

The grid reference of the site entrance is SO 07902 08829 and exit SO 07983 08813.

4.1.3 Site Ownership

The site is owned by Merthyr Borough Recycling Centre Limited.

4.1.4 Site Layout

The permitted area is shown in drawing **10915 - 000 - B**.

A block plan for the site is shown in drawing **10915 - 000 - C**. The entrance to the site is located in the south western corner of the site. Access to the site is via a pair of 2.0 m high steel palisade fence type gates. A weighbridge and disused containerised office units are located immediately to the north of the site entrance, and to the east an L-shaped portal frame building housing the weighbridge and administrative offices, staff welfare facilities, a large workshop and at its northern extent, a small biomass boiler. To the immediate north of the L-shaped building is a waste processing line comprising screens, a trommel and picking line which is elevated above a series of storage bays. To the immediate west and north of the waste processing line is a storage area for mixed and segregated wastes, to the north east of which is a rectangular portal frame building housing a biomass boiler and drying floor ("Biomass Building 2"). In the centre of the site, immediately to the south of Biomass Building 2, is additional storage. The whole site to the south and west of Biomass Building 2 in impermeably surfaced with a sealed drainage system and is suitable for the storage of non-hazardous and hazardous wastes. To the east of Biomass Building 2 is an area used for the storage of empty skips and a wind turbine. To the south east of the wind turbine, and running parallel with the eastern site boundary, is an area used to store skips containing sorted wastes. To the west of this storage area is a third portal frame building used for vehicle storage, a small containerised biomass plant, and a small concrete manufacturing area containing a cement silo and mixer.

A large bund, approximately 5m high extends along the southern boundary of the site, another bund, approximately 3m high, along the eastern boundary of the site. The site fenced on all sides using a combination of palisade and wire mesh fences 2.0m high.

4.1.5 Site Personnel

Technically competent staff will supervise the site and ensure that it is operated in accordance with the environmental permit, this Environmental Management System Plan and current legislation.

The site Manager will ensure that sufficient competent staff are present on-site to manage and operate the sites activities without causing pollution. Staff will be competent in the activities they are expected to carry out. Staff will be expected to not only be competent in normal situations, but also be adequately trained so that they are competent in abnormal situations such as plant failures or accidents.

Procedure **PR12** details the method by which the company will record staff responsibilities. It ensures that staff roles and responsibilities are clearly defined and recorded (**FR9**) and names placed against each role and responsibility (e.g. Technically Competent Manager, Plant Operator, etc.). Details of who is responsible for ensuring compliance with each part of the permit and other relevant legislation and guidance are also registered. Documents are reviewed and updated at least every 6 months, or if staff change roles or leave the organisation.

4.1.6 Technically Competent Manager

The company will employ and train at least one Technically Competent Manager.

The site's Technically Competent Manager is Nicholas Brannan who holds a WAMITAB Level 4 qualification in compliance with permit requirements.

Other Technically Competent Managers will be recruited as necessary to maintain compliance with permit attendance criteria. The times that the Technically Competent Manager spends at the facility during operating hours will be recorded in the Site Diary.

4.2 Plant and Equipment

All plant and equipment is serviced by our in-house mechanic on a pre-planned maintenance schedule.

The mobile plant used to process aggregate materials include:

- Jaw crusher
- Various screens
- 2 x Wheeled Loading Shovel
- 360º excavator

From time to time specialist equipment may be hired to produce certain products.

4.3 Inspection and Maintenance Procedures for Site Infrastructure

The Site Manager is responsible for carrying out site inspections on at least a twice daily basis. These inspections provide a mechanism to assess whether site operations are being carried out in accordance with the EMS and that environmental management and control systems are operating within expected performance limits. The yards, buildings, office/welfare area, fence and entrance gates/doors are inspected. Olfactory, Dust and Noise assessments are carried out along the site boundary. The outcome of those inspections are recorded on the daily inspection checklist (**FR1**) along with any remedial action required. If necessary, for more complex actions

(e.g. changes to infrastructure), a Corrective Action Request (**FR11**) is also raised in accordance with **PR15**. The CAR process will identify the root cause of any problem, and allocate a member of staff and timeframe to ensure that the corrective action is carried out. Outstanding CARs are reviewed at the quarterly business management meetings (or sooner if there is a significant risk to the environment or operations of the business).

Any defect encountered during inspection will be repaired as soon as is reasonably practicable within the working day as a temporary measure and permanent repairs will be completed within 7 working days.

The existing concrete slabs will be cleared of all wastes in a phased sequence to ensure that all areas are progressively exposed for inspection at a frequency no less than once per month. The cleared areas will be swept clean or scraped to remove any adhering solids and to ensure the absence of breeding insects or vermin. The exposed areas will then be inspected thoroughly to ensure continuing impervious integrity and any defects repaired to a standard no less than that when new. The inspections, findings and any repairs undertaken will be entered in the Site Diary.

The impermeable concrete surfaces will be inspected annually by a Chartered Civil Engineer who will report whether or not the impermeable surface is in a good condition and suitable for the purpose described in the Environmental Management System Plan.

The dates of all such inspections, the findings and any repairs and cleaning undertaken will be entered in the Site Diary.

Maintenance procedures are detailed in Procedure **PR11**. A maintenance schedule identifying items of plant, location of maintenance instructions and responsibilities will be kept and maintained (**FR5A** and **FR5B**). Maintenance records (**FR6**) for plant and equipment and site infrastructure will be kept in the Weighbridge Office and maintained by the Site Manager.

4.4 Storage Areas

All inert waste may be stored and treated on either impermeable surface with sealed drainage or hardstanding.

Designated storage areas and bays are located within the waste transfer station buildings and in the yard areas as indicated on Drawing **10915 - 000 - C**.

5 METHOD STATEMENT OF PRODUCTION

5.1 Waste Acceptance Procedure

All wastes arriving at the site are accepted in acordance with the site's Waste Acceptance Procedure (**PR9**).

The process of ensuring that the correct materials enter the site begins with the sales process. A telephone call is made to the office requesting a skip or waste service to be provided and the sales staff advise the customer what may and may not be placed in the skip.

When waste is collected from the producer the driver will inspect the load to check that the waste is suitable and will issue a Waste transfer Note. The Waste Transfer Note will contain the following details:-

- Name and address of Waste Producer
- Name and address of Waste Carrier
- Name and address of Waste Disposal Point
- Waste Carriers` Licence Number
- Date of Collection
- Waste Description
- EWC Code
- SIC Code
- Pre-treatment status of the waste
- Statement regarding adherence to the waste hierarchy
- Signatures of all parties involved in the waste transfer
- Any other information required by the Duty of Care legislation

Builder's skips and RO-RO containers delivered to the transfer station by waste management contractors or by the company's own vehicles enter the facility via the site main entrance.

Where waste is delivered by third-parties the driver is required to attend at the site office where all waste transfer notes are inspected by the Site Supervisor (or other competent person on-site) and the information is recorded.

The vehicle is directed to the site weighbridge and the gross vehicle weight measured. The Site Supervisor (or other competent person on-site) then carries out visual checks on the waste to confirm that it is described adequately, conforms to any pre-acceptance checks and that the waste is permitted for acceptance at the site.

A weighbridge ticket is produced and the vehicle is directed to the tipping area to deposit the load. The vehicles is unloaded and loads inspected again. The inspection shall confirm that the deposited load complies with the waste transfer note description and EWC coding and also that any visible amounts of foreign materials (including wood, plastics, asbestos, rubber, metal, plaster, organic material) do not exceed the maximum tolerances of 1%.

Following inspection, either:

- Wastes are acceptable, the company takes responsibility for the duty of care of the waste, and the driver is issued with a conveyance note confirming receipt of the waste; or
- If the Site Supervisor/Technically Competent Person finds any irregularities with the waste after deposit then the waste will be either re-loaded back into the vehicle and rejected from the site, or will be

quarantined within a secure quarantine area pending further enquiries and agreement with or instructions received from Natural Resources Wales (as required). The Best Practicable Environmental Option for recovery/disposal of the non-conforming material will be used. Arrangements for the offsite transfer/disposal of non-conforming wastes will be made as soon as arrangements can be finalised taking due account of their potential to cause environmental impact/nuisance e.g. odour etc. A rejection notice (Appendix A – Form **FPC2**) will be issued for rejected loads.

For all loads received on site the Site Operator shall enter the load details in the Register of Deliveries, Rejections and Collections (Appendix A – Form **FPC1**).

Once accepted the vehicle returns to the weighbridge and is weighed again to determine the net weight of the load.

Waste Transfer Notes, Weighbridge Tickets and Rejection Notices shall be kept in the main office for a minimum period of 6 years.

The materials segregated and used to produce a recycled aggregate will include only the following waste types (in accordance with the materials defined in Appendix C of the Aggregates Quality Protocol):-

European Waste Catalogue Code

01 04 08	Waste gravel and crushed rocks other than those mentioned in 01 04 07
01 04 09	Waste sand and clays
10 11 03	Waste glass based fibrous materials
15 01 07	Glass packaging
17 01 01	Concrete including solid dewatered concrete process waste
17 01 02	Bricks
17 01 03	Tiles and ceramics
17 01 07	Mixtures of concrete, brick, tiles and ceramics
17 02 02	Glass
17 03 02	Bituminous mixtures other than those mentioned in 17 03 01
17 05 04	Soils and stones including gravel
17 05 06	Dredging spoil
17 05 08	Crushed rock, sand, clay, road base and planings and track ballast
17 09 04	Mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03
19 12 05	Glass
19 12 09	Minerals (for example sand, stones)
20 01 02	Glass
20 02 02	Soils and stones restricted to parks waste

5.2 Production

A flow diagram of the main steps in the Method of Production is provided in Appendix B.

Once inspected and accepted, wastes will be stockpiled in designated areas prior to processing. Stockpiled materials shall be inspected on a daily basis by the site staff to ensure there are no issues that could affect product quality. The inspection will look to at conditions such as contamination or moisture levels. Where the condition of the stockpile is such that the material would not be suitable for processing it shall be removed to the reject area and the details of the rejected material recorded.

The material stockpiled has already been through a pre-sorting process (or more extensive sorting process to remove minerals from incoming construction and demolition waste) and is mainly uncrushed inert material. The production process involves screening to remove soils and smaller stones, dry crushing and secondary screening to separate a range of sized aggregates. Any metals are removed with a magnet into a skip and any foreign objects are hand-picked from the stockpile.

The finished product is visually inspected at least twice a day during production. If non-conforming items are found within the product, then the material is spread and re-picked until visually clean again. If it is not possible to remove contaminants to a satisfactory level, the material will be quarantined and removed from the production process. It is impossible for the finished product to be completely free of contaminants, but the company strives to minimise contamination to the best of its ability.

5.3 Products

All product designations will be derived from the relevant European Standard for Aggregates and industry specifications. Table 1 defines the specification for products currently produced on site.

Product	Standards	Specifications	Property	Tested in Accordance with:	Grade	Quality Controls
Granular Sub-Base (GSB) Unbound mixture	BS EN 13242 Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction	BS EN 13285: Unbound mixtures; Specifications or Highways Agency Specifications for Highway Works (SHW) Series 800 Clauses 800, 801 and 803 or HAUC: Specification for the reinstatement of openings in highways (SROH) or A Specification for Recycled Aggregate for use in Minor Schemes (RAMS)	(i) Grading	BS EN 933-1	0/31,5 and G_P	BS EN 13242: Level 4 Attestation Evaluation of Conformity to BS EN 16236* SHW Quality Control procedures in accordance with the Quality Protocol for the production of aggregates from inert waste. SROH: Compliance with SHW
			(ii) Maximum fines and oversize categories	BS EN 933-1	UF_9 and OC_{75}	
			(iii) Crushed, or broken and totally rounded particles	BS EN 933-5	$C_{90/3}$	
			(iv) Los Angeles coefficient	BS EN1097-2	LA_{50}	
			(v) Resistance to wear	BS EN 1097-1	M_{DE}NR (no requirement)	
			(vi) Resistance to freezing and thawing – magnesium sulfate soundness	BS EN 1367-1	MS_{35}	
			(vii) Water absorption	BS EN 1097-6	WA_{24}NR	
			(viii) Volume stability of blast furnace slag	BS EN 1744-1	Free from dicalcium silicate and iron disintegration	
			(ix) Volume stability of steel (BOF) and EAF) slag	BS EN 1744-1	V_5	
			(x) Other aggregate requirements	BS EN 13242	Category NR (no requirement)	
			(xi) Class Ra (asphalt), Rg (glass) and X content	BS EN 933-11	SHW Clause 710	
			(xii) California Bearing Ratio	BS 1377-4	SHW Clause 7	

			(xiii) Frost Heave	BS 812-124	SHW Annex B	
			(xiiii) Water soluble sulfate	EN 1744-1	SHW Clause 10	
			(xv) Total Sulphur	BS EN 1744-1	SHW Clause 11	
			(xvi) Description	BS EN 932-3 and BS EN 13242 Annex A		
			(xvii) Sulfide content	BS EN 1744-1	SHW Clause 13	
6F5 Unbound recycled aggregate: Granular fill. General fill Capping Aggregates from source code A4 (mixed recycled aggregate) shall contain not more than 50% of constituents in Class Ra (bituminous materials).	BS EN 13242 Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction	BS EN 13285: Unbound mixtures; Specifications or Highways Agency Specifications for Highway Works (SHW) Series 600 Clauses 600, 601 and 602 or HAUC: Specification for the reinstatement of openings in highways (SROH) or A Specification for Recycled Aggregate	(i) Size designation and overall grading category	BS EN 933-1	0/80 and G_E	BS EN 13242: Level 4 Attestation Evaluation of Conformity to BS EN 16236* SHW Quality Control procedures in accordance with the Quality Protocol for the production of aggregates from inert waste. SROH: Compliance with SHW
			(ii) Maximum fines and oversize categories	BS EN 933-1	UF_{12} and OC_{75}	
			(iii) Los Angeles coefficient	BS EN1097-2	LA_{50}	
			(iv) Volume stability of blast furnace slag	BS EN 1744-1	Free from dicalcium silicate and iron disintegration	
			(v) Volume stability of steel (BOF) and EAF) slag	BS EN 1744-1	V_5	
			(vi) Other aggregate requirements	BS EN 13242	Category NR (no requirement)	
			(vii) Laboratory dry density and optimum water content	BS EN 13285 Clause 5.3	Declared values	
			(viii) Water content	BS EN 1097-5		
			(ix) Class Ra (asphalt) content	BS EN 933-11	SHW Clause 710	
			(x) bitumen content	BS EN 12697-1 or BS EN 12697-39	Note: Does not apply if the Class Ra (asphalt) content of any	

		for use in Minor Schemes (RAMS)			recycled aggregate is 20% or less.	

Table 1. Product details.

5.4 Testing

The material produced is tested in accordance with the schedules presented in 5.4.1.

The testing regime has been developed reflecting the nature of the waste materials accepted and the rate of throughput at the site. Product performance compliance testing will be carried out at varied frequencies depending on the product and test. The test schedule will be maintained and updated by the Site Manager and a copy kept on site.

Daily production records will be kept by the site operatives and samples will be sent for testing in accordance with the test schedule. All samples will have the following details recorded: sample preparation date, test type and name of production facility.

The sampling, including the preparation of samples, shall be undertaken by an independent consultant with the samples sent to a UKAS accredited laboratory. Testing will be performed on samples obtained in accordance with BS EN 932: Tests for general properties of aggregates. BS EN 932 – Part 1: Methods for sampling describes how routine samples will be collected.

Results of the testing will be kept at the general office and the Site Manager shall undertake a review of the test results every six months to ensure testing is up to date.

Test reports will be supplied to customers on request.

5.4.1 Testing Requirements

5.4.1.1 Minimum Testing Requirements

A schedule of test frequencies identifying the minimum requirements of the aggregates FPC system for a range of routine tests is shown in Table 2.

End Use	Standard and Specification	Test	BS Test Reference	Minimum Testing Frequency[1]
All end uses	BS EN 13242 BS EN 13285	Particle size distribution and fines content	EN 933-1	1 per week
		Particle density and water absorption	EN 1097-6	1 per month
		Resistance to fragmentation (LA)	EN 1097-2	2 per year
		Classification of constituents (see Table 3)	EN 933-11	1 per month
		Water soluble sulfate	EN 1744-1	1 per month
		Magnesium Sulphate Soundness	EN 1367-2	1 per 2 years

Table 2. Minimum testing requirements.[2]

[1] Minimum testing frequencies are defined in terms of 'production week', 'production month' and 'production year'. A 'production week' is defined as the period taken to complete the equivalent of 5 production days (40 hours of production). A 'production month' is defined as the period taken to complete the equivalent of 20 production days (160 hours of production). A 'production year' is defined as the period taken to complete the equivalent of 240 production days (1920 hours of production).

[2] Testing frequencies should be increased where variability is identified through Factory Production Control and where the

Code	Constituents
Rc	Concrete, concrete products, mortar, concrete masonry units
Ru	Unbound aggregate, natural stone, hydraulically bound aggregate
Rb	Clay masonry units (i.e. bricks and tiles), calcium silicate masonry units, aerated non-floating concrete
Ra	Bituminous materials
Rg	Glass
FL	Floating material in volume
X	Cohesive (e.g. clay and soil), metals, wood, plastic, rubber, gypsum plaster

Table 3. Classification of constituents.

The maximum permitted amount for constituent X is 1% by mass.

5.4.1.2 Supplementary Testing

Where customers require additional testing for conformance with specifications other than BS EN 13285, the appropriate specification (SHW, HAUC or RAMS as shown in Table 1) shall be followed and testing undertaken in accordance with the defined frequencies shown in Table 4 (unless otherwise stated in the relevant specification).

Test	BS Test Reference	Minimum Testing Frequency[3] per BS EN 16326
Flakiness index and shape index	EN 933-3	1 per month
Shape of coarse and all-in aggregate	EN 933-11	1 per month
Percentage of crushed or broken particles	EN 933-5	1 per month
Angularity of aggregates	EN 933-6	1 per month
California Bearing Ratio	EN 1377 Part 4	1 per month
Plasticity of Fines	EN 1377 Part 2	1 per week
Frost Heave	EN 812 Part 124	1 per year
Resistance to wear	EN 1097-1	2 per year
Volume stability of blast furnace slag	EN 1744-1	2 per year
Volume stability of steel (BOF) and EAF) slag	EN 1744-1	2 per year
Petrographic description	EN 932-3	1 per 3 years
Plasticity Index	EN 1377-2	1 per week
Permeability	EN 1377-6	1 per month
Leaching	EN 1744-3	2 per year

Table 4. Supplementary testing.

Copies of the relevent sections of the SHW are included in Appendices D and E.

measured value is close to the specified limit.

[3] Minimum testing frequencies are defined in terms of 'production week', 'production month' and 'production year'. A 'production week' is defined as the period taken to complete the equivalent of 5 production days (40 hours of production). A 'production month' is defined as the period taken to complete the equivalent of 20 production days (160 hours of production). A 'production year' is defined as the period taken to complete the equivalent of 240 production days (1920 hours of production).

5.5 Changes to Products

It is the company's intention to produce unbound aggregates as sub-base, drainage and general fill material. If the end uses change and an aggregate is produced for recycled aggregate for concrete, recycled aggregate for asphalt, recycled aggregate for hydraulically bound mixtures, or reclaimed asphalt for use in bituminous mixtures, the specifications and testing requirements will be updated as required.

5.6 Storage of Product

Each product shall be clearly marked and kept separate from other products and materials to prevent contamination. The Site Manager shall inspect all stockpiling areas on a daily basis and where there is any issue affect product quality, e.g. cross contamination or excessive moisture levels, corrective action shall be taken as appropriate e.g. reprocessing or rejection of product.

5.7 Supply of Recycled Product

All vehicles collecting product shall first weigh in whereupon they shall be given a Dispatch Ticket (Appendix A – Form **FPC3**). The site operator will load the product and complete the relevant details on the loading authority ticket. The vehicle will be weighed again and the weight recorded. The loading authority ticket must also confirm whether the vehicle leaving the site is sheeted.

All material sold as Aggregates Quality Protocol compliant aggregate is marked on the Dispatch Tickets. Dispatch Tickets will state as a minimum:

- date of supply;
- customer's name and contact details;
- product description to aggregates standard and customer specification;
- the name and contact details of the producer, including the address of the site of production;
- quantity supplied by weight/volume; and
- a statement that the product was produced in compliance with the Aggregates Quality Protocol.

For all loads dispatched from site the Site Operator shall enter the load details in the Register of Deliveries, Rejections and Collections (Appendix A – Form **FPC1**).

All Dispatch Tickets are kept for a minimum of three years.

5.8 Non Conforming Products

The Site Manager shall be responsible for inspecting products on a daily basis. Where appropriate 'non conforming' products may be directed for reprocessing or rejected to the reject area. Where it is necessary to take corrective action for non conforming products, including delivered product found to be non conforming, details will be fully recorded. The Site Manager shall review the processing operations and take actions as necessary to address the problems.

6 DOCUMENTATION

6.1 Record Keeping

The following documentation shall be maintained as part of the aggregates FPC system procedures:

- Waste Transfer Notes
- Weighbridge Tickets
- Register of Deliveries
- Rejection Notices
- Production Records
- Non-Conforming Records
- Sampling Result Records
- Loading Authority Tickets
- Mobile plant maintenance and inspection records
- Waste Exemption Registration

All records shall be kept by the general office for a minimum period of three years (6 years for Waste Transfer Notes, Weighbridge Tickets and Rejection Notices). All records shall be made available to customers and the site regulator on request.

DRAWINGS

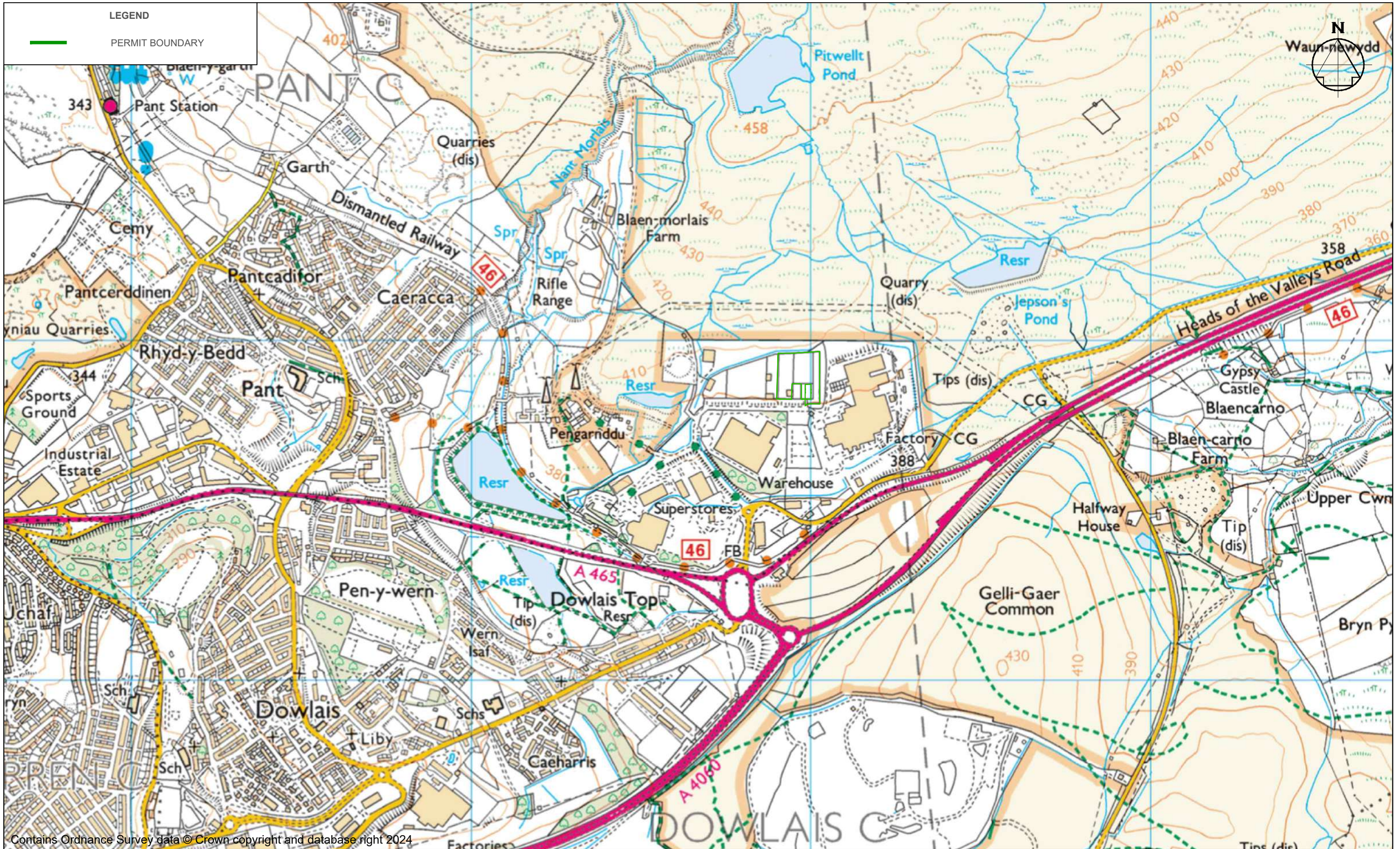
Refer to the Drawings section of the EMS for current Site Drawings and Plans

Drawing **10915 – 000 - A** Permitted Area Plan

Drawing **10915 – 000 - B** Site and Surrounding Area Plan

Drawing **10915 – 000 - C** Site (Block) Plan

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AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	UPDATE BASE MAP	04/07/22	SCW	NB
B	UPDATE BASE MAP	24/04/23	SCW	NB
C	UPDATE BASE MAP	25/07/25	SCW	NB

TECHNIA ENVIRONMENT AND PLANNING LTD
UNIT 1 FOXES LANE, OAKDALE BUSINESS PARK
BLACKWOOD, NP12 4AB
TEL: 02921 900400
EMAIL: PLANNING@TEPL.EU

MERTHYR BOROUGH RECYCLING COMPANY LTD

LOCATION PLAN

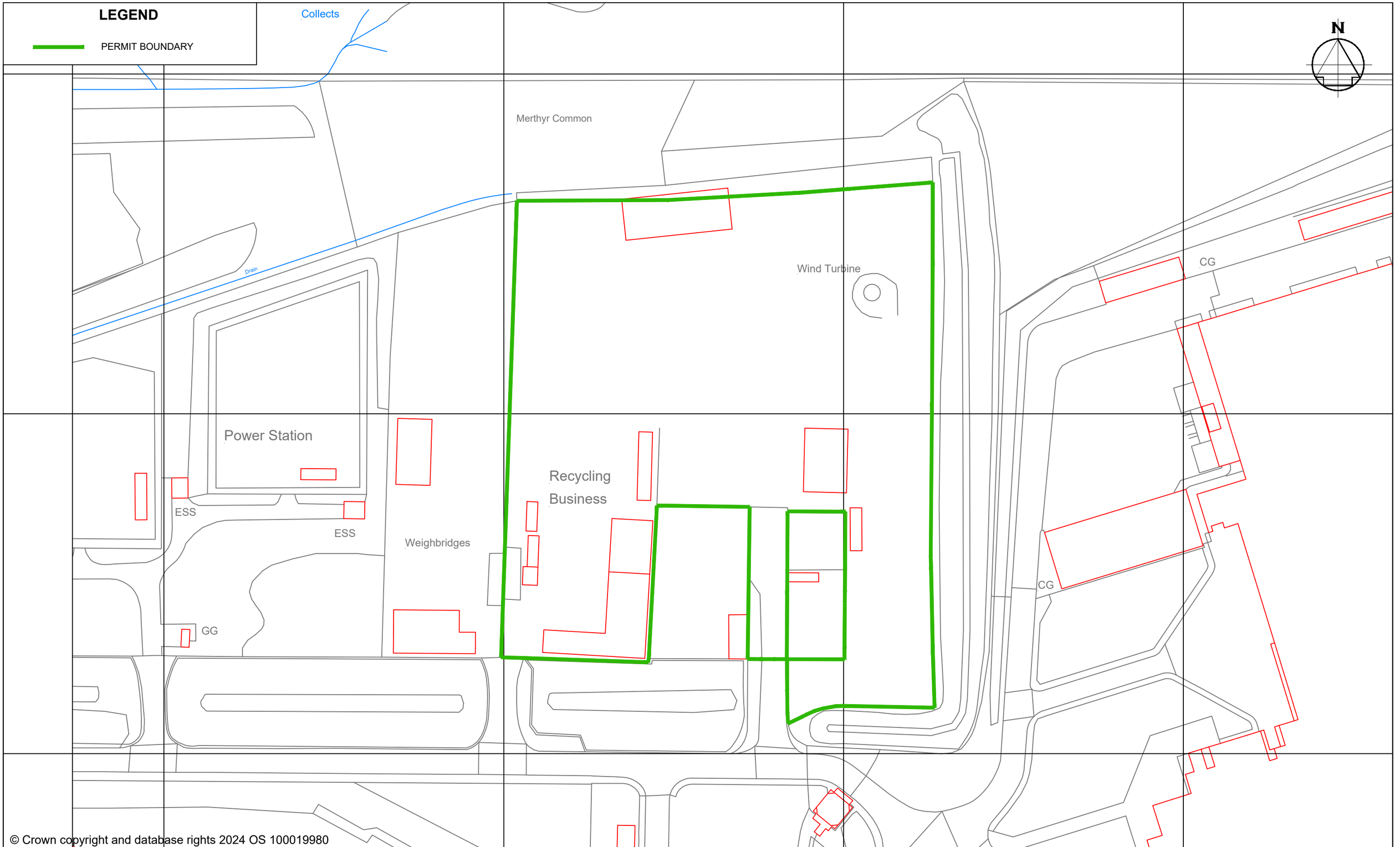
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Drawn	SCW	1:10,000
Ch'kd	NB	
Appr'd	NB	@A3
Date	25/07/25	

Job No. MBRC Drg No. 10915 - 000 - A

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LEGEND

PERMIT BOUNDARY



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AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	UPDATE BASE MAP	24/04/23	SCW	NB
B	UPDATE BASE MAP	25/07/25	SCW	NB

TECHNIA ENVIRONMENT AND PLANNING LTD
UNIT 1 FOXES LANE, OAKDALE BUSINESS PARK
BLACKWOOD, NP12 4AB
TEL: 02921 900400
EMAIL: PLANNING@TEPL.EU

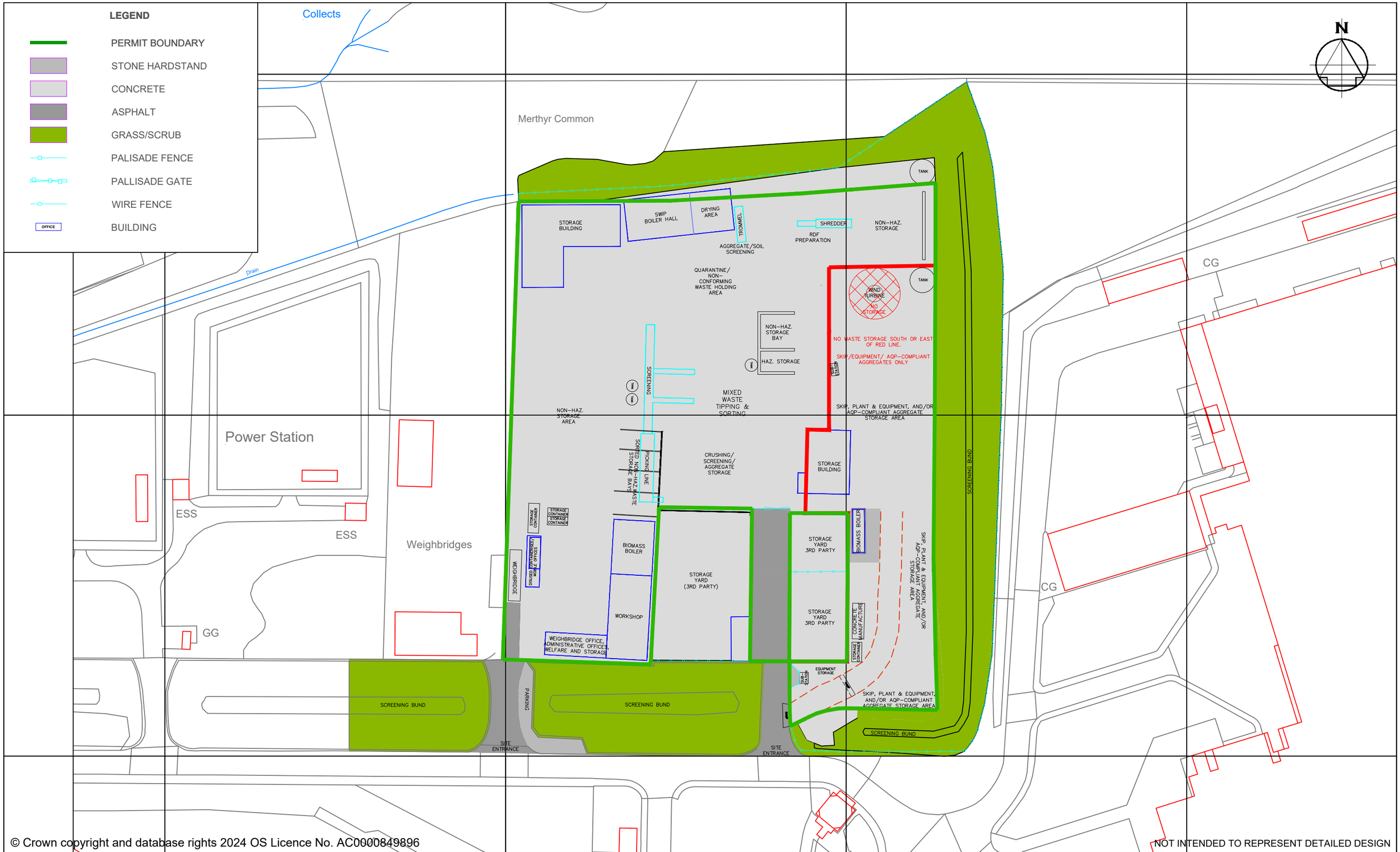
MERTHYR BOROUGH RECYCLING COMPANY LTD

SITE PLAN

Drawn	SCW	Scale	1:1,000
Ch'kd	NB		
Appr'd	NB	@A3	
Date	25/07/25		

Job No.	MBRC	Drg No.	10915 - 000 - B

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NOT INTENDED TO REPRESENT DETAILED DESIGN

AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	UPDATE LAYOUT	19/12/21	SCW	NB
B	UPDATE LAYOUT	24/04/23	SCW	NB
C	UPDATE BASE MAP, UPDATE LAYOUT	25/07/25	SCW	NB

TECHNIA ENVIRONMENT AND PLANNING LTD
UNIT 1 FOXES LANE, OAKDALE BUSINESS PARK
BLACKWOOD, NP12 4AB
TEL: 02921 900400
EMAIL: PLANNING@TEPL.EU

MERTHYR BOROUGH RECYCLING COMPANY LTD

SITE LAYOUT

Drawn	SCW	Scale	1:1,000
Ch'kd	NB		
Appr'd	NB	@A3	
Date	25/07/25		

Job No.	MBRC	Drg No.	10915 - 000 - C

APPENDIX A – DOCUMENTATION

FPC1 - Register of Deliveries, Rejections and Collections

merthyr borough recycling centre

REGISTER OF DELIVERIES, REJECTIONS AND COLLECTIONS

SHEET NO:	

	DETAILS OF INCOMING WASTE LOADS								DETAILS OF DISPATCHED PRODUCT LOADS			
DATE	WTN NO.	DELIVERED BY	WCL #	WASTE TYPE	EWC CODE	QTY. BY WEIGHT IN	ACCEPTED OR REJECTED?	REJECTION NOTICE NO.	RECEIVED BY/ DELIVERED TO	ORDER NO.:	PRODUCT TYPE	QTY. BY WEIGHT OUT

FPC2 - Rejection Notice

FPC2 - Rejection Notice

Merthyr Borough Recycling Centre Limited

Unit 5 Pengarnddu Industrial Estate

Dowlais, Merthyr Tydfil,

CF48 2TA

REJECTION NOTICE NO.

The waste load has been deemed as failing the acceptance criteria to enable it to be processed to produce reycled aggregates in accordance with the Aggregates Quality Protocol.

Customer delivering load:	
Company contact advised of load failure:	
Date:	

Detals of Load

Date:	
Time:	
Name:	
Signed:	
Comments/Reason for Rejection:	

Internal note: Please complete one copy for the Supplier and one copy for company records.

FPC3 - Dispatch Ticket

FPC3 - Dispatch Ticket

Customer:	
Collected From:	
Date:	

Empty Weight:	Tonnes
Product:	
Weight After Loading:	Tonnes
Net Weight:	Tonnes

Is Vehicle Sheeted?	Yes	No

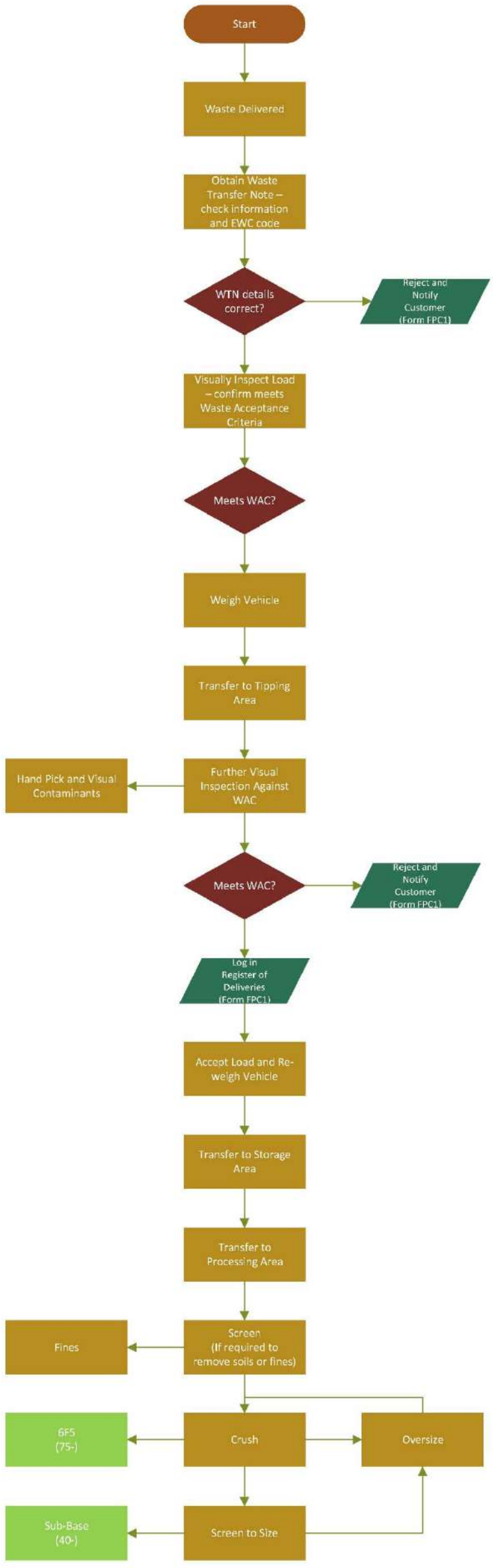
Signed on Behalf of Merthyr Borough Recycling Centre Limited:	
Print Name:	
Signed on Behalf of Customer:	
Print Name:	

Quality Statement: This recycled aggregate was produced by Merthyr Borough Recycling Centre Limited in accordance with the Aggregates Quality Protocol.

Internal note: Please complete one copy for the Customer and one copy for company records.

APPENDIX B – ACCEPTANCE AND PROCESSING OF INERT WASTE

Acceptance and Processing of Inert Waste



APPENDIX C –AGGREGATES QUALITY PROTOCOL

Contents Page

Quality Protocol

Aggregates from inert waste

End of waste criteria for the production of aggregates from inert waste



This Quality Protocol was funded by Defra, the Welsh Government and the Northern Ireland Environment Agency (NIEA) as a business resource efficiency activity. It was developed by the Environment Agency and WRAP (Waste & Resources Action Programme) in consultation with Defra, the Welsh Government, industry and other regulatory stakeholders. The Quality Protocol is applicable in England, Wales and Northern Ireland. It sets out the end of waste criteria for the production and use of aggregates from inert waste.

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3. Providing evidence of compliance with the Quality Protocol 07

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Appendix C 17
Wastes considered to be inert waste for the purposes of this document and to be acceptable for the production of recycled aggregates

Appendix D 20
Good practice applicable to the transport, storage and handling of recycled aggregates

Foreword

Background

Uncertainty over the point at which waste has been fully recovered and ceases to be waste within the meaning of Article 3(1) of the EU Waste Framework Directive (2008/98/EC) has inhibited the development and marketing of materials produced from waste which could otherwise be used beneficially without damaging human health and the environment. In some cases, this uncertainty has also inhibited the recovery and recycling of waste and its diversion from landfill.

Interpretation of EU legislation is ultimately a matter for the Courts and there is now a substantial body of case law on the interpretation of the definition of waste. Drawing on the principles established in this case law, it is possible to identify the point at which certain wastes can be regarded as having ceased to be waste and thus when the Directive's waste management controls should no longer apply. This identification is the purpose of the Waste Protocols Project.

What is a Quality Protocol?

A Quality Protocol sets out end of waste criteria for the production and use of a product from a specific waste type. Compliance with these criteria is considered sufficient to ensure that the fully recovered product may be used without undermining the effectiveness of the Waste Framework Directive and therefore without the need for waste management controls.

A Quality Protocol indicates how compliance should be demonstrated and points to good practice for the storage, transportation and handling of the fully recovered product. The Quality Protocol further aims to provide increased market confidence in the quality of products made from waste and so encourage greater recovery and recycling.

1. Introduction

Definitions of terms that appear in italics when they are first used in this Quality Protocol are given in Appendix A.

1.1. What is this Quality Protocol?

1.1.1 This Quality Protocol has been developed by the *Environment Agency*, the *Northern Ireland Environment Agency (NIEA)* and *WRAP (Waste & Resources Action Programme)* in consultation with industry and other regulatory stakeholders. It is applicable in England, Wales and Northern Ireland.

1.1.2 The Quality Protocol sets out end of waste criteria for the production and use of *aggregates* from *inert* waste. It supersedes 'Quality Protocol for the production of aggregates from inert waste', revised edition (ISBN 1-84405-217-6). If the criteria set out are met, the resulting outputs will normally be regarded as having been fully recovered and to have ceased to be waste.

1.1.3 Producers and users are not obliged to comply with the Quality Protocol. If they do not, the aggregate will normally be considered to be waste[1] and *waste management controls* will apply to its handling, transport and use.

1.1.4 This Quality Protocol does not affect the obligation of producers to hold an *environmental permit* (including an exemption) and to comply with its conditions when storing and processing waste.

1.1.5 This Quality Protocol does not affect permitting or any other legal requirements that do not depend on the status of the material as a waste.

1.2 The purpose of the Quality Protocol

1.2.1 The Quality Protocol has four main purposes:

i. clarifying the point at which waste management controls are no longer required;
ii. providing users with confidence that the aggregate they purchase conforms to an approved industry specification defined in accordance with an appropriate European aggregate standard;
iii. providing users with confidence that the aggregate is suitable for a use within a *designated market sector(s)* including by conforming with the industry standard; and
iv. protecting human health and the environment (including soil).

1.2.2 In addition, the Quality Protocol describes acceptable good practice for the transportation, storage and handling of aggregate (see Appendix D).

1.3 Complying with the Quality Protocol

1.3.1 Aggregate will normally be regarded as having ceased to be waste, and therefore no longer subject to waste management controls, provided:

- it conforms to the requirements of the European standard appropriate to the use it is destined for as set out in Section 2;
- the aggregate is produced under *Factory Production Control* as required by the European standard and as set out in Section 2;
- within Factory Production Control, inputs are limited and controlled as set out in Section 2;
- it requires no further processing, including size reduction, for the use it is destined for as set out in Section 2;

[1] Unless on a case-by-case basis it can be demonstrated that the material is non-waste.

- it is destined for a use within the designated market sectors set out in Section 4; and
- it conforms with CE conformity marking requirements contained in the Construction Products Regulations, which will apply to all aggregates placed on the market to harmonised European Aggregates Standards from July 2013.

1.3.2 Producers must demonstrate that these criteria have been met. They should do this in the ways set out in Section 3.

1.3.3 This Quality Protocol will be adopted as a technical regulation under *Technical Standards and Regulations Directive (98/34/EC)* as amended. We recognise that there may be codes of practice which apply in the *European Economic Area (EEA)* States other than the UK setting out requirements for the use of aggregate. We accept that aggregate may cease to be waste provided it has been produced in compliance with:

- a relevant code of practice of a national standards body or equivalent body of any EEA State; or
- any relevant international standard recognised for use in any EEA State; or
- any relevant technical regulation with mandatory or de facto mandatory application for marketing or use in any EEA State.

These must give levels of product performance and protection of human health and the environment which are equivalent to those required by this Quality Protocol.

1.3.4 An outline of the main stages and control mechanisms of the Quality Protocol is presented in Figure 1. These are described further in Sections 2 and 3.

1.4 When Quality Protocol compliant material may become waste

1.4.1 Producers and users of aggregate should note that, even if the Quality Protocol is complied with, the material will become waste again and subject to waste management controls at any stage it is discarded or there is an intention or requirement to discard, for example if it is:

- disposed of; or
- stored indefinitely with little prospect of being used.

1.4.2 In addition, if Quality Protocol compliant material is mixed with waste materials, the resulting mix will be considered to be a waste and subject to waste management controls. If Quality Protocol compliant material is mixed with non-waste materials, the resulting mix will not, as a result, be waste.

1.5 Failure to comply with the Quality Protocol

1.5.1 Where this Quality Protocol is not complied with, for example the aggregate does not conform to the requirements of the European standard or the producer cannot demonstrate evidence of compliance, the aggregate produced will normally be considered to be waste. In such circumstances, the producer or user must comply with the appropriate waste management controls[2] for the transportation, storage and use of the aggregate and may be committing an offence if they do not do so.

1.5.2 Detailed guidance on waste management controls can be obtained from the Environment Agency's National Customer Contact Centre on 08708 506 506, from its website (www.environment-agency.gov.uk/subjects/waste/), from Natural Resources Wales website (enquiries@naturalresourceswales.gov.uk) or from NIEA's website (www.ni-environment.gov.uk/waste-home/authorisation.htm).

[2] For example, in compliance with Article 23 of the Waste Framework Directive, the user might need to obtain a permit from the Environment Agency or Natural Resources Wales (or in Northern Ireland a waste management licence or PPC permit from the NIEA).

1.6 Updating the Quality Protocol

1.6.1 We will review and update this document as we consider appropriate.

1.6.2 Triggers for a review could include:

- pollution incidents;
- development in scientific understanding;
- a change in the market;
- a change in legislation or case law; or
- a change to the agreed European standard.

1.6.3 This Quality Protocol may be withdrawn if it becomes apparent that it is generally being misapplied and/or misused.

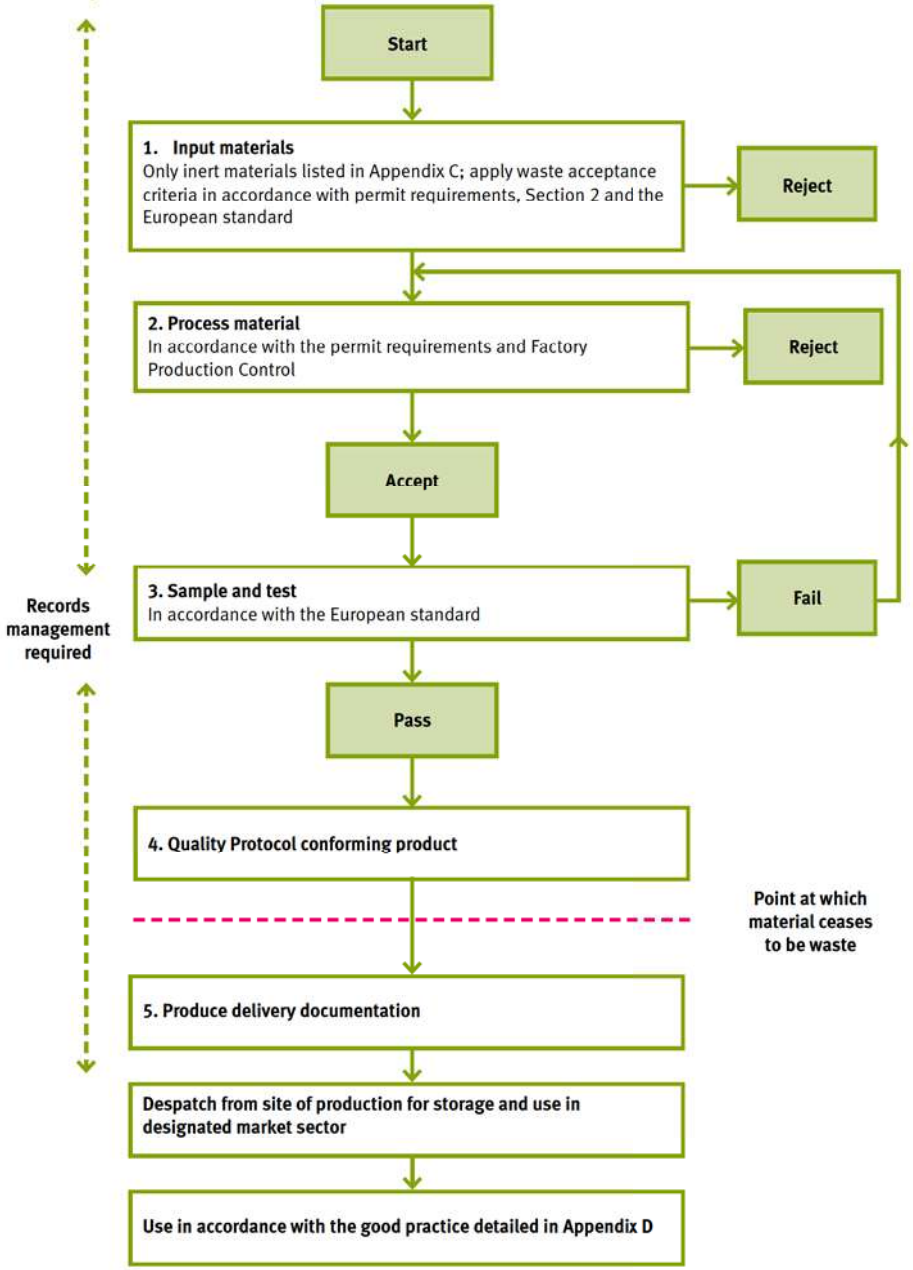
1.7 Importing and exporting Quality Protocol compliant material

1.7.1 Producers intending to export material that has been produced in compliance with this Quality Protocol should be aware that, although the material may cease to be waste in England, Wales and Northern Ireland, the country of destination may take a different view. If the competent authority in the country of destination considers the material to be waste, the shipment will be subject to the controls set out in the Waste Shipment Regulation (EC No. 1013/2006).

1.7.2 Those intending to import Quality Protocol compliant material into England, Wales or Northern Ireland should be aware that, if the country of despatch regards the material as waste, the controls set out in the Waste Shipment Regulation will apply to the shipment. This is the case even though the material may be regarded as having ceased to be waste in England, Wales and Northern Ireland.

1.7.3 Before importing or exporting such material it is prudent to check with the competent authority for the country of despatch or destination. A list of the competent authorities can be found at: http://ec.europa.eu/environment/waste/shipments/pdf/list_competent_authorities.pdf

Figure 1: Main stages and control mechanisms of the Quality Protocol



2. Producing aggregates from inert waste

2.1 Regulating the production process

2.1.1 The process of turning inert waste material into a product is classified as a waste recovery operation and is subject to the waste management controls set out in the Waste Framework Directive and domestic legislation. This Quality Protocol does not affect the obligation on producers to hold an environmental permit (including exemptions) (in Northern Ireland a waste management licence or exemption or a PPC permit is required) that authorises the storage and processing of inert waste and to comply with its conditions.

2.2 Criteria for producing aggregate that has ceased to be waste

2.2.1 To comply with this Quality Protocol, aggregate must be produced in compliance with the criteria outlined in Sections 2.3 to 2.5. In addition, the material should be destined for use in the designated market sector described in Section 4.

2.3 Input materials

2.3.1 The only acceptable input materials are the inert waste materials specified in Appendix C.

2.3.2 To ensure that only inert waste is accepted, producers must have acceptance criteria which meet, as a minimum, the requirements set out in Appendix C.

2.4 Processed in accordance with the approved standard including a Factory Production Control system

2.4.1 The producer must comply with all the requirements of a BS EN aggregates standard (for example, BS EN 13242), appropriate for the use for which the aggregate is destined, at the time it is produced, to comply with this Quality Protocol. Appendix B details the main standards and specifications relating to aggregates at the time of publishing this Quality Protocol.

2.4.2 The specifications (for example, the Highways Agency's Specification for Highway Works (SHW)) summarised in Appendix B have properties selected from the BS EN aggregates standards. The requirements for evaluation of conformity from the relevant BS EN apply in all cases.

2.4.3 The standards and specifications summarised in Appendix B are subject to review and producers should ensure they work to the latest version. Any changes to the agreed standards and specifications may trigger a review of the Quality Protocol (see Section 1.6.2).

2.4.4 Producers must set up and produce the aggregate under a system for Factory Production Control as set out in the relevant BS EN aggregates standard listed in Appendix B.

2.5 Requires no further processing

2.5.1 The aggregate must require no further processing, including size reduction, for the use for which it is destined at the time it is produced to comply with this Quality Protocol.

3 Providing evidence of compliance with the Quality Protocol

3.1 Producers must be able to demonstrate compliance with all the requirements of this Quality Protocol.

3.2 Some of the records specified below may already be required as part of the producer's environmental permit conditions (waste management licence or PPC permit conditions if in Northern Ireland). This Quality Protocol does not affect the obligations on producers to comply with environmental permit conditions (waste management licence or PPC permit conditions if in Northern Ireland).

3.3 Records management

3.3.1 To be able to demonstrate compliance with the Quality Protocol, producers must maintain *delivery documentation* for every load of *recycled aggregate* despatched.

3.3.2 This delivery documentation must include:

- date of supply;
- customer's name and contact details;
- product description to aggregates standard and customer specification;
- the name and contact details of the producer, including the address of the site of production;
- quantity supplied by weight/volume; and
- a statement that the product was produced in compliance with this Quality Protocol.

Where requested by the purchaser further documentation should also include:

- test results and procedures in accordance with the standard or specification in Appendix B and for any further tests required to assess suitability for a particular end use;
- outline details of the Factory Production Control manual; and
- information on good practice relating to the storage, transportation and handling of aggregate (as set out in Appendix D).

3.3.3 These requirements are additional to any statutory record-keeping obligations. However, some records may be used to fulfil both a regulatory obligation and evidence of compliance with this Quality Protocol.

3.3.4 For the purposes of this Quality Protocol the producer, must:

- keep and retain specified records for a minimum of two years; and
- make them available for inspection by the regulator (if requested).

4. Storage and use of recycled aggregates

4.1 As for all aggregate, users of recycled aggregate that complies with this Quality Protocol should take full account of any environmental impact resulting from its use.

4.2 Storage of recycled aggregate

4.2.1 Aggregate produced in compliance with the requirements of this Quality Protocol, which is therefore regarded as having ceased to be waste, may need to be stored temporarily either before delivery to the customer or at the customer's premises. The materials will not be waste at that point, so waste management controls will not apply.

4.2.2 If it appears that the material is being stored indefinitely with no certainty of use, the material will revert to being a waste and waste management controls will apply as specified in Section 1.4.

4.2.3 Producers, distributors and users should follow good practice for the transportation, storage and handling of aggregate, details of which are included in Appendix D.

4.3 Use of recycled aggregate – designated market sectors

4.3.1 To comply with this Quality Protocol, aggregate must be destined for use in unbound or bound applications in civil engineering and construction (as set out below) and appropriate product descriptions must be used on delivery documentation.

- Unbound – including sub-base, capping, general fill, pipe bedding and drainage;
- Bound – including hydraulically bound applications, concrete and asphalt.

Appendix A Definitions

In this Quality Protocol, the words and phrases below have the following meanings.

Agent: An agent acts like a broker, putting buyer and seller together. The agent does not take possession of the aggregate but is paid commission while the buyer is invoiced directly.

Aggregate: A granular material used in construction. For the avoidance of doubt, clays and soils are not considered to be aggregates for the purposes of this Quality Protocol.

Defra: Defra is the UK government department responsible for policy and regulations on the environment, food and rural affairs.

Delivery documentation: Record of who the aggregate is supplied to, including the documentation accompanying each load of aggregate. It details the standard to which the product complies and states that the product was produced in compliance with this Quality Protocol.

Designated market sector(s): The sector(s) listed in Section 4 to which this Quality Protocol applies.

Environment Agency: The Environment Agency is the leading public body for protecting and improving the environment in England. Its job is to make sure that air, land and water are looked after by everyone in today's society, so that tomorrow's generations inherit a cleaner, healthier world.

Environmental permit: Environmental permits issued or exemptions registered under the Environmental Permitting (England and Wales) Regulations 2010.

European Economic Area (EEA): The EEA States consist of the members of the EU (Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the UK) together with Iceland, Liechtenstein, Norway. Switzerland is not part of the EEA, but linked through a series of bilateral agreements. Although the Channel Islands and the Isle of Man are UK Crown dependencies, they are not part of the EU and businesses registered there are subject to different licensing legislation.

European Waste Catalogue (EWC): European Waste Catalogue (EWC 2002 and amendments) – a comprehensive list of waste codes and descriptions based on waste source and type (Commission Decision 2000/532/EC amended by Commission Decisions 2001/118/EC and 2001/119/EC and Council Decision 2001/573/EC).

Factory Production Control: A management system focusing mainly on the production process which aims to ensure that product quality is consistently maintained to the required specifications. Factory Production Control (FPC) for the production of aggregates is specified in BS EN 16236 Evaluation of conformity of aggregates — Initial Type Testing and Factory Production Control.

Inert: Waste is inert if:

(a) it does not undergo any significant physical, chemical or biological transformations;
(b) it does not dissolve, burn or otherwise physically or chemically react, biodegrade or adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm to human health; and
(c) its total leachability and pollutant content and the ecotoxicity of its leachate are insignificant and, in particular, do not endanger the quality of any surface water or groundwater.

Northern Ireland Environment Agency (NIEA): NIEA is the leading public body in Northern Ireland responsible for protecting, conserving and promoting the natural environment and built heritage.

Natural Resources Wales (NRW): NRW is the public body in Wales and its purpose is to ensure that the natural resources of Wales are sustainably maintained, enhanced and used, now and in the future.

PPC permit (Northern Ireland): A permit issued under the Pollution Prevention and Control Regulations (Northern Ireland) S.R. 2003/46. Establishes a pollution control regime for certain installations or mobile plants and includes combustion activities.

Producers: The operator(s) undertaking aggregate processing.

Quality Protocol: A Quality Protocol sets out criteria for the production of a product from a specific waste type. Compliance with these criteria is considered sufficient to ensure that the recovered product can be regarded as having ceased to be waste and that therefore no longer subject to waste management controls. In addition, the Quality Protocol indicates how compliance may be demonstrated and points to good practice for transportation, storage and handling of the recovered product.

Recycled aggregate: Aggregate produced in compliance with the Quality Protocol for the production of aggregate from inert waste (version applicable at the time of production).

Technical Standards and Regulations Directive 98/34/EC: Seeks to ensure the transparency of technical regulations and is intended to help avoid the creation of new technical barriers to trade within the European Community.

User(s): User means construction companies, manufacturers, contractors and all those organisations or individuals responsible for the end use of aggregate.

Waste management controls: Controls under legislation that govern the treatment, handling, containment, transportation storage use and disposal of waste.

Waste management licence or exemption (Northern Ireland): An authorisation issued in Northern Ireland under the Waste Management Licensing Regulations (Northern Ireland) 2003 (as amended), or registered exemption. The Regulations provide for applications in Northern Ireland for waste management licenses authorising the deposit, disposal and treatment of controlled waste. This includes exemptions from waste management licensing.

WRAP (Waste & Resources Action Programme): WRAP's vision is a world without waste, where resources are used sustainably. It works with businesses and individuals to help them reap the benefits of reducing waste, develop sustainable products and use resources in an efficient way.

Appendix B Approved industry standards and Factory Production Control

B1 Approved industry standards

B1.0 The producer must comply with all the requirements of a BS EN aggregates standard appropriate to the use for which the aggregate is destined for at the time it is produced to comply with this Quality Protocol. Table B1 details the standards and main specifications relating to aggregates at the time of publishing this Quality Protocol.

Table B1: Standards, specifications and quality controls for the use of aggregates

Product and Use	Standard	Specification	Quality controls
1 Unbound recycled aggregate: Pipe bedding Drainage	BS EN 13242: Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction	Highways Agency Specification for Highway Works (SHW): Series 500 Highway Authorities and Utilities Committee (HAUC): Specification for the reinstatement of openings in highways (SROH)	BS EN 13242: Level 4 Attestation Evaluation of Conformity to BS EN 16236* SHW: Quality Control procedures in accordance with the Quality Protocol for the production of aggregates from inert waste SROH: Compliance with SHW
2 Unbound recycled aggregate: Granular fill General fill Capping	BS EN 13242: Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction	Highways Agency Specification for Highway Works: Series 600 HAUC: Specification for the reinstatement of openings in highways BS EN 13285: Unbound mixtures: Specifications	BS EN 13242: Level 4 Attestation Evaluation of Conformity to BS EN 16236* SHW: Quality Control procedures in accordance with the Quality Protocol for the production of aggregates from inert waste SROH: Compliance with SHW
3 Unbound recycled aggregate: sub base	BS EN 13242: Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction	Highways Agency Specification for Highway Works: Series 800 HAUC: Specification for the reinstatement of openings in highways BS EN 13285: Unbound mixtures: Specifications	BS EN 13242: Level 4 Attestation Evaluation of Conformity to BS EN 16236* SHW: Quality Control procedures in accordance with the Quality Protocol for the production of aggregates from inert waste SROH: Compliance with SHW

4 Recycled aggregate for concrete	BS EN 12620: Aggregates for concrete	Highways Agency Specification for Highway Works: Series 1000 BS 8500-2: Concrete	BS EN 12620: Level 4 Attestation Evaluation of Conformity to BS EN 16236* SHW: Quality Control procedures in accordance with the Quality Protocol for the production of aggregates from inert waste
5 Recycled aggregate for asphalt	BS EN 13043: Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas	Highways Agency Specification for Highway Works: Series 900 HAUC: Specification for the reinstatement of openings in highways	BS EN 13043: Level 4 Attestation Evaluation of Conformity to BS EN 16236* SHW: Quality Control procedures in accordance with the Quality Protocol for the production of aggregates from inert waste SROH: Compliance with SHW
6 Recycled aggregate for hydraulically bound mixtures	BS EN 13242: Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction	Highways Agency Specification for Highway Works: Series 800 HAUC: Specification for the reinstatement of openings in highways BS EN 14227-1 to 5 Hydraulically Bound Mixtures: Specifications	BS EN 13242: Level 4 Attestation Evaluation of Conformity to BS EN 16236* SHW: Quality Control procedures in accordance with the Quality Protocol for the production of aggregates from inert waste SROH: Compliance with SHW
7 Reclaimed asphalt for use in bituminous mixtures	BS EN 13108-8 Bituminous mixtures – Material specifications – Part 8: Reclaimed asphalt.	Highways Agency Specification for Highway Works: Series 900 BS EN 13108-1 to 5 Bituminous mixtures – Material specifications	BS EN 13108-8 NHSS Sector Scheme 14 SHW: Quality Control procedures in accordance with the Quality Protocol for the production of aggregates from inert waste SROH: Compliance with SHW

*BS EN 16236 Evaluation of conformity of aggregates – Initial Type Testing and Factory Production Control.

The British Standards Institute (BSI) publishes guidance documents that explain how the European Aggregate Standards are applied within the UK. the ones relevant to table B1 are:

- PD 6682-1 Aggregates for concrete. Guidance on the use of BS EN 12620
- PD 6682-2 Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas. Guidance on the use of BS EN 13043
- PD 6682-6 Aggregates for unbound and hydraulically bound materials for use in civil engineering works and road construction. Guidance on the use of BS EN 13242

All aggregates PDs and BS ENs can be purchased from BSI: http://shop.bsigroup.com

B2 Factory Production Control

B2.0 Production and standards/specification requirements

- Factory Production Control (FPC) must be set up. This is mandatory when producing to BS EN aggregate standards and to this Quality Protocol.
- The requirements set out in B2.1 to B2.9 are complementary to the evaluation of conformity requirements of BS EN 16236, which must be implemented in full.
- The FPC is required to include the following quality management requirements set out below. These, which must be implemented.

B2.1 General points about the procedures

- A FPC manual must be produced which documents how the FPC is implemented and sets out procedures for establishing the approval, issue, distribution and administration of documentation and data for internal and external use.
- A management representative must be nominated as responsible for ensuring the FPC is implemented.
- The FPC must be reviewed periodically by management to ensure its continuing suitability and effectiveness. Records of such reviews must be kept.
- Controls on sub-contractors must be defined.

B2.2 Waste acceptance criteria

- To ensure only inert waste is accepted, the producer must develop 'acceptance criteria' specific to each site/location. These criteria must be followed at all times.
- The acceptance criteria must incorporate all statutory requirements relating to the receipt of incoming waste shall be observed and included in the Acceptance Criteria. These requirements include those arising from an environmental permit, waste management licence or a waste exemption, and the duty of care.
- The acceptance criteria must also include:
  - a list of the types of waste that are accepted (including waste codes);
  - source/place of origin of the waste;
  - supplier and transporting agent; and
  - method of acceptance.
- Every load must be inspected visually, both on initial receipt and after tipping, to ensure compliance with the acceptance criteria.
- A procedure for dealing with non-conforming incoming waste must be set up, for example, rejection of loads, quarantine or disposal. Records must be kept of how the procedure has been implemented.

B2.3 Production and testing

- The manner is which processing equipment is maintained and adjusted during production must be defined.
- Input materials must be stocked in a controlled manner in clearly identified locations.
- Material taken from stock for processing must be checked for deterioration.
- The finished product must be identifiable up to the point of sale.
- Procedures must be in place and implemented to maintain the quality of the product during handling, storage, transport and delivery.
- Procedures for the use, control, calibration and maintenance of inspection, measuring and test equipment must be setup and followed. Equipment must be uniquely identified.

B2.4 Training

- All personnel must be trained on the FPC including:
  - acceptance criteria;
  - procedures for non-compliant input wastes and output products;
  - sampling;
  - testing; and
  - inspection.

B2.5 Records

- Records of relevant controls and inspections, calibrations, changes and training must be maintained for a suitable period of time. This period must be defined.
- A Method Statement of Production (MSP) must be produced and maintained. The MSP represents the recovery process for the incoming waste and it is part of the FPC. It must contain a description or representation of the production process for each product type including:
  - input materials;
  - equipment used; and
  - actions undertaken at each stage from acceptance of waste to allocation to product stockpiles.
- The aggregates must be produced to a recognised standard and/or specification. This specification will define the properties and characteristics of the product, as suitable for its application.

B2.6 Documentation

- Delivery documentation must:
  - record the type of aggregate product despatched;
  - state the site at which the product was produced;
  - state that the aggregate was produced under a quality management scheme conforming to the aggregates Quality Protocol.
- If requested, purchasers must be provided with the results from the testing regime undertaken on each product.
- Historical records of test results must be kept and/or made available as summary results (for example, a graph of test results over time).

B2.7 Testing

- Procedures for the use, control, calibration and maintenance of inspection, measuring and test equipment must be set up and followed. Equipment must be uniquely identified.
- A test plan for production must be defined that includes:
  - the type of testing for each product; and
  - sampling and testing frequency (see B2.8 below for information about minimum test frequencies).
- Table B2 provides a summary of the frequencies required for the minimum testing requirements set out in the main standards.
- The test procedures must be appropriate to the end use of the recycled aggregates and testing frequencies must comply with the standards/specifications for the aggregate produced.
- Producers must have in place testing procedures to meet the testing requirements for each product. A summary of the frequencies required for the minimum testing requirements within the mainstream standards is provided in Table B2 (below).
- More detailed testing requirements are defined within the aggregate standards and specifications.

B2.8 Minimum testing requirements – frequencies

- Tables B2 and B4 collate the minimum test frequencies required by common standards and specifications, including the minimum requirements of the FPC for a range of routine tests.
- Frequencies are defined in terms of 'production week' or similar and/or 'production day'. These periods should be defined by the producer depending on the throughput of the plant/equipment.
- Production week can be defined as the period of seven consecutive days comprising at least five production days or the period taken to complete five production days, whichever is longer.

B2.9 Departure from minimum test frequencies

- Where materials are known to be marginal or if initial test results show them as such, the frequency of testing should be increased.
- The producer must prepare a schedule of test frequencies taking into account the minimum requirements of the relevant FPC.
- Under special conditions the test frequencies may be reduced below those given in the FPC annex of the standards. Possible reasons include:
  - highly automated production equipment;
  - long-term experience with consistency of special properties;
  - sources of high conformity; and
  - running a Quality Management System with exceptional measures for surveillance and monitoring of the production process.
- Reasons for reducing test frequencies must be stated in the FPC manual.

Table B2: Summary of testing requirements associated with particular end uses and standards (Note: Testing frequencies should be increased where variability is identified through Factory Production Control and where the measured value is close to the specified limit.)

End use	Standard and Specifications	Test	BS test reference	Minimum test frequency (see B2.8)
All end uses	BS EN 13242 BS EN 12620	Particle size Distribution	EN 933-1	1 per week
		Particle density	EN 1097-6	1 per month
		Resistance to fragmentation (LA)	EN 1097-2	2 per year
		Classification of constituents(see table B3)	EN 933-11	1 per month
		Water soluble sulfate	EN 1744-1	1 per month
Aggregates for concrete	BS EN 12620	Particle density and water absorption	EN 1097-6	1 per month
		Sulfur containing compounds	EN 1744-1	2 per year
		Chlorides	EN 1744-5	2 per year
		Influence on setting time of cement	EN 1744-6	2 per year

Tests listed are not exhaustive and reference should be made to relevant standards and specifications for additional requirements. Tests for BS EN 13043 and additional minimum test frequencies for other aggregate standards are tabled in EN 16236.

Table B3: Classification of constituents: testing to BS EN 933-11, classification groups

Code	Constituents
Rc	Concrete, concrete products, mortar, concrete masonry units
Ru	Unbound aggregate, natural stone, hydraulically bound aggregate
Rb	Clay masonry units (i.e. bricks and tiles), calcium silicate masonry units, aerated non-floating concrete
Ra	Bituminous materials
Rg	Glass
FL	Floating material in volume
X	Cohesive (e.g. clay and soil), metals, wood, plastic, rubber, gypsum plaster

Notes: Maximum permitted for constituent **X**: 1% by mass

Maximum permitted for constituent **FL:** ≤10 cm^3/kg unbound, ≤5 cm^3/kg aggregates for concrete

Table B4: Example of supplementary testing to meet Specification requirements

End Use	Standard and Specifications	Test	BS Test Reference	Minimum test frequency (see section B2.7)
Unbound: Fills Capping Sub-base	SHW Series 600, & 800 SROH	California Bearing Ratio Plasticity of fines Frost Heave	 1377: part 4 1377: part 2 812: part 124	 1 per month 1 per week 1 per year

Tests listed are not exhaustive and reference should be made to relevant standards and specifications for additional requirements.

Appendix C: Wastes considered to be inert waste for the purpose of this Quality Protocol and to be acceptable for the production of recycled aggregates

General restrictions

This QP only applies to aggregates i.e. a granular material used in construction, which is processed from inert waste. For the avoidance of doubt, clays and soils are not considered to be aggregates for the purposes of this Quality Protocol.

C1 Table C1 lists all the input materials and their relevant 'waste code'[3] or European Waste Catalogue (EWC) code considered inert and acceptable for the production of recycled aggregate under this Quality Protocol. The table includes notes to clarify any limits and restrictions relating to specific waste types. Waste inputs must not contain or be contaminated with dangerous substances as described in the List of Wastes (England) Regulations 2005, List of Wastes (Wales) Regulations 2005 and List of Wastes (Northern Ireland) 2005, as amended. Incidental quantities of inert physical contaminants (such as soils, peat, clays, silts, wood, plastics, rubber, metal) may be present with the input material but must be removed during the processing of the waste to comply with the constituent requirements of aggregates standards and table B3 of this Quality Protocol.

Table C1: Acceptable inert waste input materials

Wastes from physical and chemical processing of non-metalliferous minerals

Type and exclusions	Waste code
Waste gravel and crushed rocks other than those mentioned in 01 04 07 May include excavation from mineral workings.	**01 04 08**
Waste sand and clays Waste sand only. Must not include contaminated sand.	**01 04 09**

Wastes from manufacture of glass and glass products

Type and restrictions	Waste code
Waste glass-based fibrous materials Allowed only if: Wastes without organic binders	**10 11 03**

3 'Waste code' refers to the six digit code for a type of waste in accordance with the List of Wastes (England) Regulations 2005, List of Wastes (Wales) Regulations 2005 and List of Wastes (Northern Ireland) Regulations 2005, as amended. Where it refers to hazardous waste, the code includes an asterisk.

Packaging (including separately collected municipal packaging waste)

Type and restrictions	Waste code
Glass packaging	**15 01 07**

Construction and demolition waste – concrete, bricks, tiles and ceramics

Type and restrictions	Waste code
Concrete Must not include concrete slurry.	**17 01 01**
Bricks	**17 01 02**
Tiles and ceramics	**17 01 03**
Mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06	**17 01 07**

Construction and demolition waste – wood, glass and plastic

Type and restrictions	Waste code
Glass Must not include fibreglass or glass fibre.	**17 02 02**

Construction and demolition waste – bituminous mixtures, coal tar and tarred products

Type and restrictions	Waste code
Bituminous mixtures other than those mentioned in 17 03 01	**17 03 02**
Allowed only if: Bituminous mixtures from the repair and refurbishment of the asphalt layers of roads and other paved areas (excluding bituminous mixtures containing coal tar and classified as waste code 17 03 01). Must not include coal tar or tarred products. Must not include freshly mixed bituminous mixtures.	

Construction and demolition waste – soil (including excavated soil from contaminated sites), stones and dredging spoil

Type and restrictions	Waste code
Soil and stones other than those mentioned in 17 05 03 Must not contain any contaminated soil or stone from contaminated sites.	**17 05 04**
Dredging spoil other than those mentioned in 17 05 05 Allowed only if: Inert aggregate from dredgings. Must not contain contaminated dredgings. Must not contain fines.	**17 05 06**
Track ballast other than those mentioned in 17 05 07	**17 05 08**
Allowed only if: Does not contain soil and stones from contaminated sites.	

Construction and demolition waste – other construction and demolition wastes

Type and restrictions	Waste code
Mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03	**17 09 04**
Allowed only if: The waste is generated from utilities trenchings. The waste consists of sub base aggregates i.e. granular material. The waste contains only materials that would be described by entries 17 01 01, 17 03 02 and 17 05 04 in this appendix if the waste was not mixed.	

Wastes from the mechanical treatment of waste not otherwise specified (for example sorting, crushing, compacting, pelletising)

Type and restrictions	Waste code
Glass Does not include glass from cathode ray tubes.	**19 12 05**
Minerals (for example sand, stones) Must not contain contaminated concrete, bricks, tiles, sand, stone or gypsum from recovered plasterboard.	**19 12 09**

Municipal wastes (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions

Type and restrictions	Waste code
Glass Must not include fibreglass.	**20 01 02**
Garden and park wastes (including cemetery waste) – soil and stones Must not contain contaminated stones from garden and parks waste.	**20 02 02**

Appendix D Good practice for the transportation, storage and use of recycled aggregates

D1 Pollution prevention and environmental good practice

- Follow the pollution prevention guidance developed in partnership with the industry to help those working on construction and demolition sites to prevent pollution.

Pollution Prevention Guidelines PPG6: Working at construction and demolition sites (April 2011), http://publications.environment-agency.gov.uk/pdf/PMHO0410BSGN-e-e.pdf

- Follow the guidance produced by CIRIA which provides practical advice for minimising environmental impacts on construction sites.

CIRIA, Environmental good practice on site (C692)

D2 Health and safety

- All applications of aggregates should comply with recommendations from the Health and Safety Executive (HSE) such as using appropriate personal protective equipment (PPE) and dust suppression measures.

D3 Transportation, storage and handling

- Aggregates should be handled and stored to minimise the creation of airborne dust.
- Engineering control measures such as containment, enclosed silos/bins/hoppers, local exhaust ventilation, sprays suppression systems, etc. should be used where there is a risk of airborne dust creation.
- Open conveyor handling systems should be provided with wind boards or other protection to prevent wind-whipping.
- Manual handling of the aggregates should be minimised through the use of mechanical aids wherever possible. Account should be taken of the Manual Handling Regulations and care should be taken when lifting by hand.
- Aggregates are inert, but dust and fine particles should be prevented from entering watercourses and drains. Deposition of dust on vegetation and surrounding property should be avoided by controlling the release of dust at source.

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recycle

APPENDIX D – SHW SERIES 600

SERIES 600 EARTHWORKS

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NATIONAL ALTERATIONS OF THE OVERSEEING ORGANISATIONS OF SCOTLAND, WALES AND NORTHERN IRELAND

Scotland

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(02/16) **Wales**

(02/16) 601W	(02/16) Classification, Definitions and Uses of Earthworks Materials	W1

Northern Ireland

601NI	(02/16) Classification, Definitions and Uses of Earthworks Materials	N1
607NI	(02/16) Explosives and Blasting for Excavation	N4

# denotes a Clause or Sample Contract Specific Appendix which has a substitute National Clause or Sample Contract Specific Appendix for one or more of the Overseeing Organisations of Scotland, Wales or Northern Ireland.

EARTHWORKS

#601 (02/16) Classification, Definitions and Uses of Earthworks Materials

(02/16) **General**

0 (02/16) This Series is part of the Specification for Highway Works. Whilst this Series is particularly relevant to the subject matter in its title it must be read in conjunction with the general requirements in Series 000 and 100 and with all other Series relevant to the specification for the particular works to be undertaken.

(02/16) **General Classification**

1 (02/16) Earthworks materials shall fall into one or other of the following general classifications:

(i) acceptable material: material excavated from within the site or imported on to the site which meets the requirements of Table 6/1 and contract specific Appendix 6/1 for acceptability for use in the permanent works;

(ii) unacceptable material Class U1A as defined in sub-Clauses 2(i)(a) and 2(i)(b) of this Clause: material excavated from within the site which, unless processed so that it meets the requirements of Table 6/1 and contract specific Appendix 6/1, shall not be used in the permanent works;

(iii) unacceptable material Class U1B as defined in sub-Clause 2(ii)(a) of this Clause: material excavated from within the site which, unless processed so that it meets the requirements of Table 6/1 and contract specific Appendix 6/1, shall not be used in the permanent works; and

(iv) unacceptable material Class U2 as defined in sub-Clause 3(i) of this Clause: material excavated from within the site which shall not be used in the permanent works.

(02/16) **Unacceptable Materials**

2 (02/16) Unacceptable material Classes U1A and U1B:

(i) unacceptable material Class U1A shall be:

(a) material which does not comply with the permitted constituents and material properties of Table 6/1 and contract specific Appendix 6/1 for acceptable material; and

(b) material, or constituents of materials, composed of the following unless otherwise described in contract specific Appendix 6/1:

- peat, materials from swamps, marshes and bogs;
- logs, stumps and perishable material;
- materials in a frozen condition;
- clay having a liquid limit determined in accordance with BS 1377: Part 2, exceeding 90 or plasticity index determined in accordance with BS 1377: Part 2, exceeding 65;
- material susceptible to spontaneous combustion except unburnt colliery spoil complying with sub-Clause 15 of this Clause;

(ii) unacceptable material Class U1B shall be:

(a) contaminated materials, including controlled wastes (as defined in the Environmental Protection Act 1990 Part IIA) whose level of contamination is above that given either in contract specific Appendix 6/14 or in contract specific Appendix 6/15, but excluding all hazardous wastes (as defined in the Hazardous Waste (England and Wales) Regulations 2005) and radioactive wastes (as defined in the Radioactive Substances Act 1993).

3 (02/16) Unacceptable material Class U2 shall be:

(i) hazardous waste (as defined in the Hazardous Waste (England and Wales) Regulations 2005) and radioactive waste (as defined in the Radioactive Substances Act 1993).

4 (02/16) Where required in contract specific Appendix 6/1, unacceptable material (other than Class U2) shall be processed by mechanical, chemical or other means to render the material acceptable for use in the permanent works in accordance with the requirements of Table 6/1 and contract specific Appendix 6/1.

(02/16) **Definitions**

5 (02/16) Where source codes are referred to these shall be for materials from the sources listed in Table 6/7.

6 (02/16) Chalk shall mean:

(i) any porous material of natural origin composed essentially of calcium carbonate and identified as chalk on the maps produced by the British Geological Survey;

(ii) material designated as Class 3 in contract specific Appendix 6/1.

7 (02/16) Argillaceous rock shall mean shales mudstones siltstones slates and micaceous schists composed of particles of clay and silt and mica. It shall include unburnt colliery spoil. Where argillaceous rock is imported onto the site, it shall be aggregate complying with BS EN 13242 from source codes P (natural aggregates described as shale, siltstone or slate), or G2 (refuse from hard coal mining (black coal shale)).

8 (02/16) Pulverised-fuel ash shall mean solid material extracted by electrostatic and mechanical means from the flue gases of furnaces fired with pulverised bituminous coal. It shall have a maximum particle size of 3 mm. Where pulverised-fuel ash is imported onto the site, it shall be aggregate complying with BS EN 13242 from source code C1 (coal fly ash).

9 (02/16) Furnace bottom ash shall mean agglomerated pulverised-fuel ash obtained from the bottom of the power station furnace and having particle size no larger than 10 mm. Where furnace bottom ash is imported onto the site, it shall be aggregate complying with BS EN 13242 from source code C4 (coal bottom ash).

10 (02/16) Formation shall be the top surface of capping. Where no capping is required formation shall be the top surface of earthworks at the underside of sub-base, unless otherwise shown on the drawings.

11 (02/16) Sub-formation shall be the top surface of earthworks at the underside of capping.

12 (02/16) Stabilisation shall mean the spreading of cement or lime or both on a layer of deposited or intact granular or cohesive material, and the subsequent process of pulverising and mixing followed by appropriate compaction to form the whole or a constituent layer of a capping.

13 (02/16) Where 'recycled aggregate' is used in this Series, the material shall be aggregate resulting from the processing of inorganic or mineral material previously used in construction and shall have been tested in accordance with Clause 710. It shall not contain more than 1% other materials (Class X), not more than 50% in Class Ra (bituminous materials) and not more than 25% in Class Rg (crushed glass). Where 'recycled aggregate' is imported onto the site, it shall be aggregate complying with BS EN 13242 from source code A (construction and demolition recycling industries).

Where 'recycled aggregate except recycled asphalt' is used in this Series, the aggregate shall have been tested in accordance with Clause 710. It shall not contain more than 1% other materials (Class X), not more than 1% in Class Ra (bituminous materials) and not more than 5% in Class Rg (crushed glass). Where 'recycled aggregate except recycled asphalt' is imported onto the site, it shall be aggregate complying with BS EN 13242 from source codes A2 (crushed concrete) and/or A3 (crushed bricks, masonry).

14 (02/16) 'As dug' shall mean material that has been excavated, transported and placed without any processing. Where imported material undergoes any processing, including cleaning and sorting, it will not be deemed 'as dug' and thus shall be aggregate complying with BS EN 13242.

(02/16) **Use of Fill Materials**

15 (02/16) In addition to any grading requirements the maximum particle size of any fill material shall be no more than two-thirds of the compacted layer thickness except that cobbles having an equivalent diameter of more than 150 mm shall not be deposited beneath verges or central reserves within 1.30 m of the finished surface.

16 (02/16) Materials placed within 500 mm, or any other distances described in the contract specific Appendix 6/3, of concrete, cement bound materials, other cementitious mixtures or stabilised capping forming part of the permanent works shall conform to, as appropriate, the following requirements:

(i) Materials shall conform to the following criteria:

(a) Water-soluble sulfate (WS) content determined in accordance with BS EN 1744-1 clause 10 shall not exceed 1500 mg of sulfate (as SO_4) per litre;

(b) Total sulfur (TS) content determined in accordance with BS EN 1744-1 clause 11 expressed as (S) shall not exceed 1% for aggregates other than air cooled blast furnace slag or 2% for air cooled blast furnace slag.

(ii) Materials shall conform to at least one of the following options:

(a) When described in accordance with BS EN 932-3 and BS EN 13242 Annex A, limestone, chalk, dolomite, blast furnace slag, steel slag or crushed concrete are predominant

or

(b) The sulfide content of the material determined in accordance with BS EN 1744-1 Clause 13 is less than 0.5% (as SO_4).

When determining WS, TS or sulfide content, at least five samples of each material shall be tested. The mean of the highest two values shall be used for comparison with the limiting values. This shall also apply if six to nine results are available. If ten or more results are available, the mean of the highest 20% of the results shall be used for comparison with the limiting values.

17 (02/16) Material placed within 500mm, or any other distances described in the contract specific Appendix 6/3, of metallic structural elements forming part of the permanent works shall conform, as appropriate, to the following requirements:

(i) Materials shall conform to the following criteria:

(a) Water-soluble sulfate (WS) content determined in accordance with BS EN 1744-1 clause 10 shall not exceed 300 mg of sulfate (as SO_4) per litre; and

(b) Total sulfur (TS) content determined in accordance with BS EN 1744-1 clause 11 expressed as (S) shall not exceed 1% for aggregates other than air cooled blast furnace slag or 2% for air cooled blast furnace slag.

(ii) Materials shall conform to at least one of the following options:

(a) When described in accordance with BS EN 932-3 and BS EN 13242 Annex A, limestone, chalk, dolomite, blast furnace slag, steel slag or crushed concrete are predominant;

or

(b) The sulfide content of the material determined in accordance with BS EN 1744-1 Clause 13 is less than 0.06% (as SO_4).

When determining WS, TS or sulfide content, at least five samples of each material shall be tested. The mean of the highest two values shall be used for comparison with the limiting values. This shall also apply if six to nine results are available. If ten or more results are available, the mean of the highest 20% of the results shall be used for comparison with the limiting values.

The requirements in (i) and (ii) above shall not apply to metallic items protected by concrete or ancillary metallic items such as the tops of chambers and gullies.

18 (02/16) Unburnt colliery spoil may be used as general fill provided it is compacted in compliance with Clause 612 and complies with the requirements of contract specific Appendix 6/1.

19 (02/16) Pulverised-fuel ash shall not be placed within the dimension described in contract specific Appendix 6/3, below sub-formation or formation.

20 (02/16) Where pulverised-fuel ash is used, the Contractor shall for each consignment, make available to the Overseeing Organisation a record of the type and source from which it was obtained and a certificate of results of tests showing that the material complies with the requirements of Table 6/1.

602 (02/16) General Requirements

1 (02/16) The Contractor shall employ only plant and working methods which are suited to the materials to be handled and traversed. He shall be responsible for maintaining the nature of the acceptable material so that when it is placed and compacted it remains acceptable in accordance with the contract. Acceptability shall be determined in accordance with Table 6/1 and any special contract specific requirements in Appendix 6/1.

2 (02/16) Haulage of material to embankments or other areas of fill shall proceed only when sufficient spreading and compaction plant is operating at the place of deposition to ensure compliance with Clause 612.

3 (02/16) No excavated acceptable material or unacceptable material required to be processed, other than surplus to the requirements of the contract, shall be removed from the site unless indicated otherwise in contract specific Appendix 6/1. Material which is unacceptable only by reason of being frozen shall be retained on site when in that condition. Where the Contractor is permitted to remove acceptable material, or unacceptable material required to be processed, from the site to suit his operational procedure, then he shall make good any consequent deficit of material arising therefrom. Environmental requirements for processing of Class U1B material, in terms of limiting values of contaminants or other requirements, shall be set out in contract specific Appendix 6/1 in the earthworks Class for which the processed material is to be used.

4 (02/16) If any acceptable material or unacceptable material required to be processed is, where permitted by contract specific Appendix 6/1, used by the Contractor for purposes other than for general fill, sufficient acceptable fill material to occupy, after full compaction, a volume corresponding to that which the excavated material occupied shall be provided by the Contractor.

5 (02/16) Acceptable material (other than Class 5A or any Class 5B material replacing Class 5A material in accordance with sub-Clause 3 of this Clause) surplus to the total requirements of the permanent works and all unacceptable material Class U1A not required to be processed shall, unless indicated otherwise in contract specific Appendix 6/1, be run to spoil in tips provided by the Contractor. In the case of unacceptable material, Class U1B and Class U2, the Contractor shall comply with any specific requirements for disposal described in contract specific Appendix 6/2.

6 (02/16) Where the excavation reveals a combination of acceptable and unacceptable materials the Contractor shall, unless indicated otherwise in contract specific Appendix 6/3, carry out the excavation in such a manner that the acceptable materials are excavated separately for use in the permanent works without contamination by the unacceptable materials. Unless otherwise described in the contract classes of fill material required to be deposited separately shall be excavated separately without contamination by other Classes of material.

7 (02/16) The Contractor shall make his own arrangements for stockpiling of acceptable material, and unacceptable material to be processed, and for the provision of sites for the purpose.

8 (02/16) The Contractor shall ensure that he does not adversely affect the stability of excavations or fills by his methods of stockpiling materials, use of plant or siting of temporary buildings or structures.

9 (02/16) Existing topsoil material shall, except where it is to be left in place in the locations described in contract specific Appendix 6/8, be stripped to depths as described in contract specific Appendix 6/8 for Class 5A material from all areas of cutting and from all areas to be covered by embankment or by other areas of fill. Where stated in contract specific Appendix 6/8 existing topsoil shall be stripped as turf in accordance with sub-Clause 3005.13.

10 (02/16) Topsoil shall wherever practicable be used immediately after its stripping and if not shall be stored in stockpiles of heights not exceeding 2 m or other heights stated in contract specific Appendix 6/8. Unless otherwise stated in contract specific Appendix 6/8, topsoil shall not be stockpiled for more than two years. Topsoil shall not be unnecessarily trafficked either before stripping or when in a stockpile. Stockpiles shall not be surcharged or otherwise loaded and multiple handling shall be kept to a minimum.

11 (02/16) All Class 5A topsoil arising from the site, or any Class 5B material replacing Class 5A material in accordance with sub-Clause 3 of this Clause, in excess of the requirements for topsoiling, shall be subject to the requirements described in contract specific Appendix 6/8.

12 (02/16) Excavations for foundations and trenches shall be adequately supported at all times, and except where otherwise described in contract specific Appendix 6/3, shall not be battered. Where excavations are permitted to be battered they shall be benched as described in contract specific Appendix 6/3 prior to backfilling and compaction. The additional work and materials shall be provided by the Contractor. Sheeting and other excavation supports shall be removed as filling proceeds except where they are required in contract specific Appendix 6/3 to be left in position.

13 (02/16) Excavations requiring backfilling shall remain open only for the minimum period necessary.

14 (02/16) Excavations requiring backfilling in existing paved or other surfaces, including those paved areas to be reconstructed or repaired, shall be carried out and reinstated in compliance with Clause 706.

15 (02/16) The Contractor shall keep earthworks free of water including:

(i) arranging for the rapid removal of water:

(a) shed on to the earthworks;

(b) entering the earthworks from any source;

(ii) lowering and maintaining by appropriate measures, the water level in excavations, sufficiently to enable the permanent works to be constructed.

16 (02/16) In carrying out the requirements of sub-Clause 15 of this Clause the Contractor shall:

(i) form and maintain cuttings, embankments and other areas of fill with appropriate falls and gradient and sealed surfaces;

(ii) provide where necessary temporary watercourses, drains, pumping and the like;

(iii) discharge accumulated water and groundwater into the permanent outfalls of the drainage system where practicable;

(iv) provide adequate means for trapping silt on temporary systems discharging into permanent drainage systems.

17 (02/16) The Contractor shall carry out and maintain any groundwater lowering or other treatment required in contract specific Appendix 6/1.

18 (02/16) Where materials are designated in the contract as either Class U1B or Class U2, the Contractor shall carry out any special requirements for their handling described in contract specific Appendix 6/2. Where such materials are encountered during the progress of the works, the Contractor shall make all necessary arrangements for their safe handling and disposal after consultation with the appropriate environmental authority.

19 (02/16) Subject to the surface level tolerances given in Clause 613 and sub-Clause 616.1, material shall not be frost susceptible if it is used within 450 mm of the designed final surface of a road or paved central reserve, or 350 mm if the annual frost index of the site is less than 50. Material shall be classified as non-frost-susceptible if the mean heave is 15 mm or less, when tested in accordance with BS 812: Part 124 or BS 1924: Part 2 for lime stabilised capping, amended as given in sub-Clause 801.7.

603 (02/16) Forming of Cuttings and Cutting Slopes

1 (02/16) Cuttings shall be excavated to the lines and levels described in contract specific Appendix 6/3.

2 (02/16) Cutting slopes or toes of cuttings shall only be undercut when required in the contract for trench or other excavations. Such excavations shall be restricted in extent as described in contract specific Appendix 6/3 and where they require backfilling shall remain open only for the minimum period necessary, so as to prevent risk to the permanent works.

3 (02/16) Except where otherwise described in contract specific Appendix 6/3, the excavation of cuttings may be halted at any stage providing at least 300 mm of material as a weather protection is left in place above the formation or above the sub-formation, subject to the requirements of Clauses 613 and 616.

4 (02/16) Where pre-split blasting is required or permitted in contract specific Appendix 6/3, it shall comply with Clause 607 and any other requirements in contract specific Appendix 6/3. Full details of the methods and arrangements to be adopted shall be made available to the Overseeing Organisation before commencement of drilling operations.

5 (02/16) Final faces of cuttings which are not to receive topsoil shall:

(i) wherever possible be left without scars or damage from construction plant; and

(ii) to achieve a natural appearance, when the stratum permits and when pre-split blasting is not adopted, have the face left irregular within tolerances given in contract specific Appendix 6/3; and

(iii) have boulders or other rock fragments that can be moved by hand without tools, removed; and

(iv) where required in contract specific Appendix 6/3 have material that can be blown away by airline hose, having pressures no greater than those stated therein, so removed; and

(v) have adequate access to enable inspection to be carried out to determine the extent of work required by this sub-Clause.

6 (02/16) Where required in contract specific Appendix 6/3, faces of cuttings which are not required to receive topsoil shall have one or more of the following measures carried out as appropriate:

(i) Isolated patches of soft, fragmented and insecure material shall each be excavated to a depth of at least 200 mm unless other depths are stated in contract specific Appendix 6/3 and replaced as soon as practicable with ST2 concrete to Clause 2602 well rammed into the cleaned out void.

(ii) Areas of cutting face requiring their surface to be made stable shall be trimmed back by a nominal 50 mm or other amount required in contract specific Appendix 6/3 and the resulting surface together with an area of any surrounding intact material as detailed in contract specific Appendix 6/3, shall have a suitable cement based grout or sprayed concrete, applied by pressure to form a total nominal thickness of 40 mm unless the required thickness is stated in contract specific Appendix 6/3. Where required in contract specific Appendix 6/3, reinforcement shall be fixed to the surface before application of the concrete or grout. Weep holes using permanent formers shall be constructed to the requirements of contract specific Appendix 6/3 and at the locations described in contract specific Appendix 6/3.

(iii) Soft or insecure material, interlayered with rock shall be excavated to the depth behind the face described in contract specific Appendix 6/3. The resulting cavity shall be filled with ST2 concrete to Clause 2602 or with masonry infill complying with the Series 2400 and provided with weep holes all in accordance with requirements in contract specific Appendix 6/3.

(iv) Netting or other sheet covering as described in contract specific Appendix 6/3 or rock bolts as described in contract specific Appendix 6/10.

7 (02/16) Where required in contract specific Appendix 6/3, faces of cuttings which are to receive topsoil shall have one or more of the following measures carried out as appropriate:

(i) Be benched to retain topsoil as described in contract specific Appendix 6/3.

(ii) Be harrowed to a depth of 50 mm. Such harrowing shall be carried out immediately prior to topsoiling, diagonally, at an angle between 5º to 45º to the line of the toe, measured on the plane of the slope.

(iii) Isolated patches of soft, fragmented or insecure material shall be excavated and either:

(a) filled by well ramming in a Class of fill with similar characteristics as the surrounding intact material; or

(b) excavated and dealt with as described in sub-Clause 6(i) of this Clause.

(iv) Other areas required to be made stable shall be dealt with as stated in contract specific Appendix 6/3.

8 (02/16) The concrete, referred to in sub-Clauses 6(i) and 6(iii) of this Clause, permanently exposed on the face of the cutting shall have surface features as nearly as possible matching those of the adjacent intact face. Such concrete and the grout referred to in sub-Clause 6(ii) of this Clause shall have a consistent colour as nearly as possible matching that of the adjacent intact face.

604 (02/16) Excavation for Foundations

1 (02/16) The bottom of all foundation excavations shall be formed to the lines and levels shown on the drawings. Pockets of soft soil or loose rock shall be removed and the resulting voids and any natural voids shall be filled with ST1 concrete to Clause 2602 (or other material as required by contract specific Appendix 6/3) except in excavations for corrugated steel buried structures when Class 6K lower bedding fill material complying with Table 6/1 shall be used.

After placing of any blinding concrete shown on the drawings, no trimming of the side faces of the excavation shall be carried out for 24 hours.

2 (02/16) The Contractor shall make good:

(i) any lateral overbreak of the excavation above the bottom of the foundation greater than the net volume required for the permanent works with material of the same Class as used for fill above structural concrete foundations to comply with Clause 611 (except that for corrugated steel buried structures Class 6K lower bedding material shall be used) or, where the excavation is too narrow to allow the compaction of earthworks materials, with ST1 concrete to Clause 2602;

(ii) any additional excavation at or below the bottom of foundations, including that resulting from removal of material which the Contractor has allowed to deteriorate, with ST1 concrete to Clause 2602 (or other material required by contract specific Appendix 6/3) except that under corrugated steel buried structures Class 6K lower bedding material shall be used.

3 (02/16) Class 6K lower bedding material referred to in this Clause shall be deposited and compacted in compliance with Clauses 608 and 612 and Table 6/1.

605 (02/16) Special Requirements for Class 3 Material

1 (02/16) When contract specific Appendix 6/1 designates a material as Class 3 to be used or to remain intact in the permanent works the following shall apply:

(i) No earthworks involving Class 3 material or trafficking of areas which consist of Class 3 material, unless they are protected, shall be carried out during the periods described in contract specific Appendix 6/4.

(ii) Excavation of Class 3 material shall be by means of a face shovel, which shall excavate, swing and unload without moving the chassis or undercarriage during one operating cycle, or by means of a similar shovel-loading machine, so as to reduce the degradation of the material to a minimum.

(iii) When excavating Class 3 material the Contractor shall arrange his method of working so as to maintain a working face of minimum height 3 m or other height required in contract specific Appendix 6/4

within Class 3 material except that where the depth of the cutting is less than 3 m the full height of Class 3 material shall form the working face excluding any protection required to the formation or sub-formation.

(iv) Material other than chalk contained within the volume designated as Class 3 material in the contract shall be excavated and deposited separately from chalk and not be mixed with it.

(v) Trafficking of areas of Class 3 material shall not be permitted by vehicles having a capacity when struck of more than 15 m^3 unless otherwise described in contract specific Appendix 6/4.

(vi) Class 3 material shall not be stockpiled or be subjected to multiple handling.

(vii) Class 3 material shall not, unless required in contract specific Appendix 6/4, be layered with other fill material in the construction of embankments and other areas of fill.

(viii) When required in contract specific Appendix 6/4 embankments and other areas of fill constructed of Class 3 material shall either:

(a) upon reaching a level 600 mm below sub-formation or, where there is no capping, a level 600 mm below formation, be left for a minimum of 4 weeks or other period stated in contract specific Appendix 6/4, before continuing filling which shall, in all cases, be continued in compliance with sub-Clause 608.9; or

(b) be continued above sub-formation or formation with a protective layer in accordance with sub-Clause 608.9(ii) but which shall be of Class 3 material. Such material shall then be left for a minimum of 4 weeks or other period stated in contract specific Appendix 6/4 before removal of the protective layer and shall be immediately continued with the preparation of sub-formation or formation, as appropriate, in accordance with Clauses 613 and 616.

(ix) Where temporary instability occurs in chalk during deposition or compaction due to excessive working by plant or to inclement weather, the Contractor shall delay the further deposition of Class 3 material until the chalk has recovered sufficient strength for work to proceed. A detailed record of the areas of instability shall be made available to the Overseeing Organisation.

(x) At the end of each working day of filling, exposed Class 3 material laid that day shall, unless otherwise stated in contract specific Appendix 6/4 be rolled with two passes of a smooth wheeled roller having a mass per metre width of roll exceeding 2100 kg.

(xi) The other special requirements for Class 3 material described in sub-Clauses 613.11(i), 613.12(i), 616.1(ii) and 616.3 shall also apply, together with any other special requirements described in contract specific Appendix 6/1 or contract specific Appendix 6/4.

606 (02/16) Watercourses

1 (02/16) The clearance and modification of existing, or the construction of new watercourses, including ditches, streams, rivers, lagoons and ponds, shall be as described in contract specific Appendix 6/3 including any protection, lining, revetment or other works and shall comply with sub-Clauses 2 to 4 of this Clause.

2 (02/16) Clearance of existing watercourses shall include the removal of vegetation, vegetable matter and all other deposits within the watercourse profile. Materials resulting from this clearance shall be dealt with as unacceptable material.

3 (02/16) New watercourses and cleared existing watercourses shall be maintained in a clear condition.

4 (02/16) Redundant watercourses shall, where required in contract specific Appendix 6/3, be drained and cleared in accordance with sub-Clause 2 of this Clause and material outside the watercourse profile excavated and dealt with as unacceptable material. The excavations shall be to the dimensions stated in the contract and the whole filled with general or selected fills of the Class described in contract specific Appendix 6/3 complying with Table 6/1

deposited and compacted in compliance with Clause 608 and 612. Where the surface is to remain exposed it shall be topsoiled and seeded, or receive other treatment, all as described in contract specific Appendix 6/3.

#607 (02/16) Explosives and Blasting for Excavation

1 (02/16) Blasting for excavation shall not be employed unless permitted or required in contract specific Appendix 6/3 and such blasting shall be confined to the locations and to within the time limits stated therein.

2 (02/16) The Contractor shall:

(i) not carry out plaster shooting;

(ii) for each location where blasting is to be undertaken, give written notice to the Overseeing Organisation of the programme of blasting, including trial explosions, at least 10 days before it commences and give written notice of each blasting event as described in (v) below, at least 12 hours beforehand;

(iii) carry out trial explosions starting with reduced quantities of explosive in order to determine the size of the actual explosive charges and their disposition, for use in the main blasting operations, so as not to exceed the values for vibrational amplitude and vibrational peak particle velocity stated in (vi) below at the positions described therein;

(iv) determine danger zones likely to be created by the blasting operations, including trial explosions, within which blasted material may be projected and utilise suitable arrangements including temporary works, to retain such projectiles and ensure that no injury or damage is caused to persons or property thereby;

(v) limit blasting to a small number of events during permitted hours per day, where an event shall comprise a single explosion or a group of explosions each separated by a short time interval, the group lasting less than a minute;

(vi) ensure that:

(a) structures and earthworks, existing or under construction, on and off the site, do not experience, during blasting operations including trial explosions, a vibrational amplitude exceeding 0.2 mm and a resultant peak particle velocity exceeding 50 mm per second, or other limits stated in contract specific Appendix 6/3, at the same time or individually; and

(b) peak overpressures, of magnitude such as to endanger windows and glazed areas of structures, do not occur.

(vii) where instrumentation and monitoring is appropriate:

(a) rigidly fix to structures and insert in earthworks described in (vi)(a) above, suitable instruments to measure the vibrational amplitude and resultant vibrational peak particle velocity, and peak overpressures, experienced during blasting operations including trial explosions;

(b) make available details of the proposed instrumentation within the site;

(c) unless otherwise stipulated in contract specific Appendix 6/3, make his own arrangements for installing instruments on property off the site including negotiating with landowners and other interested parties;

(d) read such instruments and take measurements throughout the period of blasting operations, including trial explosions;

(e) for instruments on structures or earthworks on the site and, where required in contract specific Appendix 6/3, on property off the site, make available the results to the Overseeing Organisation at the end of each day's blasting.

(viii) take measurements of vibrational amplitude and peak particle velocity in each of three mutually perpendicular planes and determine the peak value, taken as the maximum resultant calculated by vector summation of the three components of amplitude and velocity respectively, measured as instantaneously as the resolution of the recording instrument permits;

(ix) ensure that noise from blasting operations is controlled in accordance with Clause 109;

(x) use explosives in the quantities and in the manner recommended by the manufacturer;

(xi) store explosives in registered premises in a licensed store or magazine provided with a separate compartment for detonators or use them under an Immediate Use Certificate issued by the police;

(xii) only permit explosives to be used or handled by or under the immediate control of a competent person in accordance with the Construction (General Provisions) Regulations 1961 (Regulation 19) and subsequent amending Regulations;

(xiii) ensure there is no unauthorised issue or improper use of explosives brought on the site and maintain a strict check on quantities issued and consumed;

(xiv) comply with the requirements of BS 6657 in respect of the use of electrical detonators in the vicinity of static and mobile radio transmitters, including normal radio and television broadcasting stations and radar units associated with aircraft movements, electricity generating plant and transmission lines.

608 (02/16) Construction of Fills

1 (02/16) All fills, including embankments, shall be constructed:

(i) in the locations described in contract specific Appendix 6/3 to the lines and levels stated therein;

(ii) of Classes of materials required or permitted in contract specific Appendix 6/1, complying with Table 6/1 with, unless otherwise described in the contract, only Class 6A material deposited into open water;

(iii) by depositing, as soon as practicable after excavation, in layers to meet the compaction requirements of Clause 612 as required for each Class of material in Table 6/1, except that:

(a) material requiring end product compaction shall be deposited in layers not exceeding 250 mm uncompacted thickness;

(b) material placed into open water shall be deposited by end tipping without compaction;

(c) material deposited in areas to receive dynamic compaction complying with Clause 630 shall be deposited and compacted to the requirements therein.

(iv) to the requirements of this Clause and any other requirements for fill in this Series.

2 (02/16) Starter layers of Classes 6B, 6C or 6D materials as described in contract specific Appendix 6/3 shall be deposited as the first layer or layers of fill above existing ground level or, if appropriate, above any ground improvement required by contract specific Appendix 6/13. Starter layers below Class 2E pulverised-fuel ash general fill shall be Class 6D material. Plant movement across starter layer material shall be restricted to that plant which is necessary for its deposition, spreading and compaction in compliance with this Clause and Clause 612 and any plant required to carry out any ground improvement beneath it if required by Clause 630. The Contractor shall take all reasonable measures to prevent damage to the underlying strata, which may include use of lighter spreading plant or a reduction of the number of passes of compaction plant.

3 (02/16) Coarse granular material Classes 1C and 6B shall, before compaction, be spread in layers by a crawler tractor of not less than 15 tonnes total mass. After compaction each layer shall, if voids remain, be blinded with an approved Class of granular material complying with Table 6/1 so that all surface voids are filled before the next layer and before any capping or sub-base is constructed.

4 (02/16) Embankments and other areas of fill shall, unless otherwise required in the contract, be constructed evenly over their full width and their fullest possible extent and the Contractor shall control and direct

constructional plant and other vehicular traffic uniformly over them. Damage by constructional plant and other vehicular traffic shall be made good by the Contractor with material having the same characteristics and strength as the material had before it was damaged.

5 (02/16) Embankments and other areas of unsupported fills shall not be constructed with steeper side slopes, or to greater widths than those described in contract specific Appendix 6/3, except to permit adequate compaction at the edges before trimming back, or to obtain the final profile following any settlement of the fill and the underlying material. However any oversteepening or increase in width shall not exceed any limits described in contract specific Appendix 6/3 and shall remain only for the minimum periods necessary consistent with the safety of the permanent works.

6 (02/16) Staged construction of fills and any controlled rates of filling, shall be carried out, in accordance with any requirements described in contract specific Appendix 6/3 including installation of instrumentation and its monitoring, in compliance with Clause 629.

7 (02/16) Where required in contract specific Appendix 6/3 the Contractor shall surcharge embankments or other areas of fill, as described therein for the periods stated. If settlement of surcharged fill results in any surcharging material, which is unacceptable for use in the fill being surcharged, lying below the formation or, where there is a capping, the sub-formation, the Contractor shall remove this unacceptable material and dispose of it in accordance with Clause 602. He shall then bring the resultant level up to formation or sub-formation, as appropriate, with acceptable material.

8 (02/16) Where pipes in embankments or in other areas of fill are permitted in contract specific Appendix 5/1 to be constructed other than in a trench, the fill shall be brought up to and over them equally on both sides. The fill shall be deposited in even layers and shall not be heaped above the pipe. Spreading and compaction shall be carried out evenly without dislodging, distorting or damaging the pipe. Power rammers are not to be used within 300 mm of any part of the pipe or joint.

9 (02/16) The last 600 mm depth of fill up to sub-formation level, or formation level as appropriate, shall, unless otherwise required in the Contract, be carried out for the full width of embankments, or between the outer extremities of the verges in other areas of fill, in a continuous operation. The Contractor shall then continue without delay to carry out either (i) or (ii) below:

(i) form the sub-formation or formation, all in accordance with Clauses 613 and 616, following immediately either by:

(a) the construction of the full thickness of capping or sub-base as appropriate; or

(b) if permitted in contract specific Appendix 6/3, the construction of a lesser thickness of capping or sub-base as described therein laid as a weather protection layer;

(ii) place an additional 300 mm minimum compacted thickness of material above sub-formation level or formation level as appropriate for the full width of the filling to form a weather protection. This weather protection shall be composed of the same material as the sub-formation or formation and compacted in compliance with Table 6/1. The material shall be provided from the Contractor's own resources and the protection layer shall be constructed in a continuous operation. For stabilised capping, the protective layer shall consist of unstabilised material.

10 (02/16) During construction of embankments and other fills, exposed sides of Classes 2E and 7B pulverised-fuel ash material shall be protected against scour and erosion from any source.

11 (02/16) Completed slopes of Classes 2E and 7B fill material shall be covered immediately by Class 5 topsoil as required in contract specific Appendix 6/8 or turf or other material, as required in contract specific Appendix 30/5.

12 (02/16) Whenever fill is to be deposited against the face of a natural slope, or sloping earthworks face including embankments, cuttings, other fills and excavations, such faces shall be benched or otherwise shaped as required in contract specific Appendix 6/3 immediately before placing the subsequent fill.

13 (02/16) All permanent faces of side slopes of embankments and other areas of fill formed in Classes 2 or 7 cohesive materials other than pulverised-fuel ash, shall, subsequent to any trimming operations, be re-worked and sealed by tracking a tracked vehicle, suitable for the purpose, on the slope, or by other suitable methods.

609 (02/16) Geotextiles and Geotextile-related Products Used to Separate Earthworks Materials

1 (02/16) Geotextiles and geotextile-related products shall conform to the requirements of the product standard BS EN 13251 and other characteristics and locations as set out in contract specific Appendix 6/5. A Declaration of Performance for each product stating compliance with BS EN 13251 and the required levels of performance stated in contract specific Appendix 6/5 shall be submitted to the Overseeing Organisation prior to their placement in the works.

610 (02/16) Fill to Structures

1 This Clause shall apply to fill to structures other than:

(i) fill for reinforced earth structures, including associated drainage layers;

(ii) fill for anchored earth structures including associated drainage layers;

(iii) fill for surround and bedding of corrugated steel buried structures;

(iv) fill above structural concrete foundations unless otherwise required in contract specific Appendix 6/6.

2 (02/16) Materials, as required or permitted in contract specific Appendix 6/6 of Classes 6N, 6P, 7A or 7B and complying with Table 6/1 shall be used as fill to structures, in the locations described in contract specific Appendix 6/6.

3 (02/16) The Contractor shall compact, in compliance with Clause 612, end-product compaction, Class 6N, 6P, 7A and 7B material to satisfy the compaction requirements for those Classes as listed in Table 6/1, but subject to the restrictions in sub-Clauses 4 and 5 of this Clause.

4 (02/16) Where fill to structures is required to the same level on more than one side of a structural element or buried structure (except where Clause 623 applies) it shall be maintained at heights not differing by more than 250 mm after compaction on opposing sides of the structural element as filling proceeds.

5 (02/16) The Contractor shall restrict compaction plant used on fill to structures, within 2 m of a structure, to the following items as described in sub-Clause 612.10 and listed in Table 6/4:

(i) vibratory roller having a mass per metre width of roll, as determined by sub-Clause 612.10, not exceeding 1,300 kg with a total mass not exceeding 1,000 kg;

(ii) vibrating plate compactor having a mass not exceeding 1,000 kg;

(iii) vibro-tamper having a mass not exceeding 75 kg.

The compacted level of the fill within this zone shall not differ during construction from the compacted level of the remainder of the adjoining fill to structures by more than 250 mm.

6 (02/16) Where required in contract specific Appendix 6/6, Class 6N, 6P and 7B material shall be shown, by means of a trial utilising not less than 20 m^3 of the material, deposited and compacted in accordance with this Clause, to be stable, when it is trimmed to a slope of 1 vertical to 1½ horizontal, or other slope described in contract specific Appendix 6/6.

611 (02/16) Fill Above Structural Concrete Foundations

1 (02/16) Fill deposited above structural concrete foundations shall be, as shown on the drawings:

(i) Class 6N, 6P, 7A or 7B selected fill material complying with Clause 610 including compaction requirements;

(ii) Class 6M selected fill material, deposited and compacted in accordance with Clause 623, above the foundation of arch profile corrugated steel buried structures;

(iii) another class of selected fill or general fill complying with Table 6/1 deposited and compacted in compliance with Clauses 608 and 612 and in addition be subject to sub-Clauses 610.4 and 5.

612 (02/16) Compaction of Fills

(02/16) **General**

1 (02/16) Except for dynamic compaction, which shall comply with Clause 630, and unless otherwise described in contract specific Appendix 6/3, the Contractor shall carry out compaction in compliance with this Clause, as soon as practicable after deposition, on all those Classes of fill in Table 6/1 which require to be compacted.

2 (02/16) Compaction shall be either method or end-product as required for the Class of fill in Table 6/1, using plant appropriate to the Class of fill and the site conditions.

3 (02/16) The Contractor shall obtain permission from the Overseeing Organisation before carrying out compaction outside normal working hours.

(02/16) **Method Compaction**

4 (02/16) Where method compaction is required to be adopted it shall comply with sub-Clauses 5 to 10 of this Clause.

5 (02/16) Except as stated in sub-Clause 6 of this Clause, method compaction shall be undertaken using the plant and methods in Table 6/4 appropriate to the compaction requirements as listed in Table 6/1 for the Class of material being compacted.

6 (02/16) Plant and methods not included in Table 6/4 shall only be used providing the Contractor demonstrates at site trials that a state of compaction is achieved by the alternative method equivalent to that obtained using the specified method.

7 (02/16) Earthmoving plant shall not be accepted as compaction equipment nor shall the use of a lighter category of plant to provide any preliminary compaction to assist the use of heavier plant be taken into account when assessing the amount of compaction required for any layer.

8 (02/16) If more than one Class of material is being used in such a way that it is not practicable to define the areas in which each Class occurs, the Contractor shall compact with plant operating as if only the material which requires the greater compactive effort is being compacted.

9 (02/16) The Contractor or Overseeing Organisation may carry out field dry density tests as described in sub-Clause 15 of this Clause on material compacted to method requirements at a frequency defined in contract specific Appendix 6/3. If the results of field tests show densities which indicate the state of compaction to be inadequate, then if this is due to failure of the Contractor to comply with the requirements of the contract, the Contractor shall carry out such further work as is required to comply with the contract.

10 (02/16) For the purposes of Table 6/4 the following shall apply:

(i) The minimum number of passes N is the minimum number of times that each point on the surface of the layer being compacted shall be traversed by the item of compaction plant in its operating mode, or struck by power rammers or falling weight compactors. D is the maximum depth of the compacted layer.

(ii) In column headed N # the number of passes shown is to be doubled for material Classes 1A, 1B, 2A, 2B, 2C and 2D when such materials occur within 600 mm of sub-formation (if capping is required) or formation. Such extra compaction shall, unless otherwise described in contract specific Appendix 6/3, either be carried out for the full width of the embankment or, in other areas of fill which are to receive a pavement, between the outer extremities of the verges.

(iii) The compaction plant in Table 6/4 is categorised in terms of static mass. The mass per metre width of roll is the total mass on the roll divided by the total roll width. Where a smooth wheeled roller has more than one axle the category of the machine shall be determined on the basis of the axle giving the highest value of mass per metre width.

(iv) A grid roller is a machine with a compacting roll or rolls constructed of heavy steel mesh of square pattern.

(v) A deadweight tamping roller is a machine with a roll or rolls from which 'feet' project and where the projected end area of each 'foot' exceeds 0.01 m² and the sum of the areas of the feet exceeds 15% of the area of the cylinder swept by the ends of the feet. The requirements for tamping rollers apply to machines that have 2 rolls in tandem. If only one tamping roll traverses each point on the surface of the layer on any one pass of the machine, the minimum number of passes shall be twice the number given in Table 6/4 plus any further doubling required to satisfy (ii) above.

(vi) For pneumatic-tyred rollers the mass per wheel is the total mass of the roller divided by the number of wheels. In assessing the number of passes of pneumatic-tyred rollers the effective width shall be the sum of the widths of the individual wheel tracks together with the sum of the spacings between the wheel tracks provided that each spacing does not exceed 230 mm. Where the spacings exceed 230 mm the effective width shall be the sum of the widths of the individual wheel tracks only.

(vii) A vibratory tamping roller, which may be self-propelled or towed, is a machine having a means of applying mechanical vibration to one or more rolls. The roll or rolls have projecting feet where the height of each foot exceeds 10% of the radius of the roll drum, the projected end area of each foot exceeds 0.1% of the roll drum surface area, and the sum of the areas of the feet exceeds 10% of the area of the cylinder swept by the ends of the feet.

The requirements for the operation of vibratory tamping rollers shall be the same as those stated for vibratory rollers in sub-Clause (viii) except that vibratory tamping rollers operating without vibration will be classified as deadweight tamping rollers.

(viii) Vibratory rollers are self-propelled or towed smooth-wheeled rollers having means of applying mechanical vibration to one or more rolls except that vibratory rollers employed for Method 5 compaction shall be single roll types.

Vibratory rollers operating without vibration will be classified as smooth-wheeled rollers.

The requirements for vibratory rollers are based on the use of the lowest gear on a self-propelled machine with mechanical transmission and a speed of 1.5 to 2.5 km/h for a towed machine, or a self-propelled machine with hydrostatic transmission. If higher gears or speeds are used an increased number of passes shall be provided in proportion to the increase in speed of travel.

Where the mechanical vibration is applied to two rolls in tandem, the minimum number of passes shall be half the number given in Table 6/4 for the appropriate mass per metre width of one vibrating roll but if one roll differs in mass per metre width from the other the number of passes shall be calculated as for the roll with the smallest value. Alternatively the minimum number of passes may be determined by treating the machine as having a single vibrating roll with a mass per metre width equal to that of the roll with the higher value.

Vibratory rollers shall be operated with their vibratory mechanism operating only at the frequency of vibration recommended by the manufacturers. Where more than one amplitude setting is available and/or a range of frequencies is recommended, the machine shall be operated at the maximum amplitude setting and at the maximum recommended frequency for that setting.

Vibratory rollers shall be equipped or provided with devices indicating the frequency at which the mechanism is operating and the speed of travel. Both devices shall be capable of being read by an inspector alongside the machine.

(ix) Vibrating-plate compactors are machines having a base-plate to which is attached a source of vibration consisting of one or two eccentrically weighted shafts and:

(a) the mass per square metre of the base-plate of a vibrating-plate compactor is calculated by dividing the total mass of the machine in its working condition by its area in contact with compacted material;

(b) vibrating-plate compactors shall be operated at the frequency of vibration recommended by the manufacturers. They shall normally be operated at travelling speeds of less than 1 km/h but if higher speeds are necessary the number of passes shall be increased in proportion to the increase in speed of travel.

(x) Vibro-tampers are machines in which an engine-driven reciprocating mechanism acts on a spring system through which oscillations are set up in a base-plate.

(xi) Power rammers are machines which are actuated by explosions in an internal combustion cylinder, each explosion being controlled manually by the operator.

(xii) Dropping weight compactors are machines in which a dead weight is dropped from a controlled height using a hoist mechanism and they include self-propelled machines with mechanical traversing mechanisms capable of compacting soil in trenches and close to structures.

(xiii) In the case of power rammers and dropping-weight compactors one pass will be considered as made when the compacting shoe has made one strike on the area in question.

(xiv) For items marked * in the Method 3 column of Table 6/4 the roller shall be towed by track-laying tractors. Self-propelled rollers are unsuitable.

(xv) Where combinations of different types or categories of plant are used, the following shall apply:

(a) the depth of layer shall be that for the type of plant requiring the least depth of layer; and

(b) the number of passes shall be that for the type of plant requiring the greatest number of passes.

(02/16) **End-product Compaction**

11 (02/16) Where end-product compaction is required it shall comply with sub-Clauses 12 to 15 of this Clause.

12 (02/16) The Contractor shall at least 7 days before commencement of end-product compaction make available the following to the Overseeing Organisation:

(i) the values of maximum dry density and the optimum moisture content obtained in accordance with BS 1377: Part 4 using the 2.5 kg rammer method or vibrating hammer method as appropriate for each of the fills he intends to use which meet the requirements of the permitted Class or Classes (where within any Class of material the fill contains material having different maximum dry densities and optimum moisture contents the Class shall be further sub-divided, by extending the identification system, in order to monitor the compacted density);

(ii) a graph of density plotted against moisture content from which each of the values in (i) above of maximum dry density and optimum moisture content were determined and, for Class 7A material, a plot of the 5% air voids curve for each sub-division.

13 (02/16) Once the information contained in sub-Clause 12 of this Clause has been made available to the Overseeing Organisation it shall form the basis for compaction.

14 (02/16) Fill compacted to end-product requirements shall have a field dry density, measured in accordance with sub-Clause 15 of this Clause, equal to or greater than the percentage given in Table 6/1 of the maximum dry density for the relevant Class of fill previously made available to the Overseeing Organisation in accordance with sub-Clause 12 of this Clause.

15 (02/16) The field dry density referred to in sub-Clause 14 of this Clause shall be measured in accordance with BS 1377: Part 9, except that nuclear methods shall only be used where required or permitted in contract specific Appendix 6/3. Where nuclear methods are used, the gauge shall be calibrated in accordance with BS 1377: Part 9.

613 (02/16) Sub-formation and Capping

1 (02/16) Capping shall be provided only in those locations, and to the extent, particularly stated in the contract specific Appendix 6/7 to be constructed with capping. It shall comply with this Clause and in addition, for stabilised capping, with Clauses 614, 615 and 643 as appropriate.

2 (02/16) Capping shall be constructed with Class 6F1, 6F2, 6F3, 6F4, 6F5, 6S, 9A, 9B, 9C, 9D, 9E or 9F material as required or permitted in contract specific Appendix 6/7 and complying with Table 6/1.

3 (02/16) Unless otherwise described in contract specific Appendix 6/7, capping shall either consist of one Class of capping material throughout its depth laid in one or more layers of compacted thickness complying with Clause 612, or be formed of not more than two elements of different capping materials. Each element shall be formed of one or more layers of the same capping material, each of compacted thickness complying with Clause 612. Class 9D or 9E stabilised capping material shall not be placed or constructed above Class 6F granular capping material or Class 6S granular filter layer material.

4 (02/16) Where required in contract specific Appendix 6/7, before commencing the construction of capping in the permanent works, the Contractor shall demonstrate the methods, equipment and materials he proposes to use by constructing an area, or areas as appropriate, of capping on a typical prepared sub-formation to the same thickness as required in the permanent works. The area of each capping construction demonstration shall be not less than 700 m².

5 (02/16) The materials placed during the demonstration may form part of the permanent works, provided they meet the requirements of the contract, or be carried out elsewhere on the site where this is detailed in contract specific Appendix 6/7. After completion of each demonstration area the Contractor shall within a period of not greater than 5 days and before commencing the main construction of the appropriate capping in the permanent works, carry out tests on each demonstration area and provide the Overseeing Organisation with records substantiating compliance with the stipulated criteria of contract specific Appendix 6/7. Where required by contract specific Appendix 6/7 the Contractor shall provide sheeting, to protect the demonstration area.

6 (02/16) The demonstration area shall, if it does not meet the requirements for the permanent works or is located elsewhere on site, be removed and the area reinstated in accordance with contract specific Appendix 6/7.

7 (02/16) The methods and materials used in the accepted demonstration shall not be changed during the course of the works without the construction of a further demonstration where such demonstrations are required by contract specific Appendix 6/7.

8 (02/16) Unless otherwise stated in contract specific Appendix 6/7, the sub-formation shall have the same longitudinal gradient, crossfall and surface level tolerances as the formation.

9 (02/16) The Contractor shall limit any unprotected area of sub-formation, which is to receive capping to suit the output of the plant in use and the rate of deposition of capping.

10 (02/16) No unprotected sub-formation which is to receive capping shall remain continuously exposed to rain causing degradation, nor be left uncovered overnight.

11 (02/16) In cuttings the Contractor shall, as permitted or required in contract specific Appendix 6/7 carry out one of the following procedures:

(i) for Class 6F granular capping material or Class 6S granular filter layer material, excavate below formation level to a depth to accept the capping, trim the surface to form the sub-formation and immediately compact with one pass of a smooth-wheeled roller having a mass per m width of roll not less than 2,100 kg or a vibratory roller having a mass per m width of roll not less than 700 kg or a vibrating plate compactor having a mass per m² of not less than 1,400 kg, except that only smooth wheeled rollers shall be used on Class 3 chalk material, and immediately deposit and compact above it a capping in Class 6F granular capping material or Class 6S granular filter layer material; or

(ii) for Class 9A, 9B, 9C, 9D, 9E or 9F capping material construct the capping by stabilising the intact material, providing it complies with Class 6E, 6R 7E, 7F, 7G or 7I material requirements, immediately below formation to form Class 9A, 9B, 9C, 9D, 9E or 9F material, respectively; or

(iii) excavate below formation to sufficient depth to enable stabilisation of intact Class 6E, 6R, 7E, 7F, 7G or 7I material to be carried out, to produce Class 9A, 9B, 9C, 9D 9E or 9F material forming the lower element of the capping (after stabilisation of this element, the capping shall be completed by depositing a further layer or layers of Class 6E, 6R 7E, 7F, 7G, or 7I material and stabilising it to form Class 9A, 9B, 9C, 9D, 9E or 9F capping or depositing and compacting Class 6F granular capping material to form the upper element of the capping); or

(iv) excavate to sub-formation level and deposit material complying with Classes 6E, 6R, 7E, 7F, 7G, or 7I to be stabilised to form a capping of Class 9A, 9B, 9C, 9D, 9E or 9F layers.

Where a stabilised layer is directly overlain by Class 6F granular capping material the stabilised layer shall be compacted as for a sub-formation in 11(i) above.

12 (02/16) On embankments and other areas of fill the Contractor shall, as permitted or required in contract specific Appendix 6/7 carry out one of the following procedures:

(i) complete the embankment to form the sub-formation or remove any protection layer and trim the surface to form the sub-formation, and in both cases compact with one pass of a smooth-wheeled roller having a mass per m width of not less than 2,100 kg or a vibratory roller of not less than 700 kg per m width or a vibrating plate compactor having a mass per m² of not less than 1,400 kg, (except that only smooth-wheeled rollers shall be used on Class 3 chalk material) and immediately construct above it, in one or more layers, Class 6F granular capping material or Class 6S granular filter layer material; or

(ii) construct the embankment to sufficient height and carry out stabilisation to form a capping of Class 9A, 9B, 9C, 9D, 9E or 9F material in one or more layers utilising where appropriate any protection layer previously constructed; or

(iii) for multi-element capping, incorporating stabilised material, construct the embankment to sufficient height to carry out the work described in 12(ii) above and immediately construct above it one or more layers of Class 6F granular capping material.

Where a stabilised layer is directly overlain by Class 6F granular capping material the stabilised layer shall be compacted as for a sub-formation in 12(i) above.

13 (02/16) For Class 6F3 material Optimum Moisture Content shall be determined according to BS 1377: Part 4 Method 3.7 (vibrating hammer test). Measurements of moisture content both for control purposes and for optimum moisture content determination shall be according to BS 1377: Part 2 Method 3 (oven dry method) but using an oven on a reduced temperature setting of 45 to 50°C.

14 (02/16) Filter layers constructed of Class 6S granular filter layer material shall be protected from damage by traffic and construction plant. The Contractor shall so organise work that only the traffic directly engaged in depositing, spreading and compacting the filter layer shall be permitted access to the surface of this layer. At no time shall the Contractor permit the leading edge of the filter layer to extend more than 100 metres beyond the leading edge of the succeeding layer of subbase.

614 (02/16) Cement Stabilisation to Form Capping

1 (02/16) Where capping is to consist of, either wholly or in part, cement stabilised material Class 9A, 9B or 9C, this Clause shall apply to the construction of those parts which are stabilised with cement.

2 (02/16) Material to be stabilised with cement shall be Class 6E, Class 7F and Class 7G materials all complying with Clause 601 and Table 6/1. Unless otherwise described in contract specific Appendix 6/7 cement shall be Portland cement complying with BS EN 197-1 and requirements given in contract specific Appendix 6/7.

3 (02/16) Class 6E, 7F or 7G material to be stabilised shall have added to it, at any point, that quantity of cement measured as a percentage of its dry weight as determined on the demonstration area, to meet the required bearing ratio in contract specific Appendix 6/1, subject to a minimum of 2% cement.

4 (02/16) The appropriate quantity of cement shall be uniformly spread, by a suitable spreading machine, on top of the layer to be processed. Using a collecting tray and balance the Contractor shall check the rate of spread of the machine once for every 500 m² of cement spread.

5 (02/16) Unless indicated otherwise in contract specific Appendix 6/7, Class 6E, 7F or 7G material shall be stabilised in a single layer if its compacted thickness is 250 mm or less. If its compacted thickness is greater, the material shall be stabilised in layers not less than 130 mm and not more than 250 mm thick, including any cutting-in required by sub-Clause 9 of this Clause.

6 (02/16) The Contractor shall not carry out cement stabilisation when the shade temperature is below 3°C unless on a rising thermometer above 0°C. Cement stabilisation shall not be carried out during periods of rain or when rain is imminent. When cement is spread on material likely to cause premature hydration, processing in accordance with sub-Clause 7 of this Clause shall follow immediately.

7 (02/16) Unless indicated otherwise by contract specific Appendix 6/7, Class 6E, 7F or 7G material forming the layer to be stabilised shall be processed by pulverising and mixing in the cement by means of a sufficient number of passes of a suitable mobile stabilising machine until 95% of the silt and clay fraction is reduced to particles or lumps passing a BS 28 mm sieve after dry sieving and the pulverisation complies with Table 6/1.

8 (02/16) During processing, sufficient water shall be available in the material to hydrate the cement and enable satisfactory mixing and compaction to be achieved. Any added water shall be through an integral spray-bar on the stabilising machine. Any added water shall have a sulfate content not exceeding 1400 mg/l as SO_4, when tested in accordance with BS EN 1744-1 clause 10.

9 (02/16) The stabilising machine shall be equipped with a device for controlling the depth of processing which shall be maintained at the correct setting at all times. An overlap of 150 mm shall be made between adjacent passes of the stabilising machine. Where a subsequent layer of material is placed on a layer previously stabilised the tines or blades of the stabilising machine shall be set so that they cut into the previously stabilised layer below by at least 20 mm.

10 (02/16) Each layer of Class 9A, 9B or 9C processed material shall be compacted as soon as possible after the final pass of the stabilising machine. Compaction shall be completed within 2 hours following the mixing of the cement into the material to be stabilised. Immediately before compaction Class 9B processed material shall have a Moisture Condition Value (MCV) of not greater than 12 nor less than the figure stated in contract specific Appendix 6/1 for Class 9B cement stabilised material, both as determined in accordance with Clause 632. Water shall be added if necessary in a uniform manner to enable this MCV requirement to be met. Any added water shall have a sulfate content not exceeding 1400 mg/l as SO_4 when tested in accordance with BS EN 1744-1 clause 10.

11 (02/16) The compaction of each layer of Class 9A or 9B material shall comply with Clause 612, Table 6/4 Method 6 or Method 7 respectively, except that if layers of Class 9A or 9B greater than 250 mm thickness are to be constructed, the number of passes of the compaction plant shall be determined from the results of a demonstration area as detailed in contract specific Appendix 6/7.

12 (02/16) The compaction of Class 9C material shall comply with Clause 612, end product compaction, to satisfy the compaction requirements given in Table 6/1 of this Class.

13 (02/16) Class 9A, 9B and 9C materials shall be cured in accordance with Clause 1035. During periods when the air temperature is forecast to drop below 3°C or when ground frost is forecast Class 9A, 9B and 9C material shall be protected, to prevent freezing, for a period of 7 days from the time of completion of compaction. Such protection shall be sealed to prevent the ingress of moisture.

14 (02/16) Class 9A, 9B and 9C materials shall not have other material deposited or compacted above them until such time as the required bearing ratio in contract specific Appendix 6/1 has been achieved. The relaxation allowed in sub-Clause 617.2 shall not apply before this time.

615 (02/16) Lime Stabilisation to Form Capping

1 (02/16) This Clause shall apply only to those capping materials which are to be stabilised with lime to form material Class 9D.

2 (02/16) Material to be stabilised with lime shall be Class 7E material complying with Clause 601 and Table 6/1.

3 (02/16) The form of lime used for lime stabilisation shall be as required in contract specific Appendix 6/7, the lime shall conform to BS EN 459-1 and meet the performance requirements stated in contract specific Appendix 6/7. This shall be demonstrated by the Declaration of Performance. Unless otherwise stated in contract specific Appendix 6/7 lime shall be either quicklime or hydrated lime conforming to BS EN 459-1. The particle size distribution of all types of quicklime shown in Tables 1 and 8 of BS EN 459-1 shall be of designation P4 as shown in Tables 5 and 12 of BS EN 459-1.

4 (02/16) The Contractor shall carry out testing of the lime as installed for available lime in accordance with Clause 641 at weekly intervals unless otherwise required in contract specific Appendix 6/7 during periods when lime stabilisation is carried out. The results shall be reported to the Overseeing Organisation. The available lime shall meet the requirements stated in contract specific Appendix 6/7 and the values stated in the Declaration of Performance.

5 (02/16) Class 7E material to be stabilised shall have added to it, at any point, the percentage of its dry weight of lime, as determined on the demonstration area, to meet the required bearing ratio in contract specific Appendix 6/1, subject to a minimum of 2½% by weight of 'available lime' as a percentage of the dry weight of the Class 7E material.

6 (02/16) Lime of quantity complying with sub-Clause 5 of this Clause shall be uniformly spread by a suitable spreading machine on top of the layer to be stabilised. Using a collecting tray and balance the Contractor shall check the rate of spread by weight, once for every 500 m² of lime spread or a different rate of testing for the rate of spread as described in contract specific Appendix 6/7. At the same time the Contractor shall collect samples of lime deposited on the tray and test them for available lime content in accordance with Clause 641.

7 (02/16) Unless indicated otherwise in contract specific Appendix 6/7, the material shall be stabilised in a single layer if its compacted thickness is 250 mm or less. If its compacted thickness is greater, the material shall be stabilised in layers not less than 130 mm and not more than 250 mm thick, including any cutting-in required by sub-Clause 12 of this Clause.

8 (02/16) Unless indicated otherwise in contract specific Appendix 6/7 lime stabilisation shall be carried out only during the months of March to September inclusive and when the shade temperature is not below 7°C. Only when the specified bearing ratio is attainable at a shade temperature less than 7°C, may lime stabilisation be carried out at such lower temperature. Lime stabilisation shall be suspended if rainfall will have an adverse effect on the material being stabilised. The spreading of lime shall not be carried out in a manner or under conditions that will result in lime being blown from the site onto adjacent land or property.

9 (02/16) Unless indicated otherwise in contract specific Appendix 6/7, the material forming the layers to be stabilised shall be processed by pulverising and mixing in the lime by means of sufficient number of passes of a suitable mobile stabilising machine until 95% of the Class 9D processed material passes a BS 28 mm sieve after dry sieving and the pulverisation complies with Table 6/1.

10 (02/16) During processing sufficient water shall be available in the material to slake the quicklime (if used) and to enable satisfactory mixing and compaction to be achieved. Any added water shall be through an integral spray-bar on the stabilising machine. Any added water shall have a sulfate content not exceeding 1400 mg/l as SO_4 when tested in accordance with BS EN 1744-1 clause 10.

11 (02/16) The layer shall receive at least two passes of the stabilising machine to pulverise and mix the lime and soil, after which the processing shall be interrupted by a period of not less than 24 hours and not greater than 72 hours, to enable the lime to react with the soil. Before this period commences the surface of the layer shall be sealed with one pass of a smooth wheeled roller having a mass per metre width of roll of not less than 2700 kg or a pneumatic tyred roller of not less than 1000 kg per wheel. At the end of this period the layer shall receive one further pass of the stabilising machine or more if required to enable the material to comply with sub-Clauses 9 and 13 of this Clause, adding water uniformly if necessary. Any added water shall have a sulfate content not exceeding 1400 mg/l as SO_4 when tested in accordance with BS EN 1744-1 clause 10.

12 (02/16) The stabilising machine shall be equipped with a device for controlling the depth of processing which shall be maintained at the correct setting at all times. An overlap of 150 mm shall be made between adjacent passes of the stabilising machine. Where a subsequent layer of material is placed on a layer previously stabilised the tines or blades of the stabilising machine shall be set so that they cut into the previously stabilised layer below by at least 20 mm.

13 (02/16) Each layer of Class 9D processed material shall be compacted as soon as possible after the final pass of the stabilising machine. Immediately before compaction the processed material shall have a Moisture Condition Value (MCV) of not greater than nor less than the figures stated in contract specific Appendix 6/1, for Class 9D lime stabilised material, both as determined in accordance with Clause 632.

14 (02/16) If there is a delay following the final pass and before commencement of compaction the surface shall be sealed by not less than 2 passes of a smooth-wheeled roller having a mass per metre width of not less than 2,700 kg or of a pneumatic tyred roller of not less than 1,000 kg mass per wheel. On recommencement and before compaction the layer shall be re-processed without the addition of lime, by a sufficient number of passes of the stabilising machine to meet the MCV requirements of sub-Clause 13 of this Clause adding water uniformly if necessary.

15 (02/16) The compaction of each layer shall comply with Clause 612, Table 6/4 Method 7 except that if layers more than 250 mm thick are constructed the number of passes of the compaction plant shall be those determined from results obtained on a demonstration area as detailed in contract specific Appendix 6/7.

16 (02/16) Class 9D material shall not have other material deposited or compacted above it until such time as the required bearing ratio in contract specific Appendix 6/1 has been achieved. The relaxation allowed in sub-Clause 617.2 shall not apply before this time.

616 (02/16) Preparation and Surface Treatment of Formation

1 (02/16) The formation shall, after completion of any subgrade drainage, and immediately before laying sub-base on areas of completed formation, have a surface level tolerance within +20 mm and -30 mm, or other level of tolerance defined in contract specific Appendix 6/7 relative to its designed level after completion of the following operations as necessary:

(i) Any protection layer shall be removed and any soft or damaged areas shall be rectified by excavating them and replacing with acceptable material having the same characteristics and strength as the surrounding material. The surface of the formation shall be trimmed and immediately cleaned free from mud and slurry which shall be dealt with as unacceptable material in accordance with sub-Clause #601.2.

(ii) The formation shall immediately be compacted, in addition to the compaction required for the fill. This additional compaction shall for this purpose be assumed to be as for a layer of 250 mm finished thickness compacted in compliance with Clause 612 and Table 6/4 Method 6 except for Class 3 materials where Method 4 shall be used. Immediately after the additional compaction the formation shall be trimmed to achieve the tolerances of this sub-Clause.

2 (02/16) Where the tolerances in sub-Clause 1 of this Clause are exceeded, the Contractor shall determine the full extent of the area which is out of tolerance and shall make good the formation as follows:

(i) if the surface is too high it shall be re-trimmed and re-compacted in compliance with Clause 612 and sub-Clause 1 of this Clause;

(ii) if the surface is too low it shall be corrected by the addition of acceptable material complying with Table 6/1 having characteristics and strength matching the overlain material, deposited and compacted in compliance with Clause 608 and 612 and sub-Clause 1 of this Clause. In cohesive materials Classes 2 and 7, where this low surface is less than 150 mm below formation, material shall be removed to a depth of at least 150 mm below formation before the additional material is deposited and compacted.

3 (02/16) After trimming, or re-trimming if necessary, the formation shall be rolled with one pass of a smoothwheeled roller having a mass per metre width of roll not less than 2100 kg or, except for Class 3 material, a vibratory roller having a mass per metre width of vibrating roll of not less than 700 kg or a vibrating plate compactor having a mass per m² under the base plate of not less than 1,400 kg.

4 (02/16) Where required in contract specific Appendix 6/7 or where the tolerances in sub-Clause 1 of this Clause cannot be achieved in the preparation of formation in rock then one of the following shall be carried out so as to achieve the above tolerances:

(i) the material shall be excavated below formation to the depth described in contract specific Appendix 6/7. The excavated material shall be processed as described in contract specific Appendix 6/7 and re-deposited and compacted in compliance with Clauses 608 and 612 and Table 6/4 Method 6 in compacted layers not greater than 250 mm thick; or

(ii) where the rock surface is tabular it shall be regulated by depositing and compacting cement bound material as described in contract specific Appendix 6/7, complying with the 1000 Series, or ST1 concrete to Clause 2602.

5 (02/16) The Contractor shall limit any areas of completed formation to suit the output of plant in use and the rate of deposition of sub-base. No formation of cohesive material Classes 2 and 7 shall remain continuously exposed to rain causing degradation or be left uncovered overnight.

6 (02/16) The preparation of formation on existing sub-base material shall be completed as described in contract specific Appendix 6/7.

617 (02/16) Use of Sub-formation or Formation by Construction Plant

1 (02/16) Construction plant and other vehicular traffic (except that required for the construction of capping) shall not be operated on the sub-formation, unless adequate protection, if necessary in addition to any weather protection, is provided.

2 (02/16) Construction plant and other vehicular traffic (except for that required for preparation of the formation in compliance with Clause 616) shall not be operated on the formation unless adequate protection, if necessary in addition to any weather protection is provided.

3 (02/16) In addition to the requirements of sub-Clauses 1 and 2 of this Clause, the Contractor shall make available to the Overseeing Organisation his proposals for the protection of the sub-formation or formation in areas where they are within 300 mm of the existing ground level, after topsoil has been stripped, before using construction plant or other vehicular traffic at or above sub-formation or formation.

618 (02/16) Topsoiling

1 (02/16) Topsoiling shall be carried out using Class 5 material complying with Table 6/1.

2 (02/16) Imported topsoil, Class 5B material, shall only be imported when required in contract specific Appendix 6/8, or contract specific Appendix 30/6.

3 (02/16) When required in contract specific Appendix 6/8 topsoil shall not be excavated from stockpiles, whether on site or imported:

(i) which have been exposed to a cumulative rainfall exceeding 100 mm, or other figure stated in contract specific Appendix 6/8, over the preceding 28 days measured at a point detailed in contract specific Appendix 6/8; or

(ii) when heavy rain is falling; or

(iii) with a tracked vehicle; or

(iv) which have been stockpiled for more than 2 years; or

(v) which are frozen; or

(vi) in the case of topsoil which has been stockpiled for more than 6 months, unless the stockpile has been treated with a total, non-residual herbicide as recently as is seasonally possible (allowing the period of time recommended by the manufacturer to elapse prior to excavation).

4 (02/16) Topsoil shall:

(i) be deposited and spread on the areas, to the thicknesses described in contract specific Appendix 6/8, in layers not exceeding 150 mm. Each layer shall be firmed before spreading the next. The thickness shall be reduced where necessary to allow for any subsequent turfing required in contract specific Appendix 30/5 (it shall not be spread using a tracked vehicle, when so stipulated in contract specific Appendix 6/8);

(ii) have stones and other debris removed and disposed off site which have:

(a) dimensions greater than 100 mm equivalent diameter, unless otherwise permitted in contract specific Appendix 6/8; and

(b) dimensions greater than 50 mm equivalent diameter which lie within 50 mm of the surface;

(iii) be graded to smooth contours, eliminating all mounds and depressions where water may collect;

(iv) not have stones or other debris protruding above the surface by more than 30 mm, and comply with the further requirements of Clauses 3004 and 3005.

619 (02/16) Earthwork Environmental Bunds

1 (02/16) Earthwork environmental bunds shall be constructed in the locations described in contract specific Appendix 6/9 with fill materials complying with the requirements therein and Clause 601 and Table 6/1. Deposition shall be in accordance with Clause 608 and compaction with the requirements of Table 6/1 unless otherwise described in contract specific Appendix 6/9 or the requirements of sub-Clauses 2 or 3 of this Clause apply.

2 (02/16) Earthwork environmental bunds formed of reinforced or anchored earth shall be constructed in compliance with Clauses 2502 and 622.

3 (02/16) Earthwork environmental bunds formed of strengthened embankments shall be constructed in accordance with Clause 621.

4 (02/16) Where required in contract specific Appendix 6/9 earthwork environmental bunds shall be topsoiled in accordance with Clause 618 and seeded, or turfed, all in accordance with Clause 3001 and Clause 3005.

620 (02/16) Landscape Areas

1 (02/16) Landscape areas shall be constructed in the locations shown in contract specific Appendix 6/9 with Class 4 material as described therein and complying with Table 6/1.

2 (02/16) Unless method compaction to Clause 612 is required in contract specific Appendix 6/9 the degree of compaction of Class 4 material shall be sufficient to remove large voids and to produce a coherent mass whilst preventing over-compaction and any build up of excess pore pressures.

3 (02/16) Following completion of filling of landscape areas, Class 4 material shall where required in contract specific Appendix 6/9, be shaped as described therein.

4 (02/16) Class 4 material shall be deposited in landscape areas after any adjoining embankment or other area of fill has been completed. Where permitted in contract specific Appendix 6/9 and provided the adjoining embankment or other area of fill is always kept at least 1 m higher than the landscape area fill, construction of such landscape area may proceed until completion.

5 (02/16) Landscape areas shall be topsoiled in accordance with Clause 618 and seeded or turfed in accordance with Clause 3001 and Clause 3005 to the requirements of contract specific Appendix 30/5.

621 (02/16) Strengthened Embankments

1 (02/16) Strengthened embankments shall be constructed in the locations and to the details described in contract specific Appendix 6/9 with fill materials and strengthening materials described therein.

622 (02/16) Earthworks for Reinforced Soil and Anchored Earth Structures

1 (02/16) The construction of earthworks for reinforced soil and anchored earth structures together with assembly and erection of reinforcing and anchor elements and associated components shall be in compliance with this Clause and Clause 2502.

2 (02/16) Excavation shall be carried out in compliance with Clause 604.

3 (02/16) Fill for reinforced soil structures shall, except for their associated drainage layers, be of Class 6I, 6J, 7B, 7C or 7D selected material complying with Table 6/1 as permitted in contract specific Appendix 6/1 together with any other additional requirements therein. Where Class 7B conditioned pulverised-fuel ash is used for fill, only non-metallic reinforcing elements shall be used and metallic fasteners shall be of stainless steel.

4 (02/16) Fill for anchored earth structures shall, except for their associated drainage layers, be of 6I or 6J selected material complying with Table 6/1 as permitted in contract specific Appendix 6/1 together with any other additional requirements therein.

5 (02/16) Drainage layers to reinforced soil and anchored earth structures shall be one of the following as appropriate:

(i) Class 6H material complying with Table 6/1 and contract specific Appendix 6/1.

(ii) for use with Class 7B material, uncrushed, partially crushed or crushed gravel sand complying with BS EN 12620, fines content category f_3 and sizes 0/4(CP), 0/4(MP) or 0/2(MP) and, when in contact with metallic components, with the properties listed in Table 6/3.

(iii) Type B filter drain material complying with Clause 505 for use only in horizontal drainage layers.

Vertical layers of drainage layer material shall be brought up at the same rate as the adjoining fill material without mixing or contamination.

6 (02/16) In addition to the requirements of sub-Clauses 7 and 8 of this Clause, fill for reinforced soil and anchored earth structures shall be deposited and compacted in compliance with Clauses 608 and 612 and Table 6/1, with method compaction for Classes 6H, 6I, 6J, 7C and 7D materials and end-product compaction for Class 7B material. Drainage layer material other than Class 6H shall be deposited in accordance with Clause 608 and compacted as described in contract specific Appendix 6/3.

7 (02/16) Reinforced soil and anchored earth structures shall have:

(i) the deposition and compaction carried out so that all layers of reinforcing and anchor elements are fixed at the required levels on top of compacted fill;

(ii) the deposition, spreading, levelling and compaction of the fill carried out generally in a direction parallel to the facing and executed in stages to alternate with the placing and fixing of the reinforcing and anchor elements and the facing elements;

(iii) the reinforcing and anchor elements kept as free as possible from damage or displacement during deposition, spreading, levelling and compaction of the fill (also the programme of filling shall be arranged so that no machines or vehicles run on the reinforcing or anchor elements);

(iv) all construction plant, and all other vehicles, having a mass exceeding 1,000 kg, kept at least 2 m away from the back of the facing;

(v) within 2 m of the back of the facing, the plant used for compacting the fill restricted to the following items as described in sub-Clause 612.10 and listed in Table 6/4:

(a) vibratory roller having a mass per metre width of roll not exceeding 1,300 kg with a total mass not exceeding 1,000 kg;

(b) vibrating plate compactor having a mass not exceeding 1,000 kg;

(c) vibro tamper having a mass not exceeding 75 kg;

(vi) at the Contractor's option, the reinforced soil and anchored earth fill beyond the 2 m zone referred to in (v) above, raised in thicker layers than within the 2 m zone, providing this is compatible with the arrangement of the reinforcing and anchor elements and the difference in compacted level does not exceed 300 mm;

(vii) during construction of the reinforced soil or anchored earth structure the retained fill at the rear of the structure, as defined in sub-Clause 8 of this Clause, maintained at the same level as the adjoining reinforced soil or anchored earth fill;

(viii) if the retained material at the rear of the reinforced soil or anchored earth structure, as defined in sub-Clause 8 of this Clause, is an existing earthwork or natural slope which requires supporting by temporary shoring, this shoring shall be removed progressively as the work proceeds to prevent the formation of voids.

8 (02/16) The rear of the reinforced soil or anchored earth structure is the position coinciding with the ends of the reinforcing or anchor elements furthest from the facing units.

623 (02/16) Earthworks for Corrugated Steel Buried Structures

1 (02/16) The construction of earthworks for corrugated steel buried structures together with assembly and erection of their components shall be in compliance with this Clause and Clause 2501.

2 (02/16) Excavation shall be carried out in compliance with Clause 604 and any additional requirements given in contract specific Appendix 6/3.

3 (02/16) Fill for corrugated steel buried structures shall be of the following selected granular materials complying with Table 6/1:

(i) Lower bedding material Class 6K;

(ii) Upper bedding material Class 6L;

(iii) Surround material Class 6M.

and the overlying fill shall be one of the following:

(iv) Well graded, uniformly graded or coarse, granular material Class 6Q; or

(v) Wet, dry, stony or silty cohesive material and chalk Class 7H.

4 (02/16) In addition to the requirements of sub-Clauses 5 to 14 of this Clause, Class 6K, 6L and 6M materials shall be deposited in compliance with Clause 608 and shall (except for Class 6L upper bedding material which shall be uncompacted) be end-product compacted in compliance with Clause 612 and Table 6/1, except that the compacted layers shall not exceed 150 mm thickness. The compaction and testing requirements for Class 6K lower bedding and Class 6M surround materials shall also comply with any additional requirements given in contract specific Appendix 6/3.

5 (02/16) As far as possible, the Class 6K lower bedding material shall be shaped to fit the invert such that it supports 20% of the circumference of circular structures or the whole of the portion of circumference occupied by the bottom plates of multi-radii structures. In the case of structures of span less than 3 m where this cannot be met and the structure is erected on a flat or partially preshaped bedding, care shall be taken to ensure that the lower bedding material is properly placed and compacted under the haunches. A uniform layer of uncompacted Class 6L upper bedding material shall be deposited before the placing of any part of the steel structure, over the whole width of the shaped lower bedding material and shall be of sufficient depth to fill the corrugations of the underside of the structure.

6 (02/16) Class 6M surround material shall be used for filling all excavations above the bedding, except those in hard material for which Class 6K lower bedding material shall be used throughout. Additional requirements for making good are given in Clause 604.

7 (02/16) Class 6M surround material shall be deposited and compacted uniformly on either side of the structure. The maximum difference in fill level on opposite sides of the structure shall be no more than 250mm at all times unless otherwise permitted in contract specific Appendix 6/3.

8 (02/16) Class 6M surround material shall be deposited and compacted in accordance with sub-Clause 4 of this Clause, above the concrete foundations of arch-profile corrugated steel buried structures.

9 (02/16) Class 6M surround material under the structure shall be well compacted by hand using a suitably sized pole or length of rectangular timber between the corrugations, or by another suitable method.

10 (02/16) Plant for compaction of Class 6M surround material within 1 m of either side of the structure and up to a height of 1 m, or one fifth of the span if greater, above the crown, shall be restricted to the following items, as described in sub-Clause 612.10 and listed in Table 6/4:

(i) vibratory rollers having a mass per metre width of roll not exceeding 750 kg;

(ii) vibrating plate compactors having mass not exceeding 750 kg;

(iii) vibro-tampers.

11 (02/16) Fill placed above the level of the crown of the structure, including Class 6M surround material, shall be deposited, spread and compacted in such a manner that any out of balance forces transmitted to the culvert are kept to a minimum. This will require that trafficking by construction plant is not all in one direction and that the compacted surface of the fill is kept as near horizontal as practicable.

12 (02/16) During all operations of filling, compaction, road pavement construction and of any other traffic movements which affect the shape of the structure, the changes in the horizontal and vertical diameters of the structure shall not exceed ± 5% for circular structures and ± 2% for structures of other cross-sections. The longitudinal straightness over any 10 m length of the structure shall not deviate by more than 25 mm, and the rotational displacement in any 10 m length of structure shall not be greater than 25 mm.

13 (02/16) Only that compaction plant described in sub-Clause 10 of this Clause, shall be used in the vicinity of the structure unless the depth of compacted Class 6M surround material placed above the crown of the structure is more than 1 m, or one fifth of the span, whichever is the greater. The structure shall not be subjected to a surcharge greater than the depth of fill required in the contract and permitted depth of any protection layer given in contract specific Appendix 6/3.

14 (02/16) No material shall be placed by tipping either onto the structure or within a distance on either side of the structure of 2 m or half the span of the structure, whichever is the greater.

15 (02/16) Method compaction shall be used for the overlying fill (Classes 6Q and 7H) according to Clause 612; the method used being that for the corresponding general fill in Table 6/1.

624 (02/16) Ground Anchorages

1 (02/16) The Contractor shall design the ground anchorages required as part of the permanent works and listed in contract specific Appendix 1/10, in accordance with the design requirements described in contract specific Appendix 6/10. The ground anchorages shall be installed and where required in contract specific Appendix 6/10 proof loaded, in accordance with the requirements therein.

2 (02/16) Ground anchorages not forming part of the permanent works will only be permitted where such anchorage will not affect the permanent works.

625 (02/16) Crib Walling

1 (02/16) The Contractor shall design the crib walling listed in contract specific Appendix 1/10 in accordance with the design specification and procedures in contract specific Appendix 6/10 and Design Manual for Roads and Bridges document BD 68 (DMRB 2.1.3).

626 (02/16) Gabions

1 (02/16) Gabions shall be manufactured and constructed in compliance with this Clause and with requirements stated in contract specific Appendix 6/10. Gabion units shall be assembled in accordance with the manufacturer's instructions.

2 (02/16) Unless otherwise stated in contract specific Appendix 6/10 they shall be filled with Class 6G material complying with Table 6/1. The grading of fill shall be as described in Appendix 6/10, the maximum size of fill material shall not exceed two thirds of the minimum dimension of the gabion compartment or 200mm whichever is smaller and the minimum size of the fill material shall be not less than the size of the mesh opening.

Gabion units shall be filled to fully achieve the required minimum cage density and compaction of fill. At no point before, during or after filling shall the cage be deformed by working methods or in use loading. The required cage density shall be as stated in contract specific Appendix 6/10. Internal tie wires shall be inserted and units shall be tensioned in accordance with the manufacturer's instructions. Gabion units shall be constructed so as to maintain tightness of mesh and shall be laced securely with wire, complying with sub-Clause 3 of this Clause.

3 (02/16) Gabion wire mesh units shall be woven steel wire conforming to BS EN 10223-3 or welded steel mesh conforming to BS EN 10223-8. The Contractor shall submit documentary evidence to the Overseeing Organisation to demonstrate compliance of the gabion units at least four weeks prior to the commencement of gabion work. Documentation that demonstrates compliance with a product acceptance scheme as described in Clause 104 sub-Clauses 15 and 16 can be supplied to meet this requirement where the scheme demonstrates that the gabion units meet the level of performance required by the specification.

Unless otherwise stated in contract specific Appendix 6/10 the site environment level shall be High Aggressive: C4; and the Assumed Working Life shall be 120 years or greater. Coating requirements for all wire shall be as required by Tables 1 and A.1 of BS EN 10223-3 and BS EN 10223-8.

4 (02/16) Unless otherwise stated in contract specific Appendix 6/10 woven steel gabions shall be of mesh designation 6x8 or 8x10 with minimum wire diameter of 2.7mm.

5 (02/16) Unless otherwise stated in contract specific Appendix 6/10 welded mesh shall be 3mm to 5mm diameter bars with the mesh size 75mm x 75mm maximum.

627 (02/16) Swallow Holes and Other Naturally Occurring Cavities

1 (02/16) Infilled swallow holes and other naturally occurring cavities shall where required in contract specific Appendix 6/11 be excavated, filled and capped as described in contract specific Appendix 6/11.

2 (02/16) Open swallow holes and other shallow cavities shall where required in contract specific Appendix 6/11 be flushed, cleared of rubbish where to do so would not endanger operatives, and filled and capped as described in contract specific Appendix 6/11.

628 (02/16) Disused Mine Workings

1 (02/16) Disused mine workings shall, where required in contract specific Appendix 6/11 be investigated, inspected, monitored, cleared, flushed, filled, capped or have any other treatment carried out, all as described in contract specific Appendix 6/11.

629 (02/16) Instrumentation and Monitoring

1 (02/16) Instrumentation, other than that required in compliance with Clause 607, shall be as described in contract specific Appendix 6/12 and shall be installed in the locations shown therein.

2 (02/16) Monitoring of instrumentation shall be carried out as required in the contract specific Appendix 6/12 and the results supplied to the Overseeing Organisation as required therein.

630 (02/16) Ground Improvement

(02/16) **Dynamic Compaction**

1 (02/16) Dynamic compaction, carried out to either method or end-product as required in contract specific Appendix 6/13 and achieved by dropping a free-falling heavy mass (pounder) a number of times at pre-determined spacings on the surface of the ground or fill, shall be applied to the areas described in contract specific Appendix 6/13.

2 (02/16) Dynamic compaction shall be completed before the commencement of construction of any permanent works, or work on the placement or diversion of Statutory Undertaker's equipment, within that part of the site defined in the contract specific Appendix 6/13 which contains the area to be dynamically compacted.

3 (02/16) The Contractor shall ensure that no damage or injury is caused to persons or property on or off the site as a result of the dynamic compaction.

(02/16) **Vibrated Stone Columns**

4 (02/16) Vibrated stone columns in existing natural soils or fill by vibroreplacement or vibrodisplacement shall be formed in the manner and in the areas described in contract specific Appendix 6/13.

5 (02/16) Unless otherwise described in contract specific Appendix 6/13, materials shall comply with sub-Clause 8 of this Clause.

6 (02/16) The Contractor shall report immediately to the Overseeing Organisation any circumstance which indicates that in the Contractor's opinion the ground conditions differ from those expected from his interpretation of the ground investigation reports.

7 (02/16) Columns shall be installed as shown on the drawings and within the permitted tolerances stated in contract specific Appendix 6/13.

(02/16) **Materials**

8 (02/16) The material used to form the columns shall be clean, hard, inert material and shall be natural sand, gravel, crushed rock other than argillaceous rocks, crushed hardcore, crushed concrete, crushed slag or well burnt non-plastic shale. The material shall be appropriate to the ground conditions in which the stone columns are formed and its use shall not be detrimental to any other work on site. The material shall be nominally single sized coarse aggregate with a value of upper (D) sieve size in the range 10 mm to 40 mm or a graded material complying with Clause 804 (Type 2 unbound mixtures for subbase) except the material passing the 0.425 mm sieve shall be non-plastic when tested in accordance with BS1377: Part 2.

(02/16) **Testing of Ground Treatment**

9 (02/16) Testing of treated ground shall be undertaken for control purposes during the treatment and on completion of the ground treatment. The performance criteria for treated ground are given in contract specific Appendix 6/13.

10 (02/16) Improvement in treated ground shall be measured in accordance with the criteria stated in contract specific Appendix 6/13.

(02/16) **Types of Test**

11 (02/16) The following tests or alternatives permitted in contract specific Appendix 6/13 shall be carried out at the positions and frequency given in contract specific Appendix 6/13.

(02/16) **Plate tests**

12 (02/16) Plate bearing tests are loading tests carried out using a plate on treated ground. The test is described in BS 1377: Part 9: 1990 Method 4.1.

(02/16) **Zone Tests**

13 (02/16) Zone tests are loading tests carried out with a slab, intended to test bearing pressure over a wider and deeper zone than in the plate tests. The test is described in BS 1377: Part 9: 1990 Method 4.2.

(02/16) **Penetration Tests**

14 (02/16) In granular soils the static cone (Dutch cone) penetration test, the standard penetration test (SPT) or dynamic cone penetration tests shall be employed as described in contract specific Appendix 6/13.

(02/16) **Trial Areas**

15 (02/16) Trial areas are to be treated and tested where required in contract specific Appendix 6/13. Trial areas which meet the performance requirements may form part of the permanent works.

16 (02/16) Equipment and materials used in trial areas shall be identical to those proposed for the permanent works.

17 (02/16) Testing in trial areas shall be carried out as given in contract specific Appendix 6/13.

18 (02/16) Detailed reports shall be prepared for all testing as defined in Table 6/6.

(02/16) **Records and Reports**

19 (02/16) Complete records of plant, equipment and materials shall be maintained during all ground treatment operations.

20 (02/16) Records shall be made available to the Overseeing Organisation including all information identified in Table 6/6 and any other information required by contract specific Appendix 6/13. All records pertaining to a particular day's operations shall be made available to the Overseeing Organisation at the start of the following day's operations.

(02/16) **Other Methods**

21 (02/16) Other methods of ground improvement shall be carried out where required in contract specific Appendix 6/13 and as described therein.

631 (02/16) Earthworks Materials Tests

1 (02/16) Unless otherwise described in the contract sampling and testing of earthworks materials shall be carried out in accordance with BS 1377: Part 1 to Part 9 inclusive.

#632 (02/16) Determination of Moisture Condition Value (MCV) of Earthworks Materials

1 (02/16) Where the Moisture Condition Value (MCV) is to be determined, the determination shall be carried out in accordance with BS 1377: Part 4.

2 (02/16) The determination of the MCV/moisture content relation in accordance with BS 1377: Part 4 shall be carried out when required in contract specific Appendix 6/1.

3 (02/16) Where permitted in contract specific Appendix 6/1 the rapid assessment procedure for material acceptability also given in BS 1377: Part 4 may be used.

633 (02/16) Determination of Undrained Shear Strength of Remoulded Cohesive Material

1 (02/16) Where required in contract specific Appendix 6/1, the undrained shear strength of cohesive soil under total stress conditions shall be determined from triaxial compression tests performed on remoulded specimens and tested under conditions where the lateral pressure is maintained constant and there is no change in total

water content of the specimens. Unless otherwise required in contract specific Appendix 6/1, the tests shall be in accordance with BS 1377: Part 7 and the additional requirements of sub-Clauses 2 to 4 of this Clause.

2 (02/16) The specimens shall be prepared in accordance with BS 1377: Part 7 using remoulded material compacted into a split mould of nominal diameter 100 mm and nominal height 200 mm. The soil shall be at its natural moisture content and compacted in accordance with BS 1377: Part 1 using the 2.5 kg rammer method described in BS 1377: Part 4.

3 (02/16) The specimens shall be tested at an operating cell pressure of 200 ± 10 kN/m² and an axial strain rate of 1% per minute. Where contract specific Appendix 6/1 requires c and ⟨ to be determined, the test shall be modified to enable Mohr circles to be plotted and c and ⟨ reported.

4 (02/16) Where stated and described in contract specific Appendix 6/1, other tests may be used during construction to supplement the test described above, provided the results have been correlated to ensure compatibility.

634 (02/16) Determination of Intact Lump Dry Density (IDD) of Chalk

1 (02/16) The intact lump dry density (IDD) of chalk lumps shall be determined in accordance with BS 1377: Part 2.

635 (02/16) Los Angeles and Other Tests for Particle Soundness

(02/16) **Resistance to Fragmentation – Los Angeles Coefficient (LA)**

1 (02/16) The value of Los Angeles coefficient shall be determined in accordance with BS EN 1097-2.

(02/16) **Other Tests for Particle Soundness**

2 (02/16) Where contract specific Appendix 6/1 requires magnesium sulfate soundness tests to be carried out, they shall be carried out in accordance with BS EN 1367-2. Where contract specific Appendix 6/1 requires slake durability, point load or other tests for soundness to be carried out, they shall be carried out in accordance with the procedures given therein.

636 (02/16) Determination of Effective Angle of Internal Friction (⟨′) and Effective Cohesion (c′) of Earthworks Materials

1 (02/16) The effective angle of internal friction ⟨′ and effective cohesion c′ shall be determined by shear box or triaxial tests as required in Table 6/1 and contract specific Appendix 6/1. Unless otherwise required in contract specific Appendix 6/1, the tests shall be in accordance with the requirements in sub-Clauses 2 to 6 of this Clause.

(02/16) **Shear Box Tests**

2 (02/16) For Classes 6N, 6P, 6I and 6J granular materials, the tests shall be carried out in accordance with BS 1377: Part 7 and the following:

(i) The plan size of the shear box shall be nominally 300 mm square.

(ii) Three samples shall be tested, each sample occupying the full depth of the shear box and shall be compacted at the optimum moisture content to a dry density of 92% ± 2% of the maximum dry density determined in accordance with BS 1377: Part 4 using the vibrating hammer method. The samples shall not be immersed in water.

(iii) Each of the samples shall be subjected to a different normal stress equal to the maximum vertical pressure in the fill at the base, quarter height and mid-height of the structure respectively. Each of the samples shall be sheared in a single stage test within one hour of compaction and the rate of shearing shall be such that no pore water pressure is generated.

(iv) The values of c′ and ⟨′ reported shall be those corresponding to the maximum strength envelope.

3 (02/16) For Classes 7A, 7C and 7D cohesive materials, the tests shall be carried out in accordance with BS 1377: Part 7 and the following:

(i) The shear boxes shall be nominally 300 mm square and nominally 60 mm square.

(ii) For the initial determination of fill properties three samples shall be tested in each size of shear box. The samples shall occupy the full depth of the shear box and shall be compacted at the optimum moisture content to a dry density of 92% ± 2% of the maximum dry density determined in accordance with BS 1377: Part 4 using the 4.5 kg rammer method. To allow the samples to soften, the shear box assembly shall then be immersed in water for a minimum period of 24 hours.

(iii) Each of the three samples in a set shall be subjected to a different effective normal stress equal to the maximum vertical pressure in the fill at the base, quarter height and mid-height of the structure respectively. Normal stresses shall be applied to the softened sample for a minimum period of 24 hours prior to shearing in a single stage test. The rate of shearing shall be such that no pore water pressure is generated.

(iv) The values of c′ and ⟨′ reported shall be those corresponding to the maximum strength envelope.

(v) The test results obtained using the 300 mm square box shall be taken as the properties of the fill. The initial test results obtained using the 60 mm square box shall be used for the subsequent quality control of the fill.

4 (02/16) For Class 7B pulverised-fuel ash material, the procedure shall be as for sub-Clause 3 of this Clause except that:

(i) The maximum dry density and optimum moisture content shall be determined in accordance with BS 1377: Part 4 using the 2.5 kg rammer method.

(ii) An additional sample in each set shall be subjected to an effective normal stress equal to the maximum vertical pressure in the fill at three quarters of the height of the structure or the lowest attainable normal stress, whichever is the greater.

(iii) As soon as the shear box has been filled and the sample compacted, the normal stress shall be applied and the sample immersed in water. This concurrent loading and immersion of the sample shall continue for a period of 24 hours and the sample shall then be sheared without further delay.

(02/16) **Triaxial Tests**

5 (02/16) Where Class 7A cohesive fill to structures is to be tested by a consolidated drained triaxial test, the test shall be in accordance with BS 1377: Part 8 using the sample size and preparation procedure in Clause 633 and the requirements of contract specific Appendix 6/1.

637 (02/16) Determination of Resistivity (r_s) to Assess Corrosivity of Soil, Rock or Earthworks Materials

(02/16) **Method of Test**

1 (02/16) Where the resistivity of the ground or of material to be used in the permanent works is required to be determined, this shall be obtained by in situ tests as described in sub-Clause 2 of this Clause or, when required in contract specific Appendix 6/1, by laboratory tests on samples in accordance with BS 1377: Part 3.

(02/16) **In Situ Resistivity Tests**

2 (02/16) In situ resistivity shall be determined at the site of the structure or the cutting or the proposed borrow pit or on stockpiles in accordance with BS 1377: Part 9 and the requirements of contract specific Appendix 6/1.

3 (02/16) Details of the area and volume of material to be tested shall be made available to the Overseeing Organisation together with the arrangement of electrodes in each test. The Overseeing Organisation shall be given notice of the date, time and location of each test.

4 (02/16) At any test location, at each selected depth, two measurements shall be made such that the electrode alignment for the second measurement is approximately at right angles to the electrode alignment for the first measurement.

5 (02/16) At any test location, the first selected depth shall be no more than 1.5 m below the ground surface or no more than 1.5 m below the upper surface of the material to be tested, whichever is appropriate. Following the measurements at the first selected depth, further measurements shall be made at selected depths increasing by approximately 2 m each time until measurements have been carried out on the full depth of ground or material to be tested.

6 (02/16) Where the depth of material to be tested is too great to be tested from the surface within the confines of the site, the Contractor shall undertake all necessary arrangements for testing such material, including subsequent tests which may be required at a lower level following excavation. Details of his arrangements shall be made available to the Overseeing Organisation.

638 (02/16) Determination of Redox Potential (E_h) to Assess Corrosivity of Earthworks Materials for Reinforced Soil and Anchored Earth Structures

(02/16) **Method of Test**

1 (02/16) Where the redox potential of material to be incorporated into reinforced earth or anchored earth structures is required to be determined, this shall be obtained by in situ tests as described in sub-Clauses 2 to 6 of this Clause or, when required in contract specific Appendix 6/1, by laboratory tests on samples in accordance with BS 1377: Part 3.

(02/16) **In Situ Redox Potential Tests**

2 (02/16) In situ redox potential shall be determined in undisturbed ground at the site of the cutting or the proposed borrow pit or on stockpiles in accordance with BS 1377: Part 9 and the requirements of contract specific Appendix 6/1.

3 (02/16) Details of the area and volume of material to be tested shall be made available to the Overseeing Organisation together with the locations of the test pits.

4 (02/16) The Overseeing Organisation shall be given notice of the date, time and location of each test.

5 (02/16) At each test location the tests shall be carried out in a test pit not less than 600 mm square in plan excavated to a depth given in contract specific Appendix 6/1.

6 (02/16) At each test location, a sample shall be taken from the base of the excavation and kept in a hermetically sealed container for determining the pH value of the fill which shall be obtained in accordance with BS 1377: Part 3.

639 (02/16) Determination of Coefficient of Friction and Adhesion Between Fill and Reinforcing Elements or Anchor Elements for Reinforced Soil and Anchored Earth Structures

(02/16) **Reinforcing Elements**

1 (02/16) The coefficient of friction and the adhesion shall be determined by tests carried out in a 300 mm size shear box with the element material fixed at the top of the lower half of the box and the fill sample occupying the top half only.

2 (02/16) The test shall be carried out following the procedure given in Clause 636 for the determination of the effective angle of internal friction and effective cohesion of earthworks materials except that:

(i) The apparatus shall in addition include a steel block fitting closely inside the lower half of the shear box and equal in height to it less the thickness of the reinforcing element material. (The flat toothed grid fitting the bottom of the shear box is not required).

(ii) The preparation of test specimens shall be as follows:

Element material shall be cut to fit the interior plan shape of the shear box using a sufficient number of strips of such material abutting to completely fill the interior plan area without overlap. They shall be firmly fixed to the top of the steel block so that the top face of the material is flush with the top edge of the lower half of the box and aligned so that shearing occurs in a direction parallel to the longitudinal axis of a reinforcing element.

A sample of the fill material to be used in the permanent works, of sufficient size to carry out the tests, and within the range of moisture contents permitted in Table 6/1 for such material, shall be sieved to obtain a test sample passing the 20 mm BS sieve, of sufficient quantity after compaction to fill the top half of the shear box. The top and bottom of the shear box shall be fixed together and the test sample of the sieved fill materials immediately placed and compacted in the top half of the box as described in Clause 636.

3 (02/16) The value of the coefficient of friction between the fill and the reinforcing element shall be obtained by plotting the values of peak shear stress, obtained in the tests, against applied normal stress and by measuring the slope of the resulting straight line graph. The adhesion between the fill and the reinforcement shall be obtained by taking the shear stress corresponding with zero normal stress.

4 (02/16) The following additional information shall be recorded for each test:

(i) Normal stress applied (kN/m²).

(ii) Peak shear stress (kN/m²).

(iii) Strain at peak shear stress (%).

(iv) Moisture content of fill after test (Classes 7B, 7C and 7D).

(02/16) **Anchor Elements**

5 (02/16) Where required in contract specific Appendix 6/1, tests shall be carried out as described therein to assess the interaction between the fill and the element.

640 (02/16) Determination of Permeability of Earthworks Materials

1 (02/16) Where required in Table 6/1 or contract specific Appendix 6/1 the permeability of earthworks materials shall be determined as described in contract specific Appendix 6/1.

641 (02/16) Determination of Available Lime Content of Lime for Lime Stabilised Capping

1 (02/16) Contract compliance testing shall be carried out by the Contractor to determine the available lime content of lime as installed for lime or lime and cement stabilised capping. This compliance testing shall be carried out in accordance with BS EN 459-2 except that the sample increments shall be taken from the collecting tray used to check the rate of spread at intervals of one increment per 500 m per lane.

2 (02/16) The available lime content shall be determined as required by BS EN 459-2, it shall be reported and categorised as required in BS EN 459-1.

642 (02/16) Determination of the Constrained Soil Modulus (M*) of Earthworks Materials for Corrugated Steel Buried structures

(02/16) **General**

1 (02/16) When required in contract specific Appendix 6/1, the constrained soil modulus M* shall be determined by one of the following methods:

(i) From plate loading tests in accordance with BS 1377: Part 9.

(ii) From the results of Standard Penetration resistance tests (SPT) on non-cohesive materials in accordance with BS 1377: Part 9.

(iii) From the values of the coefficient of volume compressibility (m_v) from one-dimensional consolidation tests on undisturbed soil specimens of cohesive materials, in accordance with BS 1377: Part 5.

(02/16) **Plate Loading Tests**

2 (02/16) When testing compacted granular fill materials the test surface shall be prepared by either:

(i) removing the surface layer carefully using hand tools to perform the test at a depth of 100 mm below the surface; or

(ii) compacting the surface, after the required compaction has been applied, with two additional passes with no vibration to remove the overstressing in the surface layer.

If necessary, the plate shall be bedded onto the fill using a small quantity of dry sand to remove any slight unevenness of the surface of the fill. The field dry density and moisture content shall be determined at the position of each plate loading test in accordance with Clause 612 and BS 1377: Part 2 or equivalent, respectively.

3 (02/16) When using the plate loading test to determine M* of the material existing on site a smooth surface shall be prepared by careful hand excavation and the plate bedded onto the soil using either sand or quick setting gypsum plaster depending on whether the soil is granular or cohesive.

4 (02/16) The loading test shall be carried out under a series of maintained loads. The maximum load shall be such that the average pressure applied to the plate is in excess of 350 kN/m². The elastic modulus E_s shall be determined as the secant modulus between average pressures applied to the plate of 150 and 350 kN/m² in the first load cycle. A value of Poisson's ratio of 0.3 shall be assumed. A second load cycle testing shall also be conducted and the results of this test compared with the first load cycle to check that the plate was seated satisfactorily during the first load cycle. If the results of the first load cycle suggest that the plate was not seated satisfactorily, then the procedure shall be repeated at a new location. Second load cycle results shall not be used to demonstrate the adequacy of the material being tested.

5 (02/16) The constrained soil modulus M* shall be determined from the elastic modulus Es using the equation:

$$M^* = \frac{(1 - v)E_s}{(1 + v)(1 - 2v)} \ (N/mm^2)$$

where v = Poisson's ratio to be taken as 0.3

and E_s = Elastic modulus of the soil (N/mm²)

(02/16) **Standard Penetration resistance Tests**

6 (02/16) The constrained soil modulus M* of non-cohesive materials existing on site shall be determined from the relationship:

$$M^* = \frac{0.39N^{1.4}}{'_m} \ (N/mm^2)$$

Where N = uncorrected SPT value and $'_m$ = 1.3

(02/16) **One-dimensional Consolidation Tests**

7 (02/16) The constrained soil modulus M* of undrained cohesive materials existing on site shall be determined from the formula:

$$M^* = \frac{1}{m_v} \ (N/mm^2)$$

where m_v (mm²/N) is the coefficient of volume compressibility

The value of m_v to be used in the formula is that calculated from the test results for the loading increment in the consolidation test corresponding to the in situ effective overburden pressure at the level of the crown of the structure.

(02/16) **Number of Tests**

8 (02/16) Three tests for M* shall be carried out on the soil occurring on each side of the structure, one of which is to be at the level of the maximum span, unless otherwise described in contract specific Appendix 6/1.

643 (02/16) Lime and Cement Stabilisation to Form Capping

1 (02/16) Where capping is to consist of, either wholly or in part, lime and cement stabilised material Class 9E or 9F, this Clause shall apply to the construction of those parts which are stabilised with lime and cement.

2 (02/16) Material to be stabilised with lime and cement shall be Class 6R or 7I material all complying with Clause 601 and Table 6/1.

3 (02/16) The form of lime used for lime and cement stabilisation shall be as required in contract specific Appendix 6/7, the lime shall conform to BS EN 459-1 and meet the performance requirements stated in contract specific Appendix 6/7. This shall be demonstrated by the Declaration of Performance. Unless otherwise stated in contract specific Appendix 6/7 lime shall be either quicklime or hydrated lime conforming to BS EN 459-1. The particle size distribution of all types of quicklime shown in Tables 1 and 8 of BS EN 459-1 shall be of designation P4 as shown in Tables 5 and 12 of BS EN 459-1.

4 (02/16) The Contractor shall carry out testing of the lime as installed for available lime in accordance with Clause 641 at weekly intervals unless otherwise required in contract specific Appendix 6/7 during periods when lime and cement stabilisation is carried out. The results shall be reported to the Overseeing Organisation. The available lime shall meet the requirements stated in contract specific Appendix 6/7 and the values stated in the Declaration of Performance.

5 (02/16) Cement for lime and cement stabilisation shall be Portland cement complying with Clause 1001, unless otherwise described in contract specific Appendix 6/7.

6 (02/16) Classes 6R and 7I material to be stabilised shall have added to it, at any point, the percentage of its dry weight of lime and cement as determined on the demonstration area, to meet the required bearing ratio in contract specific Appendix 6/1, subject to a minimum of 1% by weight of 'available lime' and 2% cement as a percentage of the dry weight of the 6R and 7I materials.

7 (02/16) The Contractor shall not carry out lime and cement stabilisation when the shade temperature is below 3°C unless on a rising thermometer above 0°C. Lime and cement stabilisation shall not be carried out during periods of rain or when rain is imminent. When cement is spread on material likely to cause premature hydration, processing in accordance with sub-Clause 16 of this Clause shall follow immediately.

8 (02/16) Lime of quantity complying with sub-Clause 6 of this Clause shall be uniformly spread by an approved spreading machine on top of the layer to be stabilised. Using a collecting tray and balance the Contractor shall check the rate of spread by weight, once for every 500 m^2 of lime spread or a different rate of testing for the rate of spread as described in contract specific Appendix 6/7. At the same time the Contractor shall collect samples of lime deposited on the tray and test them for available lime content in accordance with Clause 641.

9 (02/16) Unless indicated otherwise in contract specific Appendix 6/7, the material shall be stabilised in a single layer if its compacted thickness is 250 mm or less. If its compacted thickness is greater, the material shall be stabilised in layers not less than 130 mm and not more than 250 mm thick, including any cutting-in required by sub-Clause 13 of this Clause.

10 (02/16) Unless indicated otherwise in contract specific Appendix 6/7, the material forming the layer to be stabilised shall be processed by pulverising and mixing in the lime by means of sufficient number of passes of an approved mobile stabilising machine until 95% of the Class 9E or 95% of the silt and clay fraction of Class 9F processed material passes a BS 28 mm sieve after dry sieving and the pulverisation complies with Table 6/1.

11 (02/16) During processing sufficient water shall be available in the material to slake the quicklime (if used) and to enable satisfactory mixing and compaction to be achieved. Any added water shall be through an integral spray-bar on the stabilising machine. Any added water shall have a sulfate content not exceeding 1400 mg/l as SO_4 when tested in accordance with BS EN 1774-1 clause 10.

12 (02/16) The layer shall receive at least two passes of the stabilising machine to pulverise and mix the lime and soil, after which the processing shall be interrupted by a period of not less than 24 hours and not greater than 72 hours to enable the lime to react with the soil. Before this period commences the surface of the layer shall be sealed with one pass of a smooth wheeled roller having a mass per metre width of roll of not less than 2700 kg or a pneumatic tyred roller of not less than 1000 kg per wheel. At the end of this period the layer shall receive one further pass of the stabilising machine or more if required to enable the material to comply with sub-Clauses 10 of this Clause.

13 (02/16) The stabilising machine shall be equipped with a device for controlling the depth of processing which shall be maintained at the correct setting at all times. An overlap of 150 mm shall be made between adjacent passes of the stabilising machine. Where a subsequent layer of material is placed on a layer previously stabilised the tines or blades of the stabilising machine shall be set so that they cut into the previously stabilised layer below by at least 20 mm.

14 (02/16) The appropriate quantity of cement shall be uniformly spread, by a suitable spreading machine, on top of the layer previously processed with lime. Using a collecting tray and balance the Contractor shall check the rate of spread of the machine once for every 500 m_2 of cement spread.

15 (02/16) Unless indicated otherwise in contract specific Appendix 6/7, the material previously mixed with lime shall be stabilised with cement in a single layer or in layers of the same compacted thickness as for the lime mixed material layers, including any cutting-in required by sub-Clause 13 of this Clause.

16 (02/16) Unless indicated otherwise in contract specific Appendix 6/7, the material forming the layer to be stabilised shall be processed by pulverising and mixing in the cement by means of a sufficient number of passes of an approved mobile stabilising machine until 95% of the silt and clay fraction is reduced to particles or lumps passing a BS 28 mm sieve after dry sieving and the pulverisation complies with Table 6/1.

17 (02/16) During processing, sufficient water shall be available in the material to hydrate the cement and enable satisfactory mixing and compaction to be achieved. Any added water shall be through an integral spray-bar on the stabilising machine. Any added water shall have a sulfate content not exceeding 1400 mg/l as SO_4 when tested in accordance with BS EN 1774-1 clause 10.

18 (02/16) The stabilising machine shall be equipped with a device for controlling the depth of processing which shall be maintained at the correct setting at all times. An overlap of 150 mm shall be made between adjacent passes of the stabilising machine. Where a subsequent layer of material is placed on a layer previously stabilised the tines or blades of the stabilising machine shall be set so that they cut into the previously stabilised layer below by at least 20 mm.

19 (02/16) Each layer of Class 9E or 9F processed material shall be compacted as soon as possible after the final pass of the stabilising machine. Compaction shall be completed within 2 hours following the mixing of the cement into the material to be stabilised. Immediately before compaction Class 9E processed material shall have a Moisture Condition Value (MCV) of not greater than 12 nor less than the figure stated in contract specific Appendix 6/1 both as determined in accordance with Clause 632. Water shall be added if necessary in a uniform manner to enable this MCV requirement to be met. Any added water shall have a sulfate content not exceeding 1400 mg/l as SO_4 when tested in accordance with BS EN 1774-1 clause 10.

20 (02/16) The compaction of each layer of Class 9E or 9F material shall comply with Clause 612, Table 6/4 Method 7, except that if layers of Class 9E or 9F greater than 250 mm thickness are to be constructed, the number of passes of the compaction plant shall be determined from the results of a demonstration area as detailed in contract specific Appendix 6/7.

21 (02/16) Class 9E and 9F materials shall be cured in accordance with Clause 1035. During periods when the air temperature is forecast to drop below 3°C or when ground frost is forecast Class 9E and 9F material shall be protected, to prevent freezing, for a period of 7 days from the time of completion of compaction. Such protection shall be sealed to prevent the ingress of moisture.

22 (02/16) Class 9E and 9F materials shall not have other material deposited or compacted above them until such time as the required bearing ratio in contract specific Appendix 6/1 has been achieved. The relaxation allowed in sub-Clause 617.2 shall not apply before this time.

644 (02/16) Determination of Sulfate Content

1 (02/16) Where required in Table 6/1 or contract specific Appendix 6/1, the effects of water-soluble sulfate, oxidisable sulfides and total potential sulfate shall be assessed in accordance with BS EN 1744-1 clauses 10, 11 and 13.

2 (02/16) Test results and limiting values for sulfate shall be given as SO_4.

3 (02/16) At least five samples of each material shall be tested for WS, OS and TPS. The mean of the highest two values shall be used for comparison with the limiting values. This also applies if six to nine results are available. If ten or more results are available, the mean of the highest 20% of the results shall be used for comparison with the limiting values.

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TABLE 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:				
									Lower	Upper			
GENERAL GRANULAR FILL	1	A	–	Well graded granular material	General Fill	Any material, or combination of materials, other than material designated as Class 3 in the Contract. (Properties (i), (ii) and (iv) in next column, shall not apply to chalk). Recycled aggregate. Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9, and 10: P (natural aggregates); A (construction and demolition recycling industries); B1 (municipal incinerator bottom ash (MIBA)); D2 (air cooled blast furnace slag) D3 (basic oxygen furnace slag) D4 (electric arc furnace slag (EAF C)) E (non ferrous steel industry – except E2 molybdenum slag) G (mining and quarry industry)	(i) grading	BS 1377: Part 2 or BS EN 13242	Tab 6/2	Tab 6/2	Tab 6/4 Method 2	1	A	–
							(ii) uniformity coefficient	See Note 5	10	–			
							(iii) mc	BS 1377: Part 2 See Note 4	App 6/1	App 6/1			
							(iv) MCV	Clause 632	App 6/1	App 6/1			
							(v) IDD of chalk	Clause 634	–	App 6/1			

TABLE 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:				
									Lower	Upper			
GENERAL GRANULAR FILL	1	B	–	Uniformly graded granular material	General Fill	Any material, or combination of materials, other than chalk. Recycled aggregate Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9, and 10: P (natural aggregates – except chalk); A (construction and demolition recycling industries); B1 (municipal incinerator bottom ash (MIBA)); C1 (coal fly ash) C4 (coal bottom ash) D2 (air cooled blast furnace slag) D3 (basic oxygen furnace slag) D4 (electric arc furnace slag (EAF C)) E (non ferrous steel industry – except E2 molybdenum slag) F (foundry industry) G (mining and quarry industry) H1 (dredge spoil sand)	(i) grading	BS 1377: Part 2 or BS EN 13242	Tab 6/2	Tab 6/2	Tab 6/4 Method 3	1	B	–
							(ii) uniformity coefficient	See Note 5	–	10			
							(iii) mc	BS 1377: Part 2 See Note 4	App 6/1	App 6/1			
							(iv) MCV	Clause 632	App 6/1	App 6/1			
	1	C	–	Coarse granular material	General Fill	Any material, or combination of materials, other than material designated as Class 3 in the Contract. (Properties (i) and (ii) in next column, shall not apply to chalk). Recycled aggregate Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9, and 10: P (natural aggregates); A (construction and demolition recycling industries); D2 (air cooled blast furnace slag) G (mining and quarry industry)	(i) grading	BS 1377: Part 2 or BS EN 13242	Tab 6/2	Tab 6/2	Tab 6/4 Method 5	1	C	–
							(ii) uniformity coefficient	See Note 5	5	–			
							(iii) Los Angeles coefficient	Clause 635	–	50			

TABLE 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:				
									Lower	Upper			
GENERAL COHESIVE FILL	2	A	–	Wet cohesive material	General Fill	Any material, or combination of materials, other than chalk.	(i) grading	BS 1377: Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 1 except for materials with liquid limit greater than 50, determined by BS 1377: Part 2, only deadweight tamping or vibratory tamping rollers or grid rollers shall be used.	2	A	–
							(ii) plastic limit (PL)	BS 1377: Part 2	–	–				
							(iii) mc	BS 1377: Part 2 See Note 4	PL -4%	App 6/1				
							(iv) MCV	Clause 632	App 6/1	App 6/1				
							(v) Undrained shear strength of remoulded material	Clause 633	App 6/1	App 6/1				
	2	B	–	Dry cohesive material	General Fill	Any material, or combination of materials, other than chalk	(i) grading	BS 1377: Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 2	2	B	–
							(ii) plastic limit (PL)	BS 1377: Part 2	–	–				
							(iii) mc	BS 1377: Part 2 See Note 4	App 6/1	PL -4%				
							(iv) MCV	Clause 632	App 6/1	App 6/1				
							(v) undrained shear strength of remoulded material	Clause 633	App 6/1	App 6/1				
	2	C	–	Stony cohesive material	General Fill	Any material, or combination of materials, other than chalk	(i) grading	BS 1377: part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 2	2	C	–
							(ii) plastic limit (PL)	BS 1377: part 2	–	–				
							(iii) mc	BS 1377: Part 2 See Note 4	App 6/1	App 6/1				
							(iv) MCV	Clause 632	App 6/1	–				
							(v) Undrained shear strength of remoulded material	Clause 633	App 6/1	–				

TABLE 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:				
									Lower	Upper			
GENERAL COHESIVE FILL	2	D	–	Silty cohesive material	General Fill	Any material, or combination of materials, other than chalk	(i) grading	BS 1377: Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 3	2	D	–
							(ii) mc	BS 1377: Part 2 See Note 4	App 6/1	App 6/1				
							(iii) MCV	Clause 632	App 6/1	App 6/1				
							(iv) undrained shear strength of remoulded material	Clause 633	App 6/1	App 6/1				
	2	E	–	Reclaimed pulverised fuel ash cohesive material	General Fill	Reclaimed material from lagoon or stockpile containing not more than 20% furnace bottom ash	(i) mc	BS 1377: Part 2 See Note 4	To enable compaction to Clause 612		End product 95% of maximum dry density of BS 1377 : Part 4 (2.5 kg rammer method)	2	E	–
							(ii) bulk density	BS 1377: Part 9	App 6/1	App 6/1				
GEN CHALK FILL	3	–	–	Chalk	General Fill	Chalk and associated materials all designated as Class 3 in the Contract	(i) mc	BS 1377: Part 2 See Note 4	–	App 6/1	Tab 6/4 Method 4, or Method 1 if required in App 6/1. All types of vibratory rollers of Categories over 1800 kg shall not be used	3	–	–
							(ii) IDD	Clause 634	App 6/1	App 6/1				

TABLE 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:					
									Lower	Upper				
LANDSCAPE FILL	4	–	–	Various	Fill to landscape areas	See App 6/1	(i) grading	BS 1377: Part 2	App 6/1	App 6/1	See Clause 620 and App 6/1	4	–	–
							(ii) mc	BS 1377: Part 2 See Note 4	–	App 6/1				
							(iii) MCV	Clause 632	App 6/1	App 6/1				
TOPSOIL	5	A	–	Topsoil, or turf, existing on site	Topsoiling	Topsoil or turf designated as Class 5A in the Contract	(i) grading	Clause 618	–	Clause 618	–	5	A	–
	5	B	–	Imported topsoil	Topsoiling	General purpose grade complying with BS 3882	–	–	–	–	–	5	B	–

TABLE 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:					
									Lower	Upper				
SELECTED GRANULAR FILL	6	A	–	Selected well graded granular material	Below water	Natural gravel, natural sand, crushed gravel, crushed rock other than argillaceous rock, crushed concrete, chalk, well burnt colliery spoil or any combination thereof. (Properties (i) and (ii) in next column, shall not apply to chalk.) Recycled aggregate Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9, and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A (construction and demolition recycling industries); G1 (red coal shale) G3 (pre-selected all-in from quarrying/mining)	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	No compaction	6	A	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5				
							(ii) uniformity	See Note 5	10	–				
							(iii) SMC of chalk index	Clause 634	–	20%				
							(iv) plasticity index	BS 1377: Part 2	Non-plastic					
	6	B	–	Selected coarse granular material	Starter layer	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, chalk, well burnt colliery spoil, slag or any combination thereof. (Properties (ii) and (iii) in next column, shall not apply to chalk.) Recycled aggregate Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9, and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A (construction and demolition recycling industries); D2 (air cooled blast furnace slag) D3 (basic oxygen furnace slag) D4 (electric arc furnace slag (EAF C)) G1 (red coal shale) G3 (pre-selected all-in from quarrying/mining)	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	Tab 6/4 Method 5	6	B	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5				
							(ii) plasticity index	BS 1377: Part 2	Non-plastic					
							(iii) Los Angeles coefficient	Clause 635	–	50				
							(iv) mc	BS 1377: Part 2 See Note 4	App 6/1	App 6/1				

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TABLE 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:				
									Lower	Upper			
SELECTED GRANULAR FILL	6	C	–	Selected uniformly graded granular material	Starter layer	Natural gravel, natural sand, crushed gravel, crushed rock other than argillaceous rock, crushed concrete, chalk, well burnt colliery spoil, slag or any combination thereof. (Property (iii) in next column, shall not apply to chalk.) Recycled aggregate Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9, and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A (construction and demolition recycling industries); D2 (air cooled blast furnace slag) D3 (basic oxygen furnace slag) D4 (electric arc furnace slag (EAF C)) G1 (red coal shale) G3 (pre-selected all-in from quarrying/mining)	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	Tab 6/4 Method 3	6	C	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5			
							(ii) uniformity coefficient	See Note 5	–	10			
							(iii) plasticity index	BS 1377: Part 2	Non-plastic				
							(iv) Los Angeles coefficient	Clause 635	–	50			
							(v) mc	BS 1377: Part 2 See Note 4	App 6/1	App 6/1			

TABLE 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:				
									Lower	Upper			
SELECTED GRANULAR FILL	6	D	–	Selected uniformly graded granular material	Starter layer below pulverised fuel ash	Natural gravel, natural sand, crushed gravel, crushed rock other than argillaceous rock, crushed concrete, chalk, well burnt colliery spoil, slag or any combination thereof. Recycled aggregate Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9, and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A (construction and demolition recycling industries); D2 (air cooled blast furnace slag) D3 (basic oxygen furnace slag) D4 (electric arc furnace slag (EAF C)) G1 (red coal shale)	(i) grading	BS 1377: Part 2 (On site)	Tab 6/2	Tab 6/2	Tab 6/4 Method 4	6	D	–
								BS EN 933-2 Imported onto site)	Tab 6/5	Tab 6/5			
							(ii) uniformity coefficient	See Note 5	–	10			
							(iii) plasticity index	BS 1377: Part 2	Non-plastic				
							(iv) mc	BS 1377: Part 2 See Note 4	App 6/1	App 6/1			
							(v) MCV	Clause 632	App 6/1	App 6/1			

TABLE 6/1: (02/16) **Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)**

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:					
									Lower	Upper				
SELECTED GRANULAR FILL	6	E	–	Selected granular material (Class 9A)	For stabilisation with cement to form capping	Any material, or combination of materials, other than unburnt colliery spoil and argillaceous rock. (Properties (i), (ii) and (iii) in next column, shall not apply to chalk.) Recycled aggregate Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9, and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A (construction and demolition recycling industries); D2 (air cooled blast furnace slag) G (mining and quarry industry – except G2 (black coal shale))	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	Not applicable	6	E	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5				
							(ii) mc	BS 1377: Part 2 See Note 4	–	App 6/1				
							(iii) liquid limit	BS 1377: Part 2	–	45				
							(iv) plasticity index	BS 1377: Part 2	–	20				
							(v) organic matter	BS 1377: Part 3	–	App 6/1				
							(vi) water soluble (WS) sulfate content	BS EN 1744-1 clause 10	–	3000 mg/l as SO_4				
							(vii) oxidisable sulfides (OS) content	BS EN 1744-1 clause 13	–	0.6% as SO_4				
							(viii) SMC of chalk	Clause 634	–	20%				
	6	F	1	Selected granular material (fine grading)	Capping	Any material, or combination of materials – including recycled aggregates with not more than 50% by mass of recycled bituminous planings and granulated asphalt, but excluding materials contaminated with tar and tar-bitumen binders, unburnt colliery spoil, argillaceous rock and chalk. Property (vi) in the next column shall not apply if the Class Ra (asphalt) content of any recycled aggregate is 20% or less. Where material in this Class is imported onto site it shall be classified as Class 6F4 and comply with the requirements for that material.	(i) grading	BS 1377: Part 2 (On site materials only)	Tab 6/2	Tab 6/2	Tab 6/4 Method 6	6	F	1
							(ii) optimum mc	BS 1377: Part 4 (vibrating hammer method)	–	–				
							(iii) mc	BS 1377: Part 2 See Note 4	Optimum mc - 2%	Optimum mc				
							(iv) Los Angeles coefficient	Clause 635	–	60				
							(v) Class Ra (asphalt) content	Clause 710	–	50%				
							(vi) bitumen content	BS EN 12697-1 or BS EN 12697-39	–	2.0%				

TABLE 6/1: (02/16) **Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)**

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:					
									Lower	Upper				
SELECTED GRANULAR FILL	6	F	2	Selected granular material (coarse grading)	Capping	Any material, or combination of materials - including recycled aggregates with not more than 50% by mass of recycled bituminous planings and granulated asphalt, but excluding materials contaminated with tar and tar-bitumen binders, unburnt colliery spoil and argillaceous rock. Property (i) in the next column shall not apply to chalk. Property (vi) in the next column shall not apply if the Class Ra (asphalt) content of any recycled aggregate is 20% or less. Where material in this Class is imported onto site it shall be classified as Class 6F5 and comply with the requirements for that material.	(i) grading	BS 1377: Part 2 (On site materials only)	Tab 6/2	Tab 6/2	Tab 6/4 Method 6	6	F	2
							(ii) optimum mc	BS 1377: Part 4 (vibrating hammer method)	–					
							(iii) mc	BS 1377: Part 2 See Note 4	Optimum mc - 2%	Optimum mc				
							(iv) Los Angeles coefficient	Clause 635	–	50				
							(v) Class Ra (asphalt) content	Clause 710	–	50%				
							(vi) bitumen content	BS EN 12697-1 or BS EN 12697-39	–	2.0%				
	6	F	3	Selected granular material	Capping	Any material, or combination of materials with not less than 50% by mass of recycled bituminous planings and granulated asphalt, but excluding materials contaminated with tar and tar-bitumen binders, unburnt colliery spoil and argillaceous rock. Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from the following source codes, see Notes 8, 9 and 10: A1 (reclaimed asphalt) A4 (mixed recycled aggregate) Aggregates from source code A4 shall contain at least 50% of constituents in Class Ra (bituminous materials).	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	Tab 6/4 Method 6 Maximum Compacted layer thickness shall be 200 mm	6	F	3
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5				
							(ii) optimum mc	Clause 613	–	–				
							(iii) mc	Clause 613 See Note 4	Optimum mc -2%	Optimum mc				
							(iv) Class Ra (asphalt) content	Clause 710	50%	–				
							(v) bitumen content	BS EN 12697-1 or BS EN 12697-39	–	10%				

TABLE 6/1: (02/16) **Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)**

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:					
									Lower	Upper				
SELECTED GRANULAR FILL	6	F	4	Selected granular material (fine grading) – imported on to the Site	Capping	Unbound mixture complying with BS EN 13285 containing aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9 and 10: P (natural aggregates – except chalk, shale, siltstone or slate, see Note 7) A2 (crushed concrete) A3 (crushed bricks, masonry) A4 (mixed recycled aggregate) B1 (municipal incinerator bottom ash (MIBA)) D2 (air cooled blast furnace slag) D3 (basic oxygen furnace slag) D4 (electric arc furnace slag (EAF C)) G (mining and quarry industry – except G2 (black coal shale)) Aggregates from source code A4 shall contain not more than 50% of constituents in Class Ra (bituminous materials). Property (x) in the next column shall not apply if the Class Ra (asphalt) content of any recycled aggregate is 20% or less.	(i) Size designation and overall grading category	BS EN 13285 – 0/31.5 and G_E	Tab 6/5	Tab 6/5	Tab 6/4 Method 6	6	F	4
							(ii) Maximum fines and oversize categories	BS EN 13285 – UF_{15} and OC_{75}	Tab 6/5	Tab 6/5				
							(iii) Los Angeles coefficient	BS EN 13242 – LA_{60}	–	60				
							(iv) Volume stability of blast furnace slag	BS EN 13242 – free from dicalcium silicate and iron disintegration	–	–				
							(v) Volume stability of steel (BOF) and EAF) slag	BS EN 13242 – V_5	–	–				
							(vi) Other aggregate requirements	BS EN 13242 – Category$_{NR}$ (no requirement)	–	–				
							(vii) Laboratory dry density and optimum water content	BS EN 13285, Clause 5.3 – declared values	–	–				
							(viii) Water content	BS EN 1097-5	Optimum wc – -2%	Optimum wc				
							(ix) Class Ra (asphalt) content	Clause 710	–	50%				
							(x) bitumen content	BS EN 12697-1 or BS EN 12697-39	–	2.0%				

TABLE 6/1: (02/16) **Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)**

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:					
									Lower	Upper				
SELECTED GRANULAR FILL	6	F	5	Selected granular material (coarse grading) – imported on to the Site	Capping	Unbound mixture complying with BS EN 13285 containing aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9 and 10: P (natural aggregates – except chalk, shale, siltstone or slate, see Note 7) A2 (crushed concrete) A3 (crushed bricks, masonry) A4 (mixed recycled aggregate) B1 (municipal incinerator bottom ash (MIBA)) D2 (air cooled blast furnace slag) D3 (basic oxygen furnace slag) D4 (electric arc furnace slag (EAF C)) G (mining and quarry industry – except G2 (black coal shale)) Aggregates from source code A4 shall contain not more than 50% of constituents in Class Ra (bituminous materials). Property (x) in the next column shall not apply if the Class Ra (asphalt) content of any recycled aggregate is 20% or less.	(i) Size designation and overall grading category	BS EN 13285 – 0/80 and G_E	Tab 6/5	Tab 6/5	Tab 6/4 Method 6	6	F	5
							(ii) Maximum fines and oversize categories	BS EN 13285 – UF_{12} and OC_{75}	Tab 6/5	Tab 6/5				
							(iii) Los Angeles coefficient	BS EN 13242 – LA_{50}	–	50				
							(iv) Volume stability of blast furnace slag	BS EN 13242 – free from dicalcium silicate and iron disintegration	–	–				
							(v) Volume stability of steel (BOF) and EAF) slag	BS EN 13242 – V_5	–	–				
							(vi) Other aggregate requirements	BS EN 13242 – Category NR (no requirement)	–	–				
							(vii) Laboratory dry density and optimum water content	BS EN 13285, Clause 5.3 – declared values	–	–				
							(viii) Water content	BS EN 1097-5	Optimum wc – -2%	Optimum wc				
							(ix) Class Ra (asphalt) content	Clause 710	–	50%				
							(x) bitumen content	BS EN 12697-1 or BS EN 12697-39	–	2.0%				
	6	G	–	Selected granular material	Gabion filling	Natural gravel, crushed rock, crushed concrete or any combination thereof. None of these constituents shall include any argillaceous rock. Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9 and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A2 (crushed concrete).	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	None	6	G	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5				
							(ii) Los Angeles coefficient	Clause 635	–	50				

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TABLE 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:				
									Lower	Upper			
SELECTED GRANULAR FILL	6	H	–	Selected granular material	Drainage layer to reinforced soil and anchored earth structures	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, chalk, well burnt colliery spoil or any structures combination thereof. None of these constituents shall include any argillaceous rock. (Properties (vi), (vii), (viii), (ix), (x), (xi) and (xii) in next column only apply when metallic reinforcing or anchor elements, facing units or fastenings are used.) (Properties (ii) and (v) in next column shall not apply to chalk.) Recycled aggregate except recycled asphalt. Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9 and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A2 (crushed concrete) A3 (crushed bricks, masonry) G1 (red coal shale)	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	Tab 6/4 Method 3	6	H	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5			
							(ii) plasticity index	BS 1377: Part 2	Non-plastic				
							(iii) Los Angeles coefficient	Clause 635	–	50			
							(iv) mc	BS 1377: Part 2 See Note 4	App 6/1	App 6/1			
							(v) MCV	Clause 632	App 6/1	App 6/1			
							(vi) pH value	BS 1377: Part 3	Tab 6/3	Tab 6/3			
							(vii) chloride ion content	BS EN 1744-1	–	Tab 6/3			
							(viii) water soluble (WS) sulfate content	BS EN 1744-1 clause 10	–	Tab 6/3			
							(ix) oxidisable sulfides (OS) content	BS EN 1744-1 clause 13	–	Tab 6/3			
							(x) resistivity	Clause 637	Tab 6/3	–			
							(xi) redox potential	Clause 638	Tab 6/3	–			
							(xii) organic content	BS 1377: Part 3	–	Tab 6/3			
							(xiii) microbial activity index	Table 6/3	–	Tab 6/3			

TABLE 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:				
									Lower	Upper			
SELECTED GRANULAR FILL	6	I	–	Selected well graded granular material	Fill to reinforced soil and anchored earth structures	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, slag, chalk, well burnt colliery spoil or any combination thereof except that chalk shall not be combined with any other constituent. None of these constituents shall include any argillaceous rock. (Properties (i), (ii) and (v) in next column shall not apply to chalk.) (Properties (viii), (ix), (x), (xi), (xii), (xiii) and (xiv) only apply when metallic reinforcing or anchor elements, facing units or fastenings are used.) Recycled aggregate except recycled asphalt. Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9 and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A2 (crushed concrete) A3 (crushed bricks, masonry) D2 (air cooled blast furnace slag) G1 (red coal shale)	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	Tab 6/4 Method 2	6	I	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5			
							(ii) uniformity coefficient	See Note 5	10	–			
							(iii) SMC of chalk	Clause 634	–	20%			
							(iv) mc	BS 1377: Part 2 See Note 4	App 6/1	App 6/1			
							(v) MCV	Clause 632	App 6/1	App 6/1			
							(vi) effective angle of friction ((') and effective cohesion (c')	Clause 636	App 6/1	–			
							(vii) coefficient of friction and adhesion (fill/ elements)	Clause 639	App 6/1	–			
							(viii) pH value	BS 1377: Part 3	Tab 6/3	Tab 6/3			
							(ix) chloride ion content	BS EN 1744-1	–	Tab 6/3			
							(x) water soluble (WS) sulfate content	BS EN 1744-1 clause 10	–	Tab 6/3			
							(xi) oxidisable sulfides (OS) content	BS EN 1744-1 clause 13	–	Tab 6/3			
							(xii) resistivity	Clause 637	Tab 6/3	–			
							(xiii) redox potential	Clause 638	Tab 6/3	–			
							(xiv) organic content	BS 1377: Part 3	–	Tab 6/3			
							(xv) microbial activity index	Table 6/3	–	Tab 6/3			

TABLE 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:				
									Lower	Upper			
SELECTED GRANULAR FILL	6	J	–	Selected uniformly graded granular material	Fill to reinforced soil and anchored earth	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, slag, chalk, well burnt colliery spoil or any combination thereof, except that chalk shall not be combined with any other constituent. None of these constituents shall include any argillaceous rock. (Properties (viii), (ix), (x), (xi), (xii), (xiii) and (xiv) in next column only apply when metallic reinforcing or anchor elements, facing units or fastenings are used.) (Properties (i), (ii) and (v) in next column shall not apply to chalk.) Recycled aggregate except recycled asphalt. Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9 and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A2 (crushed concrete) A3 (crushed bricks, masonry) D2 (air cooled blast furnace slag) G1 (red coal shale).	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	Tab 6/4 Method 3	6	J	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5			
							(ii) uniformity coefficient	See Note 5	5	10			
							(iii) SMC of chalk	Clause 634	–	20%			
							(iv) mc	BS 1377: Part 2 See Note 4	App 6/1	App 6/1			
							(v) MCV	Clause 632	App 6/1	App 6/1			
							(vi) effective angle of friction (ϕ') and effective cohesion (c')	Clause 636	App 6/1	–			
							(vii) coefficient of friction and adhesion (fill/ elements)	Clause 639	App 6/1	–			
							(viii) pH value	BS 1377: Part 3	Tab 6/3	Tab 6/3			
							(ix) chloride ion content	BS EN 1744-1	–	Tab 6/3			
							(x) water soluble (WS) sulfate content	BS EN 1744-1 clause 10	–	Tab 6/3			
							(xi) oxidisable sulfides (OS) content	BS EN 1744-1 clause 13	–	Tab 6/3			
							(xii) resistivity	Clause 637	Tab 6/3	–			
							(xiii) redox potential	Clause 638	Tab 6/3	–			
							(xiv) organic content	BS 1377: Part 3	–	Tab 6/3			
							(xv) microbial activity index	Table 6/3	–	Tab 6/3			

TABLE 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:				
									Lower	Upper			
SELECTED GRANULAR FILL	6	K	–	Selected granular material	Lower bedding for corrugated steel buried structures	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, well burnt colliery spoil or any combination thereof. None of these constituents shall include any argillaceous rock. Recycled aggregate except recycled asphalt. Where material is imported onto which is not 'as dug' site it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes,)see Notes 8, 9 and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A2 (crushed concrete) A3 (crushed bricks, masonry) G1 (red coal shale)	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	End product 90% of maximum dry density of BS 1377: Part 4 (Vibrating hammer method)	6	K	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5			
							(ii) uniformity coefficient	See Note 5	5	–			
							(iii) plasticity index	BS 1377: Part 2	–	6			
							(iv) optimum mc	BS 1377: Part 4 (vibrating hammer method)	–	–			
							(v) mc	BS 1377: Part 2 See Note 4	Optimum mc -2%	Optimum mc +1%			
							(vi) MCV	Clause 632	App 6/1	App 6/1			
							(vii) Los Angeles coefficient	Clause 635	–	40			
							(viii) resistivity	Clause 637	2000 ohm cm	–			
							(ix) water soluble (WS) sulfate content	BS EN 1744-1 clause 10	–	300 mg/ l as SO_4			
							(x) oxidisable sulfides (OS) content	BS EN 1744-1 clause 13	–	0.06% as SO_4			
							(xi) chloride ion content	BS EN 1744-1	–	0.025%			
							(xii) pH value	BS 1377: Part 3	6	9			
							(xiii) sulfide and hydrogen sulfide	Standard textbook of qualitative inorganic analysis	–	Rapid blackening of lead acetate paper			

TABLE 6/1: (02/16) **Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)**

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:				
									Lower	Upper			
SELECTED GRANULAR FILL	6	L	–	Selected uniformly graded granular material	Upper bedding for corrugated steel buried structures	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, well burnt colliery spoil or any combination thereof. None of these constituents shall include any argillaceous rock. Recycled aggregate except recycled asphalt. Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9 and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A2 (crushed concrete) A3 (crushed bricks, masonry) G1 (red coal shale)	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2		6	L	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5			
							(ii) resistivity	Clause 637	2000 ohm cm	–			
							(iii) water soluble (WS) sulfate content	BS EN 1744-1 clause 10	–	300 mg/ l as SO_4			
							(iv) oxidisable sulfides (OS) content	BS EN 1744-1 clause 13	–	0.06% as SO_4			
							(v) chloride ion content	BS EN 1744-1	–	0.025%			
							(vi) pH value	BS 1377: Part 3	6	9			
							(vii) sulfide and hydrogen sulfide	Standard textbook of qualitative inorganic analysis	–	Rapid blackening of lead acetate paper			

TABLE 6/1: (02/16) **Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)**

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:				
									Lower	Upper			
SELECTED GRANULAR FILL	6	M	–	Selected granular material	Surround to corrugated steel buried structures	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, well burnt colliery spoil or any combination thereof. None of these constituents shall include any argillaceous rock. Recycled aggregate except recycled asphalt. Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9 and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A2 (crushed concrete) A3 (crushed bricks, masonry) G1 (red coal shale).	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	End product 90% of maximum dry density of BS 1377: Part 4 (Vibrating hammer method) unless otherwise stated in App 6/1	6	M	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5			
							(ii) uniformity coefficient	See Note 5	5	–			
							(iii) plasticity index	BS 1377: Part 2	–	6			
							(iv) optimum mc	BS 1377: Part 4 (vibrating hammer method)	–	–			
							(v) mc	BS 1377: Part 2 See Note 4	Optimum mc -2%	Optimum mc +1%			
							(vi) MCV	Clause 632	App 6/1	App 6/1			
							(vii) Los Angeles coefficient	Clause 635	–	40			
							(viii) resistivity	Clause 637	2000 ohm cm	–			
							(ix) water soluble (WS) sulfate content	BS EN 1744-1 clause 10	–	300 mg/ l as SO_4			
							(x) oxidisable sulfides (OS) content	BS EN 1744-1 clause 13	–	0.06% as SO_4			
							(xi) chloride ion content	BS EN 1744-1	–	0.025%			
							(xii) pH value	BS 1377: Part 3	6	9			
							(xiii) sulfide and hydrogen sulfide	Standard textbook of qualitative inorganic analysis	–	Rapid blackening of lead acetate paper			

TABLE 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:				
									Lower	Upper			
SELECTED GRANULAR FILL	6	N	–	Selected well graded granular material	Fill to structures	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, slag, well burnt colliery spoil or any combination thereof. None of these constituents shall include any argillaceous rock. Recycled aggregate except recycled asphalt. Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9 and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A2 (crushed concrete) A3 (crushed bricks, masonry) D2 (air cooled blast furnace slag) G1 (red coal shale).	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	End product 95% of maximum dry density of BS 1377: Part 4 (vibrating hammer method)	6	N	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5			
							(ii) uniformity coefficient	See Note 5	10	–			
							(iii) Los Angeles coefficient	Clause 635	–	40			
							(iv) undrained shear parameters (c and 〈)	Clause 633	App 6/1	–			
							(v) effective angle of internal friction (〈 ') and effective cohesion (c')	Clause 636	App 6/1	–			
							(vi) permeability	Clause 640	App 6/1	–			
							(vii) mc	BS 1377: Part 2 See Note 4	App 6/1	App 6/1			
							(viii) MCV	Clause 632	App 6/1	App 6/1			
							(ix) slope stability test (where required in App 6/6)	Clause 610	App 6/6				

TABLE 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:				
									Lower	Upper			
SELECTED GRANULAR FILL	6	P	–	Selected granular material	Fill to structures	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, slag, chalk, well burnt colliery spoil or any combination thereof. None of these constituents shall include any argillaceous rock. (Properties (i), (ii) and (ix) in next column shall not apply to chalk.) Recycled aggregate except recycled asphalt. Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9 and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A2 (crushed concrete) A3 (crushed bricks, masonry) D2 (air cooled blast furnace slag) G1 (red coal shale).	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	End product 95% of maximum dry density of BS 1377: Part 4 (vibrating hammer method)	6	P	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5			
							(ii) uniformity coefficient	See Note 5	5	–			
							(iii) IDD of chalk	Clause 634	–	App 6/1			
							(iv) Los Angeles coefficient	Clause 635	–	60			
							(v) undrained shear parameters (c and 〈)	Clause 633	App 6/1	–			
							(vi) effective angle of internal friction (〈 ') and effective cohesion (c')	Clause 636	App 6/1	–			
							(vii) permeability	Clause 640	App 6/1	–			
							(viii) mc	BS 1377: Part 2 See Note 4	App 6/1	App 6/1			
							(ix) MCV	Clause 632	App 6/1	App 6/1			
							(x) slope stability test (where required in App 6/6)	Clause 610	App 6/6				

TABLE 6/1: (02/16) **Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)**

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:					
									Lower	Upper				
SELECTED GRANULAR FILL	6	Q	–	Selected granular material	Fill to structures	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, slag, chalk, well burnt colliery spoil or any combination thereof. None of these constituents shall include any argillaceous rock. (Properties (i), (ii) and (ix) in next column shall not apply to chalk.) Recycled aggregate except recycled asphalt. Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9 and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A2 (crushed concrete) A3 (crushed bricks, masonry) D2 (air cooled blast furnace slag) G1 (red coal shale).	As for Class 1A, 1B or 1C with the addition of the following:				End product 95% of maximum dry density of BS 1377: Part 4 (vibrating hammer method)	6	Q	–
							(i) water soluble (WS) sulfate content	BS EN 1744-1 clause 10	–	300 mg/ l as SO_4				
							(ii) oxidisable sulfides (OS) content	BS EN 1744-1 clause 13	–	0.06% as SO_4				
							(iii) chloride ion content	BS EN 1744-1	–	0.025%				
							(iv) pH value	BS 1377: Part 3	6	9				
							(v) sulfide and hydrogen sulfide	Standard textbook of qualitative inorganic analysis	–	Rapid blackening of lead acetate paper				

TABLE 6/1: (02/16) **Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)**

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:					
									Lower	Upper				
SELECTED GRANULAR FILL	6	R	–	Selected granular material	For stabilisation with lime and cement to form capping (Class 9F)	Any material, or combination of materials, other than unburnt colliery spoil and argillaceous rock. (Properties (i), (ii) and (iii) in next column, shall not apply to chalk.)	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2		6	R	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5				
							(ii) mc	BS 1377: Part 2 See Note 4	App 6/1	–				
							(iii) liquid limit	BS 1377: Part 2	–	45				
							(iv) plasticity index	BS 1377: Part 2	–	20				
							(v) organic matter	BS 1377: Part 3	–	App 6/1				
							(vi) water soluble (WS) sulfate content	BS EN 1744-1 clause 10	–	3000 mg/ l as SO_4				
							(vii) oxidisable sulfides (OS) content	BS EN 1744-1 clause 13	–	0.6% as SO_4				
							(viii) IDD of chalk	Clause 634	–	App 6/1				
	6	S	–	Selected well graded granular material	Filter layer below subbase	Crushed rock or sand. Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9 and 10: P (natural aggregates – except chalk, shale, siltstone or slate, see Note 7).	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	–	6	S	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5				
							(ii) plasticity index	BS 1377: Part 2	–	Non-plastic				

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TABLE 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:				
									Lower	Upper			
SELECTED COHESIVE FILL	7	A	–	Selected cohesive material	Fill to structures	Any material or combination of materials, other than argillaceous rock and materials designated as Class 3 in the Contract. If chalk is used it shall form 100% of constituents. (Properties (i) and (iii) shall not apply to chalk.) (Properties (vii) and (viii) may be increased to 54% and 31% respectively for Lias Clay only and subject to the requirements of contract specific Appendix 6/6)	(i) grading	BS 1377: Part 2	Tab 6/2	Tab 6/2	End product: 100% of maximum dry density of BS 1377 : Part 4 (2.5 kg rammer method) or a dry density corresponding to 5% air voids at field mc whichever is lower	7	A	–
							(ii) mc	BS 1377: Part 2 See Note 4	App 6/1	App 6/1			
							(iii) MCV	Clause 632	App 6/1	App 6/1			
							(iv) undrained shear parameters (c and ⟨)	Clause 633	App 6/1	App 6/1			
							(v) effective angle of internal friction (⟨ ') and effective cohesion (c')	Clause 636	App 6/1	App 6/1			
							(vi) IDD of chalk	Clause 634	App 6/1	App 6/1			
							(vii) liquid limit	BS 1377: Part 2	–	45			
							(viii) plasticity index	BS 1377: Part 2	–	25			

TABLE 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:				
									Lower	Upper			
SELECTED COHESIVE FILL	7	B	–	Selected conditioned pulverised fuel ash cohesive material	Fill to structures and to reinforced soil	Conditioned material direct from power station dust collection system and to which a controlled quantity of water has been added	(i) mc	BS 1377: Part 2 See Note 4	To enable compaction to Clause 612		End product: 95% of maximum dry density of BS 1377 : Part 4 (2.5 kg rammer method)	7	B	–
							(ii) bulk density	BS 1377: Part 9	App 6/1	App 6/1			
							(iii) undrained shear parameters (c and ⟨)	Clause 633	App 6/1	–			
							(iv) effective angle of internal friction (⟨ ') and effective cohesion (c')	Clause 636	App 6/1	–			
							(v) coefficient of friction and adhesion (fill/ elements)	Clause 639	App 6/1	–			
							(vi) permeability	Clause 640	App 6/1	–			
							(vii) slope stability test (where required in App 6/6)	Clause 610	App 6/6				

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TABLE 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within: Lower	Acceptable Limits Within: Upper				
SELECTED COHESIVE FILL	7	C	–	Selected wet cohesive material	Fill to reinforced soil	Any material, or combination of materials, other than unburnt colliery spoil, argillaceous rock and chalk. (Properties (viii), (ix), (x), (xi) and (xii) in next column only apply when metallic reinforcing elements, facing units or fastenings are used)	(i) grading	BS 1377: Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 1	7	C	–
							(ii) mc	BS 1377: Part 2 See Note 4	App 6/1	App 6/1				
							(iii) MCV	Clause 632	App 6/1	App 6/1				
							(iv) effective angle of internal friction (⟨ ') and effective cohesion (c')	Clause 636	App 6/1	–				
							(v) coefficient of friction and adhesion (fill/ elements)	Clause 639	App 6/1	–				
							(vi) liquid limit	BS 1377: Part 2	–	45				
							(vii) plasticity index	BS 1377: Part 2	–	25				
							(viii) pH value	BS 1377: Part 3	Tab 6/3	Tab 6/3				
							(ix) chloride ion content	BS EN 1744-1	–	Tab 6/3				
							(x) water soluble (WS) sulfate content	BS EN 1744-1 clause 10	–	Tab 6/3				
							(xi) oxidisable sulfides (OS) content	BS EN 1744-1 clause 13	–	Tab 6/3				
							(xii) resistivity	Clause 637	Tab 6/3	–				
							(xiii) redox potential	Clause 638	Tab 6/3	–				

TABLE 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within: Lower	Acceptable Limits Within: Upper				
SELECTED COHESIVE FILL	7	D	–	Selected stony cohesive material	Fill to reinforced soil	Any material, or combination of materials, other than unburnt colliery spoil, argillaceous rock and chalk. (Properties (vi), (vii), (viii), (ix), (x), (xi) and (xii) in next column only apply when metallic reinforcing elements, facing units or fastenings are used)	(i) grading	BS 1377: Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 2	7	D	–
							(ii) mc	BS 1377: Part 2 See Note 4	App 6/1	App 6/1				
							(iii) MCV	Clause 632	App 6/1	App 6/1				
							(iv) effective angle of internal friction (⟨ ') and effective cohesion (c')	Clause 636	App 6/1	–				
							(v) coefficient of friction and adhesion (fill/ elements)	Clause 639	App 6/1	–				
							(vi) liquid limit	BS 1377: Part 2	–	45				
							(vii) plasticity index	BS 1377: Part 2	–	25				
							(viii) pH value	BS 1377: Part 3	Tab 6/3	Tab 6/3				
							(ix) chloride ion content	BS EN 1744-1	–	Tab 6/3				
							(x) water soluble (WS) sulfate content	BS EN 1744-1 clause 10	–	Tab 6/3				
							(xi) oxidisable sulfides (OS) content	BS EN 1744-1 clause 13	–	Tab 6/3				
							(xii) resistivity	Clause 637	Tab 6/3	–				
							(xiii) redox potential	Clause 638	Tab 6/3	–				

TABLE 6/1: (02/16) **Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)**

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:				
									Lower	Upper			
SELECTED COHESIVE FILL	7	E	–	Selected cohesive material	For stabilisation with lime to form capping (Class 9D)	Any material, or combination of materials, other than unburnt colliery spoil	(i) grading	BS 1377: Part 2	Tab 6/2	Tab 6/2	Not applicable	7	E	–
							(ii) mc	BS 1377: Part 2 See Note 4	–	App 6/1				
							(iii) MCV	Clause 632	App 6/1	–				
							(iv) plasticity index	BS 1377: Part 2	10	–				
							(v) organic matter	BS 1377: Part 3	–	App 6/1				
							(vi) water soluble (WS) sulfate content	BS EN 1744-1 clause 10	–	App 6/1				
							(vii) oxidisable sulfides (OS) content	BS EN 1744-1 clause 13	–	App 6/1				
							(viii) total potential sulfate (TS) content	BS EN 1744-1 clause 11	–	App 6/1				
	7	F	–	Selected silty cohesive material	For stabilisation with cement to form capping (Class 9B)	Any material, or combination of materials, other than chalk, unburnt colliery spoil and argillaceous rock	(i) grading	BS 1377: Part 2	Tab 6/2	Tab 6/2	Not applicable	7	F	–
							(ii) uniformity coefficient	See Note 5	5	–				
							(iii) mc	BS 1377: Part 2 See Note 4	App 6/1	App 6/1				
							(iv) MCV	Clause 632	App 6/1	App 6/1				
							(v) liquid limit	BS 1377: Part 2	–	45				
							(vi) plasticity index	BS 1377: Part 2	–	20				
							(vii) organic matter	BS 1377: Part 3	–	App 6/1				
							(viii) water soluble (WS) sulfate content	BS EN 1744-1 clause 10	–	App 6/1				
							(ix) oxidisable sulfides (OS) content	BS EN 1744-1 clause 13	–	App 6/1				
							(x) total potential sulfate (TS) content	BS EN 1744-1 clause 11	–	App 6/1				

TABLE 6/1: (02/16) **Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)**

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:				
									Lower	Upper			
SELECTED COHESIVE FILL	7	G	–	Selected conditioned pulverised fuel ash cohesive material	For stabilisation with cement to form capping (Class 9C)	Conditioned material direct from power station dust collection system and to which a controlled quantity of water has been added	(i) mc	BS 1377: Part 2 See Note 4	App 6/1	App 6/1		7	G	–
							(ii) water soluble (WS) sulfate content	BS EN 1744-1 clause 10	–	3000 mg/l as SO_4				
							(iii) oxidisable sulfides (OS) content	BS EN 1744-1 clause 13	–	0.6% as SO_4				
							(iv) total potential sulfate (TS) content	BS EN 1744-1 clause 11	–	1.2% as SO_4				
	7	H	–	Wet, dry, stony or silty cohesive material and chalk	Overlying fill for corrugated steel buried structures	As Class 2A, 2B, 2C, 2D general cohesive fill material or Class 3 chalk fill material, except that argillaceous rock, slag, PFA or any combination thereof shall not be used	As for Class 2A, 2B, 2C, 2D or 3 with the addition of the following					7	H	–
							(i) water soluble (WS) sulfate content	BS EN 1744-1 clause 10	–	300 mg/l as SO_4				
							(ii) oxidisable sulfides (OS) content	BS EN 1744-1 clause 13	–	0.06% as SO_4				
							(iii) chloride ion content	BS EN 1744-1	–	0.025%				
							(iv) pH value	BS 1377: Part 3	6	9				
	7	I	–	Selected cohesive material	For stabilisation with lime and cement to form capping (Class 9E)	Any material, or combination of materials, other than unburnt colliery spoil	(i) grading	BS 1377: Part 2	Tab 6/2	Tab 6/2	Not applicable	7	I	–
							(ii) mc	BS 1377: Part 2 See Note 4	–	App 6/1				
							(iii) MCV	Clause 632	App 6/1	–				
							(iv) plasticity index	BS 1377: Part 2	10	–				
							(v) organic matter	BS 1377: Part 3	–	App 6/1				
							(vi) water soluble (WS) sulfate content	BS EN 1744-1 clause 10	–	App 6/1				
							(vii) oxidisable sulfides (OS) content	BS EN 1744-1 clause 13	–	App 6/1				
							(viii) total potential sulfate (TS) content	BS EN 1744-1 clause 11	–	App 6/1				

TABLE 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:				
									Lower	Upper			
MISC FILL	8	–	–	Class 1, Class 2 or Class 3 material	Lower trench fill	Any material; except no stones or lumps of clay shall be retained on the 40mm test sieve. Recycled aggregate Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9 and 10: P (natural aggregates); A (construction and demolition recycling industries) B1 (municipal incinerator bottom ash (MIBA)) D2 (air cooled blast furnace slag) D3 (basic oxygen furnace slag) D4 (electric arc furnace slag (EAF C)) G (mining and quarry industry).	(i) mc	BS 1377: Part 2 See Note 4	App 6/1	App 6/1	Tab 6/4	8	–	–
							(ii) MCV	Clause 632	App 6/1	App 6/1				
STABILISED MATERIALS	9	A	–	Cement stabilised well graded granular material	Capping	Class 6E with addition of cement according to Clause 614	(i) pulverisation	BS EN 13286-48	60%	–	Tab 6/4 Method 6	9	A	–
							(ii) bearing ratio	BS EN 13286-47	App 6/1	–				
							(iii) mc	BS EN 13286-2	App 6/1	App 6/1				
	9	B	–	Cement stabilised silty cohesive material	Capping	Class 7F with addition of cement according to Clause 614	(i) pulverisation	BS EN 13286-48	App 6/1	–	Tab 6/4 Method 7	9	B	–
							(ii) MCV immediately before compaction	Clause 632	App 6/1	12				
							(iii) bearing ratio	BS EN 13286-47	App 6/1	–				
							(iv) mc	BS EN 13286-2	App 6/1	App 6/1				
	9	C	–	Cement stabilised conditioned pulverised fuel ash cohesive material	Capping	Class 7G with addition of cement according to Clause 614	(i) pulverisation	BS EN 13286-48	60%	–	End product 95% of maximum dry density BS EN 13286-47 (2.5 kg rammer method)	9	C	–
							(ii) bearing ratio	BS EN 13286-47	App 6/1	–				
							(iii) mc	BS EN 13286-2	To enable compaction to Clause 612					

TABLE 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:				
									Lower	Upper			
STABILISED MATERIALS	9	D	–	Lime stabilised cohesive material	Capping	Class 7E with addition of lime according to Clause 615	(i) pulverisation	BS EN 13286-48	30%	–	Tab 6/4 Method 7	9	D	–
							(ii) MCV immediately before compaction	Clause 632	App 6/1	App 6/1				
							(iii) bearing ratio	BS EN 13286-47	App 6/1	–				
							(iv) mc	BS EN 13286-2	App 6/1	App 6/1				
	9	E	–	Lime and cement stabilised cohesive material	Capping	Class 7I with addition of lime and cement according to Clause 643	(i) pulverisation	BS EN 13286-48	30%	–	Tab 6/4 Method 7	9	E	–
							(ii) MCV immediately before completion	Clause 632	App 6/1	App 6/1				
							(iii) bearing ratio	BS EN 13286-47	App 6/1	–				
							(iv) mc	BS EN 13286-2	App 6/1	App 6/1				
	9	F	–	Lime and cement stabilised well graded granular material	Capping	Class 6R with addition of lime and cement according to Clause 643	(i) pulverisation	BS EN 13286-48	60%	–	Tab 6/4 Method 6	9	F	–
							(ii) bearing ratio	BS EN 13286-47	App 6/1	–				
							(iii) mc	BS EN 13286-2 See Note 4	App 6/1	App 6/1				

Footnotes to Table 6/1

1	(02/16) App = contract specific Appendix
2	(02/16) Tab = Table
3	(02/16) Where in the Acceptable Limits column reference is made to App 6/1, only those properties having limits ascribed to them in contract specific Appendix 6/1 shall apply. Where contract specific Appendix 6/1 gives limits for other properties not listed in this Table such limits shall also apply.
4	(02/16) Where BS 1377: Part 2 is specified for mc, this shall mean BS 1377: Part 2 where the material is a soil or BS EN 1097-5 where the material is required to conform to a harmonised European Standard.
5	(02/16) Uniformity coefficient is defined as the ratio of the particle diameters D_{60} to D_{10} on the particle-size distribution curve, where: D_{60} = particle diameter at which 60% of the soil by weight is finer D_{10} = particle diameter at which 10% of the soil by weight is finer
6.	(02/16) The limiting values for Class U1B material are given in contract specific Appendix 6/14 and contract specific Appendix 6/15.
7	(02/16) For works in Wales see sub-Clause 601.21W.
8	(02/16) Where material source codes are referenced these are as listed in Table 6/7.
9	(02/16) Where materials are required to be aggregates conforming to BS EN 13242 materials certificated as being compliant with BS EN 13285 are acceptable for use provided that they meet all the specification requirements and the Declaration of Performance for constituent parts to BS EN 13242 are provided to the Overseeing Organisation.
10	(02/16) Materials shall comply with the current Environmental Regulations at the time of use. Reference shall be made to Annex ZA (informative) of BS EN 13242.

TABLE 6/2: (02/17) Grading Requirements for Acceptable Earthworks Materials Other Than Classes 6F4, 6F5 and 6S

Percentage by Mass Passing the Size Shown																					
Class	**Size (mm)**		**Size (mm) BS Series**													**Size (microns) BS Series**				**Size (micr-ons)**	**Class**
	500	**300**	**125**	**90**	**75**	**37.5**	**28**	**20**	**14**	**10**	**6.3**	**5**	**3.35**	**2**	**1.18**	**600**	**300**	**150**	**63**	**2**	
1A		100	95-100																<15		1A
1B			100																<15		1B
1C	100		10-95													0-25			15		1C
2A & 2B			100											80-100					15-100		2A & 2B
2C			100											15-80					15-80		2C
2D			100																80-100	0-20	2D
6A	100									0-100		0-85				0-45			0-5		6A
6B	100		0-10																		6B
6C			100			0-100					0-100		0-35	0-10		0-2					6C
6D										100		89-100		60-100	30-100	15-80	5-48	0-15 except 0-20 for crushed rock			6D
6E & 6R			100	85-100						25-100						10-100				<15	6E & 6R
6F1					100	75-100				40-95		30-85				10-50			<15		6F1
6F2			100	80-100	65-100	45-100				15-60		10-45				0-25			0-12		6F2
6F3			100	80-100	65-100	45-100				15-60		10-45				0-25			0-12		6F3
6H								100				60-100			15-45	0-25		0-5			6H
6I & 6J			100		85-100				25-100					15-100		9-100			<15		6I & 6J
6K								100											0-10		6K
6L										100		89-100		60-100	30-100	15-100	5-70	0-15 except 0-20 for crushed rock			6L

TABLE 6/2: (02/16) Grading Requirements for Acceptable Earthworks Materials (continued)

Percentage by Mass Passing the Size Shown																					
Class	**Size (mm)**		**Size (mm) BS Series**													**Size (microns) BS Series**				**Size (micr-ons)**	**Class**
	500	**300**	**125**	**90**	**75**	**37.5**	**28**	**20**	**14**	**10**	**6.3**	**5**	**3.35**	**2**	**1.18**	**600**	**300**	**150**	**63**	**2**	
6M					100														0-10		6M
6N & 6P					100														<15		6N & 6P
6S					100									60-100		30-90		4-45	0-16		6S
7A					100														15-100		7A
7C			100		85-100				83-100					80-100		60-100			15-45	0-20	7C
7D			100		85-100				40-90					15-79		15-75			15-45	0-20	7D
7E					100		95-100												15-100		7E
7F			100																15-100		7F
7I					100		95-100												15-100		7I

TABLE 6/3: (02/16) **Limits of Material Properties of Fill for Use With Metal Components in Reinforced Soil and Anchored Earth Structures for Class 6H, 6I, 6J, 7C and 7D Materials**

Reinforcing Element Material	Properties of Fill								
	pH Value		Max Chloride Ion Content %	Max Organic Content %	Max Water Soluble (WS) Sulfate Content mg/l as SO_4	Maximum Oxidisable Sulfides (OS) Content % as SO_4	Minimum Restivity Ohm.cm	Minimum Redox Potential volts	Microbial Activity Index
	Min	Max							
Galvanised Steel	5	10	0.02	0.2	300	0.06	5000	0.40	))) Less than 5))
Stainless Steel	5	10	0.025	0.2	600	0.12	3000	0.35	

NOTES:

1 (02/16) A method of calculating the Microbial Activity Index may be obtained by reference to TRRL Contractor Report 54 'Soil Corrosivity Assessment'.

2 (02/16) The corrosion potential of frictional fill shall be assessed from resistivity, pH, chloride, water soluble sulfate and oxidisable sulfides tests. For cohesive soil it will be necessary to test additionally for organic content. Should either organic content or sulfate be in excess of the specified levels, then tests shall also be included for Redox Potential and Microbial Activity Index.

3 (02/16) The water soluble sulfate content and oxidisable sulfides content shall be determined in accordance with the methods described in BS EN 1744-1 clause 10, 11 and 13.

4 (02/16) Methods of test (except for Microbial Activity Index, water soluble sulfate content and oxidisable sulfides content) are given in BS 1377: Part 3.

TABLE 6/4: (02/16) **Method Compaction for Earthworks Materials: Plant and Methods (Method 1 to Method 6) (This Table is to be read in conjunction with sub-Clause 612.10)**

Type of Compaction Plant	Ref No.	Category	Method 1		Method 2		Method 3		Method 4		Method 5		Method 6		
			D	N#	D	N#	D	N#	D	N	D	N	N for D = 110 mm	N for D = 150 mm	N for D = 250 mm
Smoothed wheeled roller (or vibratory roller operating without vibration)	1	Mass per metre width of roll: over 2100 kg up to 2700 kg	125	8	125	10	125	10*	175	4	unsuitable		unsuitable	unsuitable	unsuitable
	2	over 2700 kg up to 5400 kg	125	6	125	8	125	8*	200	4	unsuitable		16	unsuitable	unsuitable
	3	over 5400 kg	150	4	150	8	unsuitable		300	4	unsuitable		8	16	unsuitable
Grid roller	1	Mass per metre width of roll: over 2700 kg up to 5400 kg	150	10	unsuitable		150	10	250	4	unsuitable		unsuitable	unsuitable	unsuitable
	2	over 5400 kg up to 8000 kg	150	8	125	12	unsuitable		325	4	unsuitable		20	unsuitable	unsuitable
	3	over 8000 kg	150	4	150	12	unsuitable		400	4	unsuitable		12	20	unsuitable
Deadweight tamping roller	1	Mass per metre width of roll: over 4000 kg up to 6000 kg	225	4	150	12	250	4	350	4	unsuitable		12	20	unsuitable
	2	over 6000 kg	300	5	200	12	300	3	400	4	unsuitable		8	12	20
Pneumatic-tyred roller	1	Mass per wheel: over 1000 kg up to 1500 kg	125	6	unsuitable		150	10*	240	4	unsuitable		unsuitable	unsuitable	unsuitable
	2	over 1500 kg up to 2000 kg	150	5	unsuitable		unsuitable		300	4	unsuitable		unsuitable	unsuitable	unsuitable
	3	over 2000 kg up to 2500 kg	175	4	125	12	unsuitable		350	4	unsuitable		unsuitable	unsuitable	unsuitable
	4	over 2500 kg up to 4000 kg	225	4	125	10	unsuitable		400	4	unsuitable		unsuitable	unsuitable	unsuitable
	5	over 4000 kg up to 6000 kg	300	4	125	10	unsuitable		unsuitable		unsuitable		12	unsuitable	unsuitable
	6	over 6000 kg up to 8000 kg	350	4	150	8	unsuitable		unsuitable		unsuitable		12	unsuitable	unsuitable
	7	over 8000 kg up to 12000 kg	400	4	150	8	unsuitable		unsuitable		unsuitable		10	16	unsuitable
	8	over 12000 kg	450	4	175	6	unsuitable		unsuitable		unsuitable		8	12	unsuitable
Vibratory tamping roller		Mass per metre width of a vibrating roll:													
	1	over 700 kg up to 1300 kg	100	12	100	12	150	12	100	10	unsuitable		unsuitable	unsuitable	unsuitable
	2	over 1300 kg up to 1800 kg	125	12	125	12	175	12*	175	8	unsuitable		12	unsuitable	unsuitable
	3	over 1800 kg up to 2300 kg	150	12	150	12	200	12*	unsuitable		unsuitable		8	12	unsuitable
	4	over 2300 kg up to 2900 kg	150	9	150	9	250	12*	unsuitable		400	5	6	10	unsuitable
	5	over 2900 kg up to 3600 kg	200	9	200	9	275	12*	unsuitable		500	6	6	10	unsuitable
	6	over 3600 kg up to 4300 kg	225	9	225	9	300	12*	unsuitable		600	6	4	8	unsuitable
	7	over 4300 kg up to 5000 kg	250	9	250	9	300	9*	unsuitable		700	6	3	7	12
	8	over 5000 kg	275	9	275	9	300	7*	unsuitable		800	6	3	6	10

TABLE 6/4: (02/16) **Method Compaction for Earthworks Materials: Plant and Methods (Method 1 to Method 6) (This Table is to be read in conjunction with sub-Clause 612.10) (Continued)**

Type of Compaction Plant	Ref No.	Category	Method 1		Method 2		Method 3		Method 4		Method 5		Method 6		
			D	N#	D	N#	D	N#	ς	τ	D	N	N for D = 110 mm	N for D = 150 mm	N for D = 250 mm
Vibratory roller		Mass per metre width of vibratory roll:													
	1	over 270 kg up to 450 kg	unsuitable		75	16	150	16	unsuitable		unsuitable		unsuitable	unsuitable	unsuitable
	2	over 450 kg up to 700 kg	unsuitable		75	12	150	12	unsuitable		unsuitable		unsuitable	unsuitable	unsuitable
	3	over 700 kg up to 1300 kg	100	12	125	10	150	6	125	10	unsuitable		16	unsuitable	unsuitable
	4	over 1300 kg up to 1800 kg	125	8	150	8	200	10*	175	4	unsuitable		6	16	unsuitable
	5	over 1800 kg up to 2300 kg	150	4	150	4	225	12*	unsuitable		unsuitable		4	6	12
	6	over 2300 kg up to 2900 kg	175	4	175	4	250	10*	unsuitable		400	5	3	5	11
	7	over 2900 kg up to 3600 kg	200	4	200	4	275	8*	unsuitable		500	5	3	5	10
	8	over 3600 kg up to 4300 kg	225	4	225	4	300	8*	unsuitable		600	5	2	4	8
	9	over 4300 kg up to 5000 kg	250	4	250	4	300	6*	unsuitable		700	5	2	4	7
	10	over 5000 kg	275	4	275	4	300	4*	unsuitable		800	5	2	3	6
Vibrating plate compactor		Mass per m² of base plate:													
	1	over 880 kg up to 1100 kg	unsuitable		unsuitable		75	6	unsuitable		unsuitable		unsuitable	unsuitable	unsuitable
	2	over 1100 kg up to 1200 kg	unsuitable		75	10	100	6	75	10	unsuitable		unsuitable	unsuitable	unsuitable
	3	over 1200 kg up to 1400 kg	unsuitable		75	6	150	6	150	8	unsuitable		unsuitable	unsuitable	unsuitable
	4	over 1400 kg up to 1800 kg	100	6	125	6	150	4	unsuitable		unsuitable		8	unsuitable	unsuitable
	5	over 1800 kg up to 2100 kg	150	6	150	5	200	4	unsuitable		unsuitable		5	8	unsuitable
	6	over 2100 kg	200	6	200	5	250	4	unsuitable		unsuitable		3	6	12
Vibro-tamper		Mass:													
	1	over 50 kg up to 65 kg	100	3	100	3	150	3	125	3	unsuitable		4	8	unsuitable
	2	over 65 kg up to 75 kg	125	3	125	3	200	3	150	3	unsuitable		3	6	12
	3	over 75 kg up to 100 kg	150	3	150	3	225	3	175	3	unsuitable		2	4	10
	4	over 100 kg	225	3	200	3	225	3	250	3	unsuitable		2	4	10
Power rammer		Mass:													
	1	100 kg up to 500 kg	150	4	150	6	unsuitable		200	4	unsuitable		5	8	unsuitable
	2	over 500 kg	275	8	275	12	unsuitable		400	4	unsuitable		5	8	14
Dropping-weight compactor		Mass of rammer over 500 kg weight drop:													
	1	over 1 m up to 2 m	600	4	600	8	450	8	unsuitable		unsuitable		unsuitable	unsuitable	unsuitable
	2	over 2 m	600	2	600	8	unsuitable		unsuitable		unsuitable		unsuitable	unsuitable	unsuitable

TABLE 6/4: (02/16) **Method Compaction for Earthworks Materials: Plant and Methods (Method 7) (This Table is to be read in conjunction with sub-Clause 612.10) (Continued)**

Type of Compaction Plant	Ref~ No.	Category	Method 7	
			N for D = 150 mm	N for D = 250mm
Smooth wheeled roller (or vibratory roller operating without vibration)		Mass per metre width of roll:		
	1	over 2100 kg up to 2700 kg	unsuitable	unsuitable
	2	over 2700 kg up to 5400 kg	unsuitable	unsuitable
	3	over 5400 kg	12	unsuitable
Grid roller		Mass per metre width of roll:		
	1	over 2700 kg up to 5400 kg	unsuitable	unsuitable
	2	over 5400 kg up to 8000 kg	16	unsuitable
	3	over 8000 kg	8	unsuitable
Deadweight tamping roller		Mass per metre width of roll:		
	1	over 4000 kg up to 6000 kg	4	8
	2	over 6000 kg	3	6
Pneumatic-tyred roller		Mass per wheel:		
	1	over 1000 kg up to 1500 kg	unsuitable	unsuitable
	2	over 1500 kg up to 2000 kg	12	unsuitable
	3	over 2000 kg up to 2500 kg	6	unsuitable
	4	over 2500 kg up to 4000 kg	5	unsuitable
	5	over 4000 kg up to 6000 kg	4	16
	6	over 6000 kg up to 8000 kg	unsuitable	8
	7	over 8000 kg up to 12000 kg	unsuitable	4
	8	over 12000 kg	unsuitable	4
Vibratory tamping roller		Mass per metre width of vibrating roll:		
	1	over 700 kg up to 1300 kg	unsuitable	unsuitable
	2	over 1300 kg up to 1800 kg	unsuitable	unsuitable
	3	over 1800 kg up to 2300 kg	16	unsuitable
	4	over 2300 kg up to 2900 kg	12	unsuitable
	5	over 2900 kg up to 3600 kg	10	unsuitable
	6	over 3600 kg up to 4300 kg	8	16
	7	over 4300 kg up to 5000 kg	7	14
	8	over 5000 kg	6	12
Vibratory roller		Mass per metre width of vibrating roll:		
	1	over 270 kg up to 450 kg	unsuitable	unsuitable
	2	over 450 kg up to 700 kg	unsuitable	unsuitable
	3	over 700 kg up to 1300 kg	unsuitable	unsuitable
	4	over 1300 kg up to 1800 kg	unsuitable	unsuitable
	5	over 1800 kg up to 2300 kg	12	unsuitable
	6	over 2300 kg up to 2900 kg	10	unsuitable
	7	over 2900 kg up to 3600 kg	10	unsuitable
	8	over 3600 kg up to 4300 kg	8	unsuitable
	9	over 4300 kg up to 5000 kg	8	unsuitable
	10	over 5000 kg	6	12
Vibratory plate compactor		Mass per m² of base plate:		
	1	over 880 kg up to 1100 kg	unsuitable	unsuitable
	2	over 1100 kg up to 1200 kg	unsuitable	unsuitable
	3	over 1200 kg up to 1400 kg	unsuitable	unsuitable
	4	over 1400 kg up to 1800 kg	10	unsuitable
	5	over 1800 kg up to 2100 kg	8	unsuitable
	6	over 2100 kg	6	unsuitable
Vibro-tamper		Mass:		
	1	over 50 kg up to 65 kg	unsuitable	unsuitable
	2	over 65 kg up to 75 kg	unsuitable	unsuitable
	3	over 75 kg up to 100 kg	unsuitable	unsuitable
	4	over 100 kg	8	unsuitable
Power rammer		Mass:		
	1	100 kg up to 500 kg	8	unsuitable
	2	over 500 kg	6	10
Dropping weight compactor		Mass of rammer over 500 kg height drop:		
	1	over 1 m up to 2 m	unsuitable	unsuitable
	2	over 2 m	unsuitable	unsuitable

TABLE 6/5: (02/16) **Imported Onto Site Grading Requirements for Class 6 Acceptable Earthworks Materials**

Class	Size (mm)		Percentage by Mass Passing the Size Shown Size (mm) BS EN 933-2 Series													Size (microns) BS EN 933-2 Series			Class
	500	300	125	80	63	40	31.5	20	16	10	8	6.3	4	2	1	500	250	125	63	0
6A	100									0-100		0-85				0-45			0-5	6A
6B	100		0-10																	6B
6C			100			0-100						0-100	0-35	0-10		0-2				6C
6D										100			85-100	60-100	30-100	15-80	5-48	0-15 except 0-20 for crushed rock		6D
6E & 6R			100	85-100						25-100						10-100			<15	6E & 6R
6F3			100	75-99		50-90		30-75		15-60				0-35					0-12	6F3
6F4					100		75-99		50-90		30-75		15-60		0-35				<15	6F4
6F5			100	75-99		50-90		30-75		15-60				0-35					0-12	6F5
6H								100				60-100			15-45	0-25		0-5		6H
6I & 6J			100	85-100					25-100					15-100		9-100			<15	6I & 6J
6K								100											0-10	6K
6L										100			85-100	60-100	30-100	15-100	5-70	0-15 except 0-20 for crushed rock		6L
6M				100															0-10	6M
6N & 6P				100															<15	6N & 6P
6S					100									60-100		30-90		8-45	0-16	6S

TABLE 6/6: (02/16) **Records and Reports - Information Required**

Ground Treatment	In situ Testing
For each column/area treated: Date Contract title Area identification Unique grid location Ground level at commencement Material used Approximate column diameter Depth of penetration of each compaction point Vibrator power consumption during operation Jetting pressure (where applicable) Duration of penetration Duration of compaction Obstructions and delays Number and type of tests carried out	For each area tested: Date Contract Title Area identification Test position, co-ordinates and level Method of test used All information required by appropriate British Standard test procedure

TABLE 6/7 (02/16) Material Sources and Source Codes for Imported Materials

This table is taken from BS EN 13242:2013 which was published on 31st May 2013 and subsequently withdrawn on 10th January 2014. All other specification requirements which reference BS EN 13242 shall be taken as reference to the version of that standard current at the Contract Reference Document Date unless otherwise detailed in the contract specific specification.

Source Code	Source	Sub-Code	Specific Material
P	Natural Aggregates	P	All petrographic types included in BS EN 932-3
A	Construction and demolition recycling industries	A1	Reclaimed asphalt
		A2	Crushed concrete
		A3	Crushed bricks, masonry
		A4	Mix of A1, A2 and A3
B	Municipal solid waste incineration industry	B1	Municipal incinerator bottom ash (excluding fly ash) (MIBA)
		B2	Municipal incinerator fly ash (MIFA)
C	Coal Power Generation Industry	C1	Coal fly ash
		C2	Fluidised bed combustion fly ash (FBCFA)
		C3	Boiler slag
		C4	Coal bottom ash
		C5	Fluidised bed combustion bottom ash (FBC bottom ash)
D	Iron and steel industry	D1	Granulated blast furnace slag (GBS)
		D2	Air-cooled blast furnace slag (ABS)
		D3	Basic oxygen furnace slag (converter slag, BOS)
		D4	Electric arc furnace slag (from carbon steel production, EAF C)
		D5	Electric arc furnace slag (from stainless/high alloy steel production, EAF S)
		D6	Ferrochromium slag
E	Non ferrous steel industry	E1	Copper slag
		E2	Molybdenum slag
		E3	Zinc slag
		E4	Phosphorous slag
F	Foundry industry	F1	Foundry sand
		F2	Foundry cupola furnace slag
G	Mining and quarry industry	G1	Red coal shale
		G2	Refuse from hard coal mining (black coal shale)
		G3	Pre-selected all-in from quarry/mining
		G4	Spent oil shale
H	Maintenance dredging works	H1	Dredge spoil sand
		H2	Dredge spoil clay
I	Miscellaneous	I1	Excavated soil
		I2	Paper sludge ash
		I3	Sewage sludge incineration ash (municipal)
		I4	Biomass ash
		I5	Crushed glass
		I6	Expanded clay

NATIONAL ALTERATIONS OF THE OVERSEEING ORGANISATION OF SCOTLAND

601TS (02/16) Classification, Definitions and Uses of Earthworks Materials

(02/16) **General**

0 (02/16) This Series is part of the Specification for Highway Works. Whilst this Series is particularly relevant to the subject matter in its title it must be read in conjunction with the general requirements in Series 000 and 100 and with all other Series relevant to the specification for the particular works to be undertaken.

(02/16) **General Classification**

1 (02/16) Earthworks materials shall fall into one or other of the following general classifications:

(i) acceptable material: material excavated from within the site or imported on to the site which meets the requirements of Table 6/1 and contract specific Appendix 6/1 for acceptability for use in the permanent works;

(ii) unacceptable material Class U1A as defined in sub-Clauses 2(i)(a) and 2(i)(b) of this Clause: material excavated from within the site which, unless processed so that it meets the requirements of Table 6/1 and contract specific Appendix 6/1, shall not be used in the permanent works;

(iii) unacceptable material Class U1B as defined in sub-Clause 2(ii)(a) of this Clause: material excavated from within the site which, unless processed so that it meets the requirements of Table 6/1 and contract specific Appendix 6/1, shall not be used in the permanent works; and

(iv) unacceptable material Class U2 as defined in sub-Clause 3(i) of this Clause: material excavated from within the site which shall not be used in the permanent works.

(02/16) **Unacceptable Materials**

2 (02/16) Unacceptable material Classes U1A and U1B:

(i) unacceptable material Class U1A shall be:

(a) material which does not comply with the permitted constituents and material properties of Table 6/1 and contract specific Appendix 6/1 for acceptable material; and

(b) material, or constituents of materials, composed of the following unless otherwise described in contract specific Appendix 6/1:

- peat, materials from swamps, marshes and bogs;
- logs, stumps and perishable material;
- materials in a frozen condition;
- clay having a liquid limit determined in accordance with BS 1377: Part 2, exceeding 90 or plasticity index determined in accordance with BS 1377: Part 2, exceeding 65;
- material susceptible to spontaneous combustion except unburnt colliery spoil complying with sub-Clause 15 of this Clause;

(ii) unacceptable material Class U1B shall be:

(a) contaminated materials, including controlled wastes (as defined in the Environmental Protection Act 1990 Part IIA) whose level of contamination is above that given either in contract specific Appendix 6/14 or in contract specific Appendix 6/15, but excluding all special wastes (as defined in the Special Waste Amendment (Scotland) Regulations 2004) and radioactive wastes (as defined in the Radioactive Substances Act 1993).

3 (02/16) Unacceptable material Class U2 shall be:

(i) special waste (as defined in the Special Waste Scotland (Amendment) Regulations 2004) and radioactive waste (as defined in the Radioactive Substances Act 1993).

4 (02/16) Where required in contract specific Appendix 6/1, unacceptable material (other than Class U2) shall be processed by mechanical, chemical or other means to render the material acceptable for use in the permanent works in accordance with the requirements of Table 6/1 and contract specific Appendix 6/1.

(02/16) **Definitions**

5 (02/16) Where source codes are referred to these shall be for materials from the sources listed in Table 6/7.

6 (02/16) Chalk shall mean:

(i) any porous material of natural origin composed essentially of calcium carbonate and identified as chalk on the maps produced by the British Geological Survey;

(ii) material designated as Class 3 in contract specific Appendix 6/1.

7 (02/16) Argillaceous rock shall mean shales mudstones siltstones slates and micaceous schists composed of particles of clay and silt and mica. It shall include unburnt colliery spoil. Where argillaceous rock is imported onto the site, it shall be aggregate complying with BS EN 13242 from source codes P (natural aggregates described as shale, siltstone or slate), or G2 (refuse from hard coal mining (black coal shale)).

8 (02/16) Pulverised-fuel ash shall mean solid material extracted by electrostatic and mechanical means from the flue gases of furnaces fired with pulverised bituminous coal. It shall have a maximum particle size of 3 mm. Where pulverised-fuel ash is imported onto the site, it shall be aggregate complying with BS EN 13242 from source code C1 (coal fly ash).

9 (02/16) Furnace bottom ash shall mean agglomerated pulverised-fuel ash obtained from the bottom of the power station furnace and having particle size no larger than 10 mm. Where furnace bottom ash is imported onto the site, it shall be aggregate complying with BS EN 13242 from source code C4 (coal bottom ash).

10 (02/16) Formation shall be the top surface of capping. Where no capping is required formation shall be the top surface of earthworks at the underside of sub-base, unless otherwise shown on the drawings.

11 (02/16) Sub-formation shall be the top surface of earthworks at the underside of capping.

12 (02/16) Stabilisation shall mean the spreading of cement or lime or both on a layer of deposited or intact granular or cohesive material, and the subsequent process of pulverising and mixing followed by appropriate compaction to form the whole or a constituent layer of a capping.

13 (02/16) Where 'recycled aggregate' is used in this Series, the material shall be aggregate resulting from the processing of inorganic or mineral material previously used in construction and shall have been tested in accordance with Clause 710. It shall not contain more than 1% other materials (Class X), not more than 50% in Class Ra (bituminous materials) and not more than 25% in Class Rg (crushed glass). Where 'recycled aggregate' is imported onto the site, it shall be aggregate complying with BS EN 13242 from source code A (construction and demolition recycling industries).

Where 'recycled aggregate except recycled asphalt' is used in this Series, the aggregate shall have been tested in accordance with Clause 710. It shall not contain more than 1% other materials (Class X), not more than 1% in Class Ra (bituminous materials) and not more than 5% in Class Rg (crushed glass). Where 'recycled aggregate except recycled asphalt' is imported onto the site, it shall be aggregate complying with BS EN 13242 from source codes A2 (crushed concrete) and/or A3 (crushed bricks, masonry).

14 (02/16) 'As dug' shall mean material that has been excavated, transported and placed without any processing. Where imported material undergoes any processing, including cleaning and sorting, it will not be deemed 'as dug' and thus shall be aggregate complying with BS EN 13242.

(02/16) **Use of Fill Materials**

15 (02/16) In addition to any grading requirements the maximum particle size of any fill material shall be no more than two-thirds of the compacted layer thickness except that cobbles having an equivalent diameter of more than 150 mm shall not be deposited beneath verges or central reserves within 1.30 m of the finished surface.

16 (02/16) Material placed within 500 mm, or any other distances described in contract specific Appendix 6/3, of concrete, cement bound materials, other cementitious materials or stabilised capping forming part of the permanent works shall conform to, as appropriate, the following requirements.

(i) Materials shall conform to the following criteria:

(a) Water-soluble sulfate (WS) content determined in accordance with BS EN 1744-1 clause 10 shall not exceed 1500 mg of sulfate (as SO_4) per litre;

(b) Total sulfur (TS) content determined in accordance with BS EN 1744-1 clause 11 expressed as (S) shall not exceed 1% for aggregates other than air cooled blast furnace slag or 2% for air cooled blast furnace slag.

(ii) Materials shall conform to at least one of the following options:

(a) When described in accordance with BS EN 932-3 and BS EN 13242 Annex A, limestone, chalk, dolomite, blast furnace slag, steel slag or crushed concrete are predominant

or

(b) The sulfide content of the mixture determined in accordance with BS EN 1744-1 Clause 13 is less than 0.5% (as SO_4).

When determining WS, TS or sulfide content, at least five samples of each material shall be tested. The mean of the highest two values shall be used for comparison with the limiting values. This shall also apply if six to nine results are available. If ten or more results are available, the mean of the highest 20% of the results shall be used for comparison with the limiting values.

17 (02/16) Material placed within 500 mm, or any other distances described in contract specific Appendix 6/3, of metallic structural elements forming part of the permanent works shall conform, as appropriate, to the following requirements.

(i) Materials shall conform to the following criteria:

(a) Water-soluble sulfate (WS) content determined in accordance with BS EN 1744-1 clause 10 shall not exceed 300 mg of sulfate (as SO_4) per litre; and

(b) Total sulfur (TS) content determined in accordance with BS EN 1744-1 clause 11 expressed as (S) shall not exceed 1% for aggregates other than air cooled blast furnace slag or 2% for air cooled blast furnace slag.

(ii) Materials shall conform to at least one of the following options:

(a) When described in accordance with BS EN 932-3 and BS EN 13242 Annex A, limestone, chalk, dolomite, blast furnace slag, steel slag or crushed concrete are predominant;

or

(b) The sulfide content of the mixture determined in accordance with BS EN 1744-1 Clause 13 is less than 0.06% (as SO_4).

When determining WS, TS or sulfide content, at least five samples of each material shall be tested. The mean of the highest two values shall be used for comparison with the limiting values. This shall also applies apply if six to nine results are available. If ten or more results are available, the mean of the highest 20% of the results shall be used for comparison with the limiting values.

The requirements in (i) and (ii) above shall not apply to metallic elements protected by concrete or ancillary metallic items such as the tops of chambers and gullies.

18 (02/16) Unburnt colliery spoil may be used as general fill provided it is compacted in compliance with Clause 612 and complies with the requirements of contract specific Appendix 6/1.

19 (02/16) Pulverised-fuel ash shall not be placed within the dimension described in contract specific Appendix 6/3, below sub-formation or formation.

20 (02/16) Where pulverised-fuel ash is used, the Contractor shall for each consignment, make available to the Overseeing Organisation a record of the type and source from which it was obtained and a certificate of results of tests showing that the material complies with the requirements of Table 6/1.

632TS (02/16) Determination of Moisture Condition Value (MCV) of Earthworks Materials in Scotland

1 (02/16) Where the Moisture Condition Value (MCV) is required in contract specific Appendix 6/1, the MCV determination shall be carried out in accordance with TRL Report 273, Appendix A, Sections 1 to 3.

2 (02/16) Where the natural moisture content MCV is required in contract specific Appendix 6/1, the MCV determination shall be carried out in accordance with TRL Report 273, Appendix A, Sections 1 to 3.

3 (02/16) Where the MCV of saturated materials is required in contract specific Appendix 6/1, the MCV determination shall be carried out in accordance with TRL Report 273, Appendix A, Sections 1, 2 and 4.

4 (02/16) When required in contract specific Appendix 6/1, the determination of the MCV/moisture content relation shall be carried out in accordance with TRL Report 273, Appendix A, Sections 1, 2 and 5.

5 (02/16) An alternative procedure is given in Appendix A, Sections 1, 2 and 6 of TRL Report 273. The rapid assessment procedure for material acceptability may be used when permitted in contract specific Appendix 6/1.

6 (02/16) The Contractor shall provide, for each Moisture Condition Apparatus (MCA) to be used, a test certificate to show that the MCA is functioning correctly. The tests for correct function shall be carried out as described in Appendix D of TRL Report 273 and the results recorded on form MCA3 (TRL Report 273, Appendix B), or similar. All equipment used shall be traceable to national standards.

7 (02/16) The Contractor shall provide, for each operator of the MCA, a certificate which shows the operator has completed an appropriate course of training approved by the Overseeing Organisation. The Overseeing Organisation shall be contacted for details of those organisations able to provide such training.

NATIONAL ALTERATIONS OF THE OVERSEEING ORGANISATION OF WALES

(02/16) 601W Classification, Definitions and Uses of Earthworks Materials

(02/16) General

0 (02/16) This Series is part of the Specification for Highway Works. Whilst this Series is particularly relevant to the subject matter in its title it must be read in conjunction with the general requirements in Series 000 and 100 and with all other Series relevant to the specification for the particular works to be undertaken.

(02/16) General Classification

1 (02/16) Earthworks materials shall fall into one or other of the following general classifications:

(i) acceptable material: material excavated from within the site or imported on to the site which meets the requirements of Table 6/1 and contract specific Appendix 6/1 for acceptability for use in the permanent works;

(ii) unacceptable material Class U1A as defined in sub-Clauses 2(i)(a) and 2(i)(b) of this Clause: material excavated from within the site which, unless processed so that it meets the requirements of Table 6/1 and contract specific Appendix 6/1, shall not be used in the permanent works;

(v) unacceptable material Class U1B as defined in sub-Clause 2(ii)(a) of this Clause: material excavated from within the site which, unless processed so that it meets the requirements of Table 6/1 and contract specific Appendix 6/1, shall not be used in the permanent works; and

(vi) unacceptable material Class U2 as defined in sub-Clause 3(i) of this Clause: material excavated from within the site which shall not be used in the permanent works.

(02/16) Unacceptable Materials

2 (02/16) Unacceptable material Classes U1A and U1B:

(i) unacceptable material Class U1A shall be:

(a) material which does not comply with the permitted constituents and material properties of Table 6/1 and contract specific Appendix 6/1 for acceptable material; and

(b) material, or constituents of materials, composed of the following unless otherwise described in contract specific Appendix 6/1:

- peat, materials from swamps, marshes and bogs;
- logs, stumps and perishable material;
- materials in a frozen condition;
- clay having a liquid limit determined in accordance with BS 1377: Part 2, exceeding 90 or plasticity index determined in accordance with BS 1377: Part 2, exceeding 65;
- material susceptible to spontaneous combustion except unburnt colliery spoil complying with sub-Clause 15 of this Clause;

(ii) unacceptable material Class U1B shall be:

(a) contaminated materials, including controlled wastes (as defined in the Environmental Protection Act 1990 Part IIA) whose level of contamination is above that given either in contract specific Appendix 6/14 or in contract specific Appendix 6/15, but excluding all hazardous wastes (as defined in the Hazardous Waste (England and Wales) Regulations 2005) and radioactive wastes (as defined in the Radioactive Substances Act 1993).

3 (02/16) Unacceptable material Class U2 shall be:

(i) hazardous waste (as defined in the Hazardous Waste (England and Wales) Regulations 2005) and radioactive waste (as defined in the Radioactive Substances Act 1993).

4 (02/16) Where required in contract specific Appendix 6/1, unacceptable material (other than Class U2) shall be processed by mechanical, chemical or other means to render the material acceptable for use in the permanent works in accordance with the requirements of Table 6/1 and contract specific Appendix 6/1.

(02/16) Definitions

5 (02/16) Where source codes are referred to these shall be for materials from the sources listed in Table 6/7.

6 (02/16) Chalk shall mean:

(i) any porous material of natural origin composed essentially of calcium carbonate and identified as chalk on the maps produced by the British Geological Survey;

(ii) material designated as Class 3 in contract specific Appendix 6/1.

7 (02/16) Argillaceous rock shall mean shales mudstones siltstones slates and micaceous schists composed of particles of clay silt and mica. It shall include unburnt colliery spoil. Where argillaceous rock is imported onto the site, it shall be aggregate complying with BS EN 13242 from source codes P (natural aggregates described as shale, siltstone or slate), or G2 (refuse from hard coal mining (black coal shale)). See sub-Clause 21.

8 (02/16) Pulverised-fuel ash shall mean solid material extracted by electrostatic and mechanical means from the flue gases of furnaces fired with pulverised bituminous coal. It shall have a maximum particle size of 3 mm. Where pulverised-fuel ash is imported onto the site, it shall be aggregate complying with BS EN 13242 from source code C1 (coal fly ash).

9 (02/16) Furnace bottom ash shall mean agglomerated pulverised-fuel ash obtained from the bottom of the power station furnace and having particle size no larger than 10 mm. Where furnace bottom ash is imported onto the site, it shall be aggregate complying with BS EN 13242 from source code C4 (coal bottom ash).

10 (02/16) Formation shall be the top surface of capping. Where no capping is required formation shall be the top surface of earthworks at the underside of sub-base, unless otherwise shown on the drawings.

11 (02/16) Sub-formation shall be the top surface of earthworks at the underside of capping.

12 (02/16) Stabilisation shall mean the spreading of cement or lime or both on a layer of deposited or intact granular or cohesive material, and the subsequent process of pulverising and mixing followed by appropriate compaction to form the whole or a constituent layer of a capping.

13 (02/16) Where 'recycled aggregate' is used in this Series, the material shall be aggregate resulting from the processing of inorganic or mineral material previously used in construction and shall have been tested in accordance with Clause 710. It shall not contain more than 1% other materials (Class X), not more than 50% in Class Ra (bituminous materials) and not more than 25% in Class Rg (crushed glass). Where 'recycled aggregate' is imported onto the site, it shall be aggregate complying with BS EN 13242 from source code A (construction and demolition recycling industries).

Where 'recycled aggregate except recycled asphalt' is used in this Series, the aggregate shall have been tested in accordance with Clause 710. It shall not contain more than 1% other materials (Class X), not more than 1% in Class Ra (bituminous materials) and not more than 5% in Class Rg (crushed glass). Where 'recycled aggregate except recycled asphalt' is imported onto the site, it shall be aggregate complying with BS EN 13242 from source codes A2 (crushed concrete) and/or A3 (crushed bricks, masonry).

14 (02/16) 'As dug' shall mean material that has been excavated, transported and placed without any processing. Where imported material undergoes any processing, including cleaning and sorting, it will not be deemed 'as dug' and thus shall be aggregate complying with BS EN 13242.

(02/16) **Use of Fill Materials**

15 (02/16) In addition to any grading requirements the maximum particle size of any fill material shall be no more than two-thirds of the compacted layer thickness except that cobbles having an equivalent diameter of more than 150 mm shall not be deposited beneath verges or central reserves within 1.30 m of the finished surface.

16 (02/16) Materials placed within 500 mm, or any other distances described in the contract specific Appendix 6/3, of concrete, cement bound materials, other cementitious mixtures or stabilised capping forming part of the permanent works shall conform to, as appropriate, the following requirements:

(i) Materials shall conform to the following criteria:

(a) Water-soluble sulfate (WS) content determined in accordance with BS EN 1744-1 clause 10 shall not exceed 1500 mg of sulfate (as SO_4) per litre;

(b) Total sulfur (TS) content determined in accordance with BS EN 1744-1 clause 11 expressed as (S) shall not exceed 1% for aggregates other than air cooled blast furnace slag or 2% for air cooled blast furnace slag.

(ii) Materials shall conform to at least one of the following options:

(a) When described in accordance with BS EN 932-3 and BS EN 13242 Annex A, limestone, chalk, dolomite, blast furnace slag, steel slag or crushed concrete are predominant

or

(b) The sulfide content of the material determined in accordance with BS EN 1744-1 Clause 13 is less than 0.5% (as SO_4).

When determining WS, TS or sulfide content, at least five samples of each material shall be tested. The mean of the highest two values shall be used for comparison with the limiting values. This shall also apply if six to nine results are available. If ten or more results are available, the mean of the highest 20% of the results shall be used for comparison with the limiting values.

17 (02/16) Material placed within 500mm, or any other distances described in the contract specific Appendix 6/3, of metallic structural elements forming part of the permanent works shall conform, as appropriate, to the following requirements:

(i) Materials shall conform to the following criteria:

(a) Water-soluble sulfate (WS) content determined in accordance with BS EN 1744-1 clause 10 shall not exceed 300 mg of sulfate (as SO_4) per litre; and

(b) Total sulfur (TS) content determined in accordance with BS EN 1744-1 clause 11 expressed as (S) shall not exceed 1% for aggregates other than air cooled blast furnace slag or 2% for air cooled blast furnace slag.

(ii) Materials shall conform to at least one of the following options:

(a) When described in accordance with BS EN 932-3 and BS EN 13242 Annex A, limestone, chalk, dolomite, blast furnace slag, steel slag or crushed concrete are predominant;

or

(b) The sulfide content of the material determined in accordance with BS EN 1744-1 Clause 13 is less than 0.06% (as SO_4).

When determining WS, TS or sulfide content, at least five samples of each material shall be tested. The mean of the highest two values shall be used for comparison with the limiting values. This shall also apply if six to nine results are available. If ten or more results are available, the mean of the highest 20% of the results shall be used for comparison with the limiting values.

The requirements in (i) and (ii) above shall not apply to metallic items protected by concrete or ancillary metallic items such as the tops of chambers and gullies.

18 (02/16) Unburnt colliery spoil may be used as general fill provided it is compacted in compliance with Clause 612 and complies with the requirements of contract specific Appendix 6/1.

19 (02/16) Pulverised-fuel ash shall not be placed within the dimension described in contract specific Appendix 6/3, below sub-formation or formation.

20 (02/16) Where pulverised-fuel ash is used, the Contractor shall for each consignment, make available to the Overseeing Organisation a record of the type and source from which it was obtained and a certificate of results of tests showing that the material complies with the requirements of Table 6/1.

21 (02/16) Where stated in contract specific Appendix 6/1 permissible options for fill materials shall include slate or other argillaceous rock materials as stated.

NATIONAL ALTERATIONS OF THE OVERSEEING ORGANISATION OF NORTHERN IRELAND

601NI (02/16) Classification, Definitions and Uses of Earthworks Materials

(02/16) General

0 (02/16) This Series is part of the Specification for Highway Works. Whilst this Series is particularly relevant to the subject matter in its title it must be read in conjunction with the general requirements in Series 000 and 100 and with all other Series relevant to the specification for the particular works to be undertaken.

(02/16) General Classification

1 (02/16) Earthworks materials shall fall into one or other of the following general classifications:

(i) acceptable material: material excavated from within the site or imported on to the site which meets the requirements of Table 6/1 and contract specific Appendix 6/1 for acceptability for use in the permanent works;

(ii) unacceptable material Class U1A as defined in sub-Clauses 2(i)(a) and 2(i)(b) of this Clause: material excavated from within the site which, unless processed so that it meets the requirements of Table 6/1 and contract specific Appendix 6/1, shall not be used in the permanent works;

(iii) unacceptable material Class U1B as defined in sub-Clause 2 (ii)(a) of this Clause: material excavated from within the site which, unless processed so that it meets the requirements of Table 6/1 and contract specific Appendix 6/1, shall not be used in the permanent works; and

(iv) unacceptable material Class U2 as defined in sub-Clause 3(i) of this Clause: material excavated from within the site which shall not be used in the permanent works.

(02/16) Unacceptable Materials

2 (02/16) Unacceptable material Classes U1A and U1B:

(i) unacceptable material Class U1A shall be:

(a) material which does not comply with the permitted constituents and material properties of Table 6/1 and contract specific Appendix 6/1 for acceptable material; and

(b) material, or constituents of materials, composed of the following unless otherwise described in contract specific Appendix 6/1:

- peat, materials from swamps, marshes and bogs;
- logs, stumps and perishable material;
- materials in a frozen condition;
- clay having a liquid limit determined in accordance with BS 1377: Part 2, exceeding 90 or plasticity index determined in accordance with BS 1377: Part 2, exceeding 65;
- material susceptible to spontaneous combustion except unburnt colliery spoil complying with sub-Clause 15 of this Clause;

(ii) unacceptable material Class U1B shall be:

(a) contaminated materials, including controlled wastes (as defined in the Waste and Contaminated Land (Northern Ireland) Order 1997 whose level of contamination is above that given either in contract specific Appendix 6/14 or in contract specific Appendix 6/15, but excluding all hazardous wastes (as defined in the Hazardous Waste Regulations (Northern Ireland) 2005) and radioactive wastes (as defined in the Radioactive Substances Act 1993).

3 (02/16) Unacceptable material Class U2 shall be:

(i) hazardous waste (as defined in the Hazardous Waste Regulations (Northern Ireland) 2005) and radioactive waste (as defined in the Radioactive Substances Act 1993).

4 (02/16) Where required in contract specific Appendix 6/1 unacceptable material (other than Class U2) shall be processed by mechanical, chemical or other means to render the material acceptable for use in the permanent works in accordance with the requirements of Table 6/1 and the contract specific Appendix 6/1.

(02/16) Definitions

5 (02/16) Where source codes are referred to these shall be for materials from the sources listed in Table 6/7.

6 (02/16) Chalk shall mean:

(i) any porous material of natural origin composed essentially of calcium carbonate and identified as chalk on the maps produced by the Geological Survey of Northern Ireland;

(ii) material designated as Class 3 in contract specific Appendix 6/1.

7 (02/16) Argillaceous rock shall mean shales mudstones siltstones slates and micaceous schists composed of particles of clay silt and mica. It shall include unburnt colliery spoil. Where argillaceous rock is imported onto the site, it shall be aggregate complying with BS EN 13242 from source codes P (natural aggregates described as shale, siltstone or slate), or G2 (refuse from hard coal mining (black coal shale)).

8 (02/16) Pulverised-fuel ash shall mean solid material extracted by electrostatic and mechanical means from the flue gases of furnaces fired with pulverised bituminous coal. It shall have a maximum particle size of 3 mm. Where pulverised-fuel ash is imported onto the site, it shall be aggregate complying with BS EN 13242 from source code C1 (coal fly ash).

9 (02/16) Furnace bottom ash shall mean agglomerated pulverised-fuel ash obtained from the bottom of the power station furnace and having particle size no larger than 10 mm. Where furnace bottom ash is imported onto the site, it shall be aggregate complying with BS EN 13242 from source code C4 (coal bottom ash).

10 (02/16) Formation shall be the top surface of capping.

Where no capping is required formation shall be the top surface of earthworks at the underside of sub-base, unless otherwise shown on the drawings.

11 (02/16) Sub-formation shall be the top surface of earthworks at the underside of capping.

12 (02/16) Stabilisation shall mean the spreading of cement or lime or both on a layer of deposited or intact granular or cohesive material, and the subsequent process of pulverising and mixing followed by appropriate compaction to form the whole or a constituent layer of a capping.

13 (02/16) Where 'recycled aggregate' is used in this Series, the material shall be aggregate resulting from the processing of inorganic or mineral material previously used in construction and shall have been tested in accordance with Clause 710. It shall not contain more than 1% other materials (Class X), not more than 50% in Class Ra (bituminous materials) and not more than 25% in Class Rg (crushed glass). Where 'recycled aggregate' is imported onto the site, it shall be aggregate complying with BS EN 13242 from source code A (construction and demolition recycling industries).

Where 'recycled aggregate except recycled asphalt' is used in this Series, the aggregate shall have been tested in accordance with Clause 710. It shall not contain more than 1% other materials (Class X), not more than 1% in Class Ra (bituminous materials) and not more than 5% in Class Rg (crushed glass). Where 'recycled aggregate except recycled asphalt' is imported onto the site, it shall be aggregate complying with BS EN 13242 from source codes A2 (crushed concrete) and/or A3 (crushed bricks, masonry).

14 (02/16) 'As dug' shall mean material that has been excavated, transported and placed without any processing. Where imported material undergoes any processing, including cleaning and sorting, it will not be deemed 'as dug' and thus shall be aggregate complying with BS EN 13242.

(02/16) **Use of Fill Materials**

15 (02/16) In addition to any grading requirements the maximum particle size of any fill material shall be no more than two-thirds of the compacted layer thickness except that cobbles having an equivalent diameter of more than 150 mm shall not be deposited beneath verges or central reserves within 1.30 m of the finished surface.

16 (02/16) Materials placed within 500 mm, or any other distances described in contract specific Appendix 6/3, of concrete, cement bound materials, other cementitious materials or stabilised capping forming part of the permanent works shall conform to, as appropriate, the following requirements:

(i) Materials shall conform to the following criteria:

(a) Water-soluble sulfate (WS) content determined in accordance with BS EN 1744-1 clause 10 shall not exceed 1500 mg of sulfate (as SO_4) per litre;

(b) Total sulfur (TS) content determined in accordance with BS EN 1744-1 clause 11 expressed as (S) shall not exceed 1% for aggregates other than air cooled blast furnace slag or 2% for air cooled blast furnace slag.

(ii) Marerials shall conform to at least one of the following options:

(a) When described in accordance with BS EN 932-3 and BS EN 13242 Annex A, limestone, chalk, dolomite, blast furnace slag, steel slag or crushed concrete are predominant

or

(b) The sulfide content of the mixture determined in accordance with BS EN 1744-1 Clause 13 is less than 0.5% (as SO_4).

When determining WS, TS or sulfide content, at least five samples of each material shall be tested. The mean of the highest two values shall be used for comparison with the limiting values. This shall also apply if six to nine results are available. If ten or more results are available, the mean of the highest 20% of the results shall be used for comparison with the limiting values.

17 (02/16) Material placed within 500 mm, or any other distances described in contract specific Appendix 6/3, of metallic structural elements forming part of the permanent works shall conform, as appropriate, to the following requirements.

(i) Materials shall conform to the following criteria:

(a) Water-soluble sulfate (WS) content determined in accordance with BS EN 1744-1 clause 10 shall not exceed 300 mg of sulfate (as SO_4) per litre; and

(b) Total sulfur (TS) content determined in accordance with BS EN 1744-1 clause 11 expressed as (S) shall not exceed 1% for aggregates other than air cooled blast furnace slag or 2% for air cooled blast furnace slag.

(ii) Materials shall conform to at least one of the following options:

(a) When described in accordance with BS EN 932-3 and BS EN 13242 Annex A, limestone, chalk, dolomite, blast furnace slag, steel slag or crushed concrete are predominant;

or

(b) The sulfide content of the mixture determined in accordance with BS EN 1744-1 Clause 13 is less than 0.06% (as SO_4).

When determining WS, TS or sulfide content, at least five samples of each material shall be tested. The mean of the highest two values shall be used for comparison with the limiting values. This shall also applies apply if six to nine results are available. If ten or more results are available, the mean of the highest 20% of the results shall be used for comparison with the limiting values.

The requirements in (i) and (ii) above shall not apply to metallic elements protected by concrete or ancillary metallic items such as the tops of chambers and gullies.

18 (02/16) Unburnt colliery spoil may be used as general fill provided it is compacted in compliance with Clause 612 and complies with the requirements of contract specific Appendix 6/1.

19 (02/16) Pulverised-fuel ash shall not be placed within the dimension described in contract specific Appendix 6/3, below sub-formation or formation.

20 (02/16) Where pulverised-fuel ash is used, the Contractor shall for each consignment make available to the Overseeing Organisation a record of the type and source from which it was obtained and a certificate of results of tests showing that the material complies with the requirements of Table 6/1.

607NI (02/16) Explosives and Blasting for Excavation

1 (02/16) Blasting for excavation shall not be employed unless permitted or required in contract specific Appendix 6/3 and such blasting shall be confined to the locations and to within the time limits stated therein.

2 (02/16) The Contractor shall:

(i) not carry out plaster shooting;

(ii) for each location where blasting is to be undertaken, provide written notice to the Overseeing Organisation of the programme of blasting, including trial explosions, at least 10 days before it commences and give written notice of each blasting event as described in (v) below, at least 12 hours beforehand;

(iii) carry out trial explosions starting with reduced quantities of explosive in order to determine the size of the actual explosive charges and their disposition, for use in the main blasting operations, so as not to exceed the values for vibrational amplitude and vibrational peak particle velocity stated in (vi) below at the positions described therein;

(iv) determine danger zones likely to be created by the blasting operations, including trial explosions, within which blasted material may be projected and utilise suitable arrangements including temporary works, to retain such projectiles and ensure that no injury or damage is caused to persons or property thereby;

(v) limit blasting to a small number of events during permitted hours per day, where an event shall comprise a single explosion or a group of explosions each separated by a short time interval, the group lasting less than a minute;

(vi) ensure that:

(a) structures and earthworks, existing or under construction, on and off the site, do not experience, during blasting operations including trial explosions, a vibrational amplitude exceeding 0.2 mm and a resultant peak particle velocity exceeding 50 mm per second, or other limits stated in contract specific Appendix 6/3, at the same time or individually; and

(b) peak overpressures, of magnitude such as to endanger windows and glazed areas of structures, do not occur;

(vii) where instrumentation and monitoring is appropriate:

(a) rigidly fix to structures and insert in earthworks described in (vi)(a) above, suitable instruments to measure the vibrational amplitude and resultant vibrational peak particle velocity, and peak overpressures, experienced during blasting operations including trial explosions;

(b) make available details of the proposed instrumentation within the site;

(c) unless otherwise stipulated in contract specific Appendix 6/3, make his own arrangements for installing instruments on property off the site including negotiating with landowners and other interested parties;

(d) read such instruments and take measurements throughout the period of blasting operations, including trial explosions;

(e) for instruments on structures or earthworks on the site and, where required in contract specific Appendix 6/3, on property off the site, make available the results to the Overseeing Organisation at the end of each day's blasting;

(viii) take measurements of vibrational amplitude and peak particle velocity in each of three mutually perpendicular planes and determine the peak value, taken as the maximum resultant calculated by vector summation of the three components of amplitude and velocity respectively, measured as instantaneously as the resolution of the recording instrument permits;

(ix) ensure that noise from blasting operations is controlled in accordance with Clause 109;

(x) use explosives in the quantities and in the manner recommended by the manufacturer;

(xi) store explosives in registered premises in a licensed store or magazine provided with a separate compartment for detonators or use them under an Immediate Use Certificate issued by the police;

(xii) only permit explosives to be used or handled by or under the immediate control of a competent person in accordance with the Construction (General Provisions) Northern Ireland Regulations 1963 (Regulation 19) and subsequent amending Regulations;

(xiii) ensure there is no unauthorised issue or improper use of explosives brought on the site and maintain a strict check on quantities issued and consumed;

(xiv) comply with the requirements of BS 6657 in respect of the use of electrical detonators in the vicinity of static and mobile radio transmitters, including normal radio and television broadcasting stations and radar units associated with aircraft movements, electricity generating plant and transmission lines.

APPENDIX E – SHW SERIES 800

SERIES 800 ROAD PAVEMENTS – UNBOUND, CEMENT AND OTHER HYDRAULICALLY BOUND MIXTURES

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ROAD PAVEMENTS – UNBOUND, CEMENT AND OTHER HYDRAULICALLY BOUND MIXTURES

800 (02/16) General

1 (02/16) This Series is part of the Specification for Highway Works. Whilst this Series is particularly relevant to the subject matter in its title it must be read in conjunction with the general requirements in Series 000 and 100 and with all other Series relevant to the specification for the particular works to be undertaken.

(02/16) Unbound Mixtures for Subbase

801 (02/16) General Requirements for Unbound Mixtures

1 (02/16) Unbound mixtures shall be made and constructed to conform to BS EN 13285, the requirement categories in Table 8/1 and Clauses 802 to 807. The permitted alternatives for each part of the permanent works shall be as described in contract specific Appendix 7/1.

TABLE 8/1: (02/16) **Mixture and Grading Requirement Categories for Unbound Mixtures**

Unbound mixture	**Type 1**	**Type 2**	**Type 3 (open graded)**	**Category B (close graded)**	**Type 4 (asphalt arisings)**
Clause	803	804	805	806	807
Standard	BS EN 13285 Categories for unbound mixture properties				
Mixture requirement category					
- Designation	0/31,5	0/31,5	0/40	0/31,5	0/31,5
- Maximum fines	UF_9	UF_9	UF_5	UF_9	UF_9
- Oversize	OC_{75}	OC_{75}	OC_{80}	OC_{80}	OC_{75}
Grading requirement category					
- Overall grading	G_P	G_E	G_O	G_B	G_P

2 (02/16) Unbound mixtures placed within 500 mm, or any other distances described in contract specific Appendix 7/1, of concrete, cement bound materials, other cementitious mixtures or stabilised capping forming part of the permanent works shall conform to requirements A and B below.

A Mixtures shall conform to the following two criteria:

(i) Water-soluble sulfate (WS) content determined in accordance with BS EN 1744-1 clause 10 shall not exceed 1500 mg of sulfate (as SO_4) per litre;

(ii) Total sulfur (TS) content determined in accordance with BS EN 1744-1 clause 11 expressed as (S) shall not exceed 1% for aggregates other than air cooled blast furnace slag or 2% for air cooled blast furnace slag.

B Mixtures shall conform to at least one of the following two options:

(i) When described in accordance with BS EN 932-3 and BS EN 13242 Annex A, limestone, chalk, dolomite, blast furnace slag, steel slag or crushed concrete are predominant;

or

(ii) The sulfide content of the mixture determined in accordance with BS EN 1744-1 clause 13 is less than 0.5% (as SO_4).

When determining WS, TS or sulfide content, at least five samples of each material shall be tested. The mean of the highest two values shall be used for comparison with the limiting values. This also applies if six to nine results are available. If ten or more results are available, the mean of the highest 20% of the results shall be used for comparison with the limiting values. The pH of the mixture shall be reported.

3 (02/16) Unbound mixtures placed within 500mm, or any other distances described in contract specific Appendix 7/1, of metallic structural elements forming part of the permanent works shall conform to requirements C and D below.

C Mixtures shall conform to the following two criteria:

(i) Water-soluble sulfate (WS) content determined in accordance with BS EN 1744-1 clause 10 shall not exceed 300 mg of sulfate (as SO_4) per litre;

(ii) Total sulfur (TS) content determined in accordance with BS EN 1744-1 clause 11 expressed as (S) shall not exceed 1% for aggregates other than air cooled blast furnace slag or 2% for air cooled blast furnace slag.

D Mixtures shall conform to at least one of the following two options:

(i) When described in accordance with BS EN 932-3 and BS EN 13242 Annex A, limestone, chalk, dolomite, blast furnace slag, steel slag or crushed concrete are predominant

or

(ii) The sulfide content of the mixture determined in accordance with BS EN 1744-1 clause 13 is less than 0.06% (as SO_4).

When determining WS, TS or sulfide content, at least five samples of each material shall be tested. The mean of the highest two values shall be used for comparison with the limiting values. This also applies if six to nine results are available. If ten or more results are available, the mean of the highest 20% of the results shall be used for comparison with the limiting values. The pH of the mixture shall be reported.

The requirements in (i) and (ii) above shall not apply to metallic items protected by concrete and ancillary metallic items such as the tops of chambers and gullies.

4 (02/16) The properties of aggregates used in unbound mixtures shall comply with the selected requirements of BS EN 13242 listed in Table 8/2.

TABLE 8/2: (02/16) **Requirements for Aggregates Used in Unbound Mixtures**

Unbound mixture	**Type 1**	**Type 2**	**Type 3** (open graded)	**Category B** (close graded)	**Type 4** (asphalt arisings)
Clause	**803**	**804**	**805**	**806**	**807**
Standard	BS EN 13242 Categories for aggregate properties				
Crushed, or broken and totally rounded particles – crushed rock, crushed manufactured and crushed recycled aggregates – see NOTE 1	$C_{90/3}$	$C_{90/3}$	$C_{90/3}$		$C_{90/3}$
– crushed gravel	$C_{50/10}$ – see NOTE 2	C_{NR} (no requirement)	Not permitted		Not permitted
Resistance to fragmentation – Los Angeles test	LA_{50}	LA_{50}	LA_{30}		LA_{50}
Resistance to wear – micro-Deval test	M_{DE}NR (no requirement). The supplier shall state the value for the aggregate used.				
Resistance to freezing and thawing – magnesium sulfate soundness	MS_{35}				
Water absorption	WA_{24}NR (no requirement). The supplier shall state the value for the aggregate used.				
Volume stability of blast furnace slags	Free from dicalcium silicate and iron disintegration.				
Volume stability of steel (BOF and EAF) slags	V_5		Not permitted		V_5
All other BS EN 13242 aggregate requirements	Category $_{NR}$ (no requirement).				
NOTES: 1. BS EN 13242 assumes that crushed rock aggregates comply with category $C_{90/3}$ without further testing. 2. Where permitted by contract specific Appendix 7/1.					

5 (02/16) Where recycled coarse aggregate or recycled concrete aggregate is used in unbound mixtures in accordance with Clauses 802 to 807 as appropriate, it shall have been tested in accordance with Clause 710. Recycled coarse aggregate and recycled concrete aggregate used in unbound mixtures in accordance with Clauses 803, 804 and 807 shall also comply with the additional requirements of Table 8/3.

TABLE 8/3: (02/16) **Additional Requirements for Recycled Coarse Aggregate and Recycled Concrete Aggregate Used in Type 1, Type 2 and Type 4 Unbound Mixtures**

Unbound Mixture	**Type 1**	**Type 2**	**Type 4 (asphalt arisings)**
Component Identified by Clause 710	**Maximum Permitted Content** (% by mass)		
Asphalt (Class Ra)	50	50	100
Glass (Class Rg)	25		
Other materials (Class X), including wood, plastic and metal	1		

6 (02/16) When required by contract specific Appendix 7/1 and Clauses 803 and 804 as appropriate, the unbound mixture shall satisfy the minimum CBR requirement of contract specific Appendix 7/1 when tested in accordance with clause 7 of BS 1377-4, with surcharge discs. The specimens shall be tested in a soaked condition. The mixture shall be tested at the density and moisture content likely to develop in equilibrium field conditions which shall be taken as being the density relating to the uniform air voids content of 5% and the value of optimum water content declared when tested as required by BS EN 13285.

(02/16) **Frost Heave**

7 (02/16) Subject to the tolerances given in Table 7/1 and unless otherwise stated in contract specific Appendix 7/1, material shall not be frost susceptible if it is used within 450 mm of the designed final surface of a road or paved central reserve, or 350 mm if the Mean Annual Frost Index (MAFI) of the site is less than 50.

8 (02/16) Material shall be classified as non-frost-susceptible if the mean heave is 15 mm or less, when tested in accordance with BS 812-124. Comparator specimens in accordance with Annex B of BS 812-124 shall be used.

802 (02/16) Transport, Laying, Compaction and Trafficking of Unbound Mixtures

(02/16) **Transporting**

1 (02/16) Unbound mixtures shall be protected from drying out and segregation both during transit to the point where it is to be laid and whilst awaiting tipping.

(02/16) **Laying**

2 (02/16) Unbound mixtures in a frozen condition shall not be incorporated in the works but may be used, if acceptable, when thawed. Unbound mixtures shall not be laid on any surface which is frozen or covered with ice.

3 (02/16) All unbound mixtures shall be placed and spread evenly. Spreading shall be undertaken either concurrently with placing or without delay. Unbound mixtures shall be spread using a paving machine or a suitable spreader box and operated with a mechanism which levels off the material to an even depth.

4 (02/16) Except where otherwise stated in contract specific Appendix 7/1, material up to 225 mm compacted thickness shall be spread in one layer so that after compaction the total thickness is as specified. Material of compacted thickness greater than 225 mm shall be laid in two or more layers and the minimum compacted thickness of any such layer shall be 110 mm. Where the layers of unbound mixtures are of unequal thickness, the lowest layer shall be the thickest layer.

(02/16) **Compaction**

5 (02/16) Compaction shall be completed as soon as possible after the mixture has been spread and in accordance with the requirements for the individual mixtures.

6 (02/16) Full compaction shall be obtained over the full area including in the vicinity of both longitudinal and transverse joints.

7 (02/16) Compaction of unbound mixtures shall be carried out by a method specified in Table 8/4, unless the Contractor demonstrates at site trials that a state of compaction achieved by an alternative method is equivalent to or better than that using the specified method.

8 (02/16) The surface of any layer of material shall on completion of compaction and immediately before overlaying, be well closed, free from movement under construction plant and from ridges, cracks, loose material, pot holes, ruts or other defects. All loose, segregated or otherwise defective areas shall be removed to the full thickness of the layer, and new material laid and compacted.

9 (02/16) For the purposes of Table 8/4 the following shall apply:

(i) The number of passes is the number of times that each point on the surface of the layer being compacted shall be traversed by the item of compaction plant in its operating mode (or struck, in the case of power rammers).

(ii) The compaction plant in Table 8/4 is categorised in terms of static mass. The mass per metre width of roll is the total mass on the roll divided by the total roll width. Where a smooth-wheeled roller has more than one axle, the category of the machine shall be determined on the basis of the axle giving the highest value of mass per metre width.

(iii) For pneumatic-tyred rollers the mass per wheel is the total mass of the roller divided by the number of wheels. In assessing the number of passes of pneumatic-tyred rollers the effective width shall be the sum of the widths of the individual wheel tracks together with the sum of the spacings between the wheel tracks provided that each spacing does not exceed 230 mm. Where the spacings exceed 230 mm the effective width shall be the sum of the widths of the individual wheel tracks only.

(iv) Vibratory rollers are self-propelled or towed smooth-wheeled rollers having means of applying mechanical vibration to one or more rolls:

(a) The requirements for vibratory rollers are based on the use of the lowest gear on a self-propelled machine with mechanical transmission and a speed of 1.5-2.5 km/h for a towed machine or a self-propelled machine with hydrostatic transmission. If higher gears or speeds are used an increased number of passes shall be provided in proportion to the increase in speed of travel.

(b) Where the mechanical vibration is applied to two rolls in tandem, the minimum number of passes shall be half the number given in Table 8/4 for the appropriate mass per metre width of one vibrating roll but if one roll differs in mass per metre width from the other, the number of passes shall be calculated as for the roll with the smaller value. Alternatively the minimum number of passes may be determined by treating the machine as having a single vibrating roll with a mass per metre width equal to that of the roll with the higher value.

(c) Vibratory rollers operating without vibration shall be classified as smooth-wheeled rollers.

(d) Vibratory rollers shall be operated with their vibratory mechanism operating at the frequency of vibration recommended by the manufacturer. All such rollers shall be equipped, or provided with devices indicating the frequency at which the mechanism is operating and the speed of travel. Both devices shall be capable of being safely read by an inspector alongside the machine.

(v) Vibrating-plate compactors are machines having a base-plate to which is attached a source of vibration consisting of one or two eccentrically-weighted shafts:

(a) The mass per square metre of base-plate of a vibrating-plate compactor is calculated by dividing the total mass of the machine in its working condition by its area in contact with compacted material.

(b) Vibrating-plate compactors shall be operated at the frequency of vibration recommended by the manufacturer. They shall normally be operated at travelling speeds of less than 1 km/h but if higher speeds are necessary, the number of passes shall be increased in proportion to the increase in speed of travel.

(vi) Vibro-tampers are machines in which an engine driven reciprocating mechanism acts on a spring system, through which oscillations are set up in a base-plate.

(vii) Power rammers are machines which are actuated by explosions in an internal combustion cylinder; each explosion being controlled manually by the operator. One pass of a power rammer shall be considered to have been made when the compacting shoe has made one strike on the area in question.

(viii) Combinations of different types of plant or different categories of the same plant will be permitted; in which case the number of passes for each shall be such proportion of the appropriate number in Table 8/4 as will together produce the same total compactive effort as any one operated singly, in accordance with Table 8/4.

TABLE 8/4: (02/16) **Compaction Requirements for Unbound Mixtures**

Type of Compaction Plant	Category	Number of passes for layers not exceeding the following compacted thicknesses:		
		110 mm	150 mm	225 mm
Smooth-wheeled roller (or vibratory roller operating without vibration)	Mass per metre width of roll:			
	over 2700 kg up to 5400 kg	16	unsuitable	unsuitable
	over 5400 g	8	16	unsuitable
Pneumatic-tyred roller	Mass per wheel:			
	over 4000 kg up to 6000 kg	12	unsuitable	unsuitable
	over 6000 kg up to 8000 kg	12	unsuitable	unsuitable
	over 8000 kg up to 12000 kg	10	16	unsuitable
	over 12000 kg	8	12	unsuitable
Vibratory roller	Mass per metre width of vibrating roll:			
	over 700 kg up to 1300 kg	16	unsuitable	unsuitable
	over 1300 kg up to 1800 kg	6	16	unsuitable
	over 1800 kg up to 2300 kg	4	6	10
	over 2300 kg up to 2900 kg	3	5	9
	over 2900 kg up to 3600 kg	3	5	8
	over 3600 kg up to 4300 kg	2	4	7
	over 4300 kg up to 5000 kg	2	4	6
	over 5000 kg	2	3	5
Vibrating-plate compactor	Mass per square metre of base plate:			
	over 1400 kg/m² up to 1800 kg/m²	8	unsuitable	unsuitable
	over 1800 kg/m² up to 2100 kg/m²	5	8	unsuitable
	over 2100 kg/m²	3	6	10
Vibro-tamper	Mass:			
	over 50 kg up to 65 kg	4	8	unsuitable
	over 65 kg up to 75 kg	3	6	10
	over 75 kg	2	4	8
Power rammer	Mass:			
	100 kg-500 kg	5	8	unsuitable
	over 500 kg	5	8	12

(02/16) **Use of Surfaces by Construction Plant and Other Traffic**

10 (02/16) Construction plant and other traffic used on pavements under construction shall be suitable in relation to the material, condition and thickness of the courses it traverses so that damage is not caused to the subgrade or the pavement courses already constructed. The wheels or tracks of plant moving over the various pavement courses shall be kept free from deleterious materials.

11 (02/16) Where the Contractor proposes to use the unbound mixture layers for construction plant he shall improve these layers where necessary, to accommodate the method of construction and the type of plant and vehicles which he proposes to use, in order to avoid damage to the laid layer(s), any capping and the subgrade. Any permanent thickening shall be across the whole width of the pavement. Temporary thickening shall not impede drainage of any layer or the subgrade.

(02/16) **Trafficking Trial**

12 (02/16) When required by contract specific Appendix 7/1, the Contractor shall undertake a Trafficking Trial incorporating the unbound mixture proposed for use in the permanent works. A trial area shall be constructed, trafficked and assessed in accordance with the procedure described in sub-Clauses 13 to 18 of this Clause. The mean vertical deformation after 1000 equivalent standard axles shall be less than 30 mm when measured in accordance with the procedure stated in sub-Clause 17 of this Clause.

Proposals for trafficking trials shall be submitted to the Overseeing Organisation for review and acceptance five days in advance of construction.

(02/16) **Trial Procedure**

13 (02/16) The trial area shall be located on a formation prepared in accordance with the specification. The trial area may be located so that it can be incorporated within the permanent works if the resistance to wheel track rutting is demonstrated to comply with sub-Clause 12 of this Clause.

14 (02/16) The trial area shall be at least 60 m long, and of sufficient width that when trafficked, the wheel paths of the test vehicle shall be at least 1 m from either edge of the top of the unbound mixture layer. The unbound mixture layer shall be compacted to the thickness specified in contract specific Appendix 7/1. The formation shall extend for a further 1 m either side of the unbound mixture layer.

15 (02/16) A sufficient run off/run on area shall be constructed at each end of the trial area of the same width, and compacted to the same level, as the trial area, to ensure correct tracking by the test vehicle and minimise dynamic effects of the vehicle bouncing on its springs. Suitable guidance shall be given to assist the driver in maintaining the same track in each pass and to achieve channelled trafficking. Examples of suitable guides would be a string or painted line.

(02/16) **Mixtures**

16 (02/16) The unbound mixture used in the trial shall be transported, laid and compacted using the equipment proposed for use in the works.

17 (02/16) Maximum vertical deformation shall be measured in both wheel tracks using optical or laser levels at pre-determined monitoring points on five transverse lines spaced equally along the length of the trial bay. The transverse lines at the ends of the trial area shall be at least 5 m from the run off/run on areas. The average deformation of the two wheel tracks after 1000 standard axles shall be recorded.

(02/16) **Reporting and Acceptance of Trafficking Trial Area**

18 (02/16) The Contractor shall provide the Overseeing Organisation, for acceptance, with a report on the Trafficking Trial, stating how the use of the unbound mixture was validated. The main construction of the permanent works shall not start until the Trafficking Trial area has been accepted by the Overseeing Organisation within two working days of receiving the Trafficking Trial area report.

803 (02/16) Type 1 Unbound Mixtures

1 (02/16) Type 1 unbound mixture shall be made from crushed rock, crushed slag, crushed concrete, recycled aggregates or well burnt non-plastic shale and may contain up to 10% by mass of natural sand that passes the 4 mm test sieve. Where permitted by contract specific Appendix 7/1, crushed gravel complying with sub-Clause 803.7 may be used.

2 (02/16) The mixture shall comply with BS EN 13285 and the requirements of Table 8/1. The grading requirements for the mixture are summarised in Table 8/5.

TABLE 8/5: (02/16) **Summary Grading Requirements for Type 1 and Type 4 Unbound Mixtures**

Sieve size, mm	Percentage by mass passing		
	Overall grading range	Supplier declared value grading range	Tolerance on the supplier declared value
63	100		
31.5	75 – 99		
16	43 – 81	54 – 72	± 15
8	23 – 66	33 – 52	± 15
4	12 – 53	21 – 38	± 15
2	6 – 42	14 – 27	± 13
1	3 – 32	9 – 20	± 10
0.063	0 – 9		
Grading of individual batches – differences in values passing selected sieves			
Retained sieve size, mm	Passing sieve size, mm	Percentage by mass passing	
		Not less than	Not more than
8	16	7	30
4	8	7	30

3 (02/16) The properties of aggregates used in the mixture shall be in accordance with BS EN 13242 and the requirements of Table 8/2.

4 (02/16) The size fraction of the unbound mixture passing the 0.425 mm size test sieve shall be non-plastic as defined by BS 1377-2 and tested in compliance therewith.

5 (02/16) Where the mixture contains recycled coarse aggregate or recycled concrete aggregate, it shall comply with sub-Clause 801.5.

6 (02/16) The mixture shall be transported, laid and compacted without drying out or segregation.

(02/16) **Additional Requirements for Mixtures Containing Crushed Gravel**

7 (02/16) For the purposes of this Clause, gravel is defined as aggregate derived from a natural, unconsolidated, coarse-grained sedimentary deposit consisting of water-worn rock fragments. Crushed gravel aggregate shall be derived from natural cobbles retained on the 63 mm test sieve and comply with the crushed, broken and totally rounded particles requirement in Table 8/2.

8 (02/16) Where required by contract specific Appendix 7/1, mixtures containing crushed gravel coarse aggregate shall comply with the minimum CBR requirement in sub-Clause 801.6. Where required by contract specific Appendix 7/1, mixtures containing crushed gravel coarse aggregate shall be assessed using a trafficking trial complying with sub-Clause 802.12.

804 (02/16) Type 2 Unbound Mixtures

1 (02/16) Type 2 unbound mixture shall be made from natural sands, gravels, crushed rock, crushed slag, crushed concrete, recycled aggregates or well burnt non-plastic shale.

2 (02/16) The mixture shall comply with BS EN 13285 and the requirements of Table 8/1. The grading requirements for the mixture are summarised in Table 8/6.

TABLE 8/6: (02/16) **Summary Grading Requirements for Type 2 Unbound Mixtures**

Sieve size, mm	Percentage by mass passing		
	Overall grading range	Supplier declared value grading range	Tolerance on the supplier declared value
63	100		
31.5	75 – 99		
16	50 – 90		
8	30 – 75	No requirement	No requirement
4	15 – 60		
1	0 – 35		
0.063	0 – 9		
Grading of individual batches – differences in values passing selected sieves			
Retained sieve size, mm	Passing sieve size, mm	Percentage by mass passing	
		Not less than	Not more than
8	16	5	35
4	8	5	35

3 (02/16) The properties of aggregates used in the mixture shall be in accordance with BS EN 13242 and the requirements of Table 8/2.

4 (02/16) The size fraction of the unbound mixture passing the 0.425 mm size test sieve when tested in compliance with BS 1377-2 shall have a plasticity index of less than 6.

5 (02/16) Where the mixture contains recycled coarse aggregate or recycled concrete aggregate, it shall comply with sub-Clause 801.5.

6 (02/16) Where required by contract specific Appendix 7/1, the mixture shall satisfy the minimum CBR requirement when tested in accordance with sub-Clause 801.6.

7 (02/16) The mixture shall be transported, laid and compacted without drying out or segregation, at a moisture content within the range 1% above to 2% below the declared value of optimum water content when tested as required by BS EN 13285.

805 (02/16) Type 3 (open graded) Unbound Mixtures

1 (02/16) Type 3 (open graded) unbound mixture shall be made from crushed rock, crushed blast furnace slag or recycled concrete aggregate. When tested in accordance with Clause 710, recycled concrete aggregate used in Type 3 (open graded) unbound mixtures shall not contain more than 5% asphalt (Class Ra) and not more than 1% other materials (Class X).

2 (02/16) The mixture shall comply with BS EN 13285 and the requirements of Table 8/1. The grading requirements for the mixture are summarised in Table 8/7.

3 (02/16) The properties of aggregates used in the mixture shall be in accordance with BS EN 13242 and the requirements of Table 8/2.

4 (02/16) The size fraction of the unbound mixture passing the 0.425 mm size test sieve shall be non-plastic as defined by BS 1377-2 and tested in compliance therewith.

5 (02/16) The mixture shall be transported, laid and compacted without drying out or segregation.

TABLE 8/7: (02/16) **Summary Grading Requirements for Type 3 (open graded) Unbound Mixtures**

Sieve size, mm	Percentage by mass passing		
	Overall grading range	Supplier declared value grading range	Tolerance on the supplier declared value
80	100		
40	80 – 99		
20	50 – 78	58 – 70	± 8
10	31 – 60	39 – 51	± 8
4	18 – 46	26 – 38	± 8
2	10 – 35	17 – 28	± 7
1	6 – 26	11 – 21	± 5
0.500	0 – 20	5 – 15	± 5
0.063	0 – 5		
Grading of individual batches – differences in values passing selected sieves			
Retained sieve size, mm	Passing sieve size, mm	Percentage by mass passing	
		Not less than	Not more than
10	20	10	25
4	10	10	25
2	4	7	20
1	2	4	15

806 (02/16) Category B (close graded) Unbound Mixtures

1 (02/16) Category B (close graded) unbound mixture shall be made from crushed rock, crushed blast furnace slag or recycled concrete aggregate. When tested in accordance with Clause 710, recycled concrete aggregate used in Category B (close graded) unbound mixtures shall not contain more than 5% asphalt (Class Ra) and not more than 1% other materials (Class X).

2 (02/16) The mixture shall comply with BS EN 13285 and the requirements of Table 8/1. The grading requirements for the mixture are summarised in Table 8/8.

TABLE 8/8: (02/16) Summary Grading Requirements for Category B (close graded) Unbound Mixtures

Sieve size, mm	Percentage by mass passing		
	Overall grading range	Supplier declared value grading range	Tolerance on the supplier declared value
63	100		
31.5	80 – 99		
16	55 – 85	63 – 77	± 8
8	35 – 68	43 – 60	± 8
4	22 – 60	30 – 52	± 8
2	16 – 47	23 – 40	± 7
1	9 – 40	14 – 35	± 5
0.500	5 – 35	10 – 30	± 5
0.063	0 – 9		
Grading of individual batches – differences in values passing selected sieves			
Retained sieve size, mm	Passing sieve size, mm	Percentage by mass passing	
		Not less than	Not more than
8	16	10	25
4	8	10	25
2	4	7	20
1	2	4	15

3 (02/16) The properties of aggregates used in the mixture shall be in accordance with BS EN 13242 and the requirements of Table 8/2.

4 (02/16) The size fraction of the unbound mixture passing the 0.425 mm size test sieve shall be non-plastic as defined by BS 1377-2 and tested in compliance therewith.

5 (02/16) The mixture shall be transported, laid and compacted without drying out or segregation.

807 (02/16) Type 4 (asphalt arisings) Unbound Mixtures

1 (02/16) Type 4 unbound mixture shall be made from recycled aggregates containing asphalt arisings, and may contain crushed rock, crushed slag, crushed concrete or well burnt non-plastic shale and up to 10% by mass of natural sand that passes the 4 mm size test sieve.

2 (02/16) Asphalt arisings shall be either asphalt road planings or granulated asphalt, but excluding materials contaminated with tar or tar-bitumen binders. Asphalt planings are defined as materials derived from the asphalt layers of the pavement using a mobile machine fitted with milling cutters. Granulated asphalt is defined as asphalt bound material recycled from roads under reconstruction or surplus asphalt material destined for bound pavement layers, but unused, which has been granulated.

3 (02/16) Type 4 unbound mixture shall have an asphalt (Class Ra) content greater than 50% when tested in accordance with Clause 710, and the recovered bitumen content of the asphalt shall be not more than 10% when tested in accordance with BS EN 12697-1.

4 (02/16) Type 4 unbound mixture shall comply with BS EN 13285 and the requirements of Table 8/1. The grading requirements for the mixture are summarised in Table 8/5.

5 (02/16) The properties of aggregates used in the mixture shall be in accordance with BS EN 13242 and the requirements of Table 8/2.

6 (02/16) The size fraction of the unbound mixture passing the 0.425 mm size test sieve shall be non-plastic as defined by BS 1377-2 and tested in compliance therewith.

7 (02/16) Where the mixture contains recycled coarse aggregate or recycled concrete aggregate, it shall comply with sub-Clause 801.5.

8 (02/16) The mixture shall be transported, laid and compacted without drying out or segregation, at a moisture content within the range 1% above to 2% below the declared value of optimum water content when tested as required by BS EN 13285. The moisture content shall be determined by oven drying at a reduced temperature setting of 45ºC to 50ºC.

9 (02/16) Where required by contract specific Appendix 7/1, Type 4 unbound mixtures shall be assessed using a trafficking trial complying with sub-Clause 802.12.

808 and 809 (02/16) Not Used

(02/16) Cement and Other Hydraulically Bound Mixtures

810 (02/16) General Requirements for Cement and Other Hydraulically Bound Mixtures

1 (02/16) Cement and other hydraulically bound mixtures (HBM) shall be produced, constructed and tested in accordance with the following Clauses. The permitted alternatives for each part of the works shall be as described in contract specific Appendix 7/1.

2 (02/16) Attributes shall be deemed to have a “No requirement” classification unless stated otherwise.

3 (02/16) The terms listed below shall apply to the HBM Clauses of this specification:

ASS	air cooled steel slag
CBGM	cement bound granular mixture
CBR	California bearing ratio
CFA	cement treated fly ash
E	modulus of elasticity
FA	fly ash (also known as 'pulverized fuel ash')
FABM	fly ash bound mixture
G_{vxx}	volumetric expansion category
GBS	granulated blast furnace slag
ggbs	ground granulated blast furnace slag
HBM	hydraulically bound mixture
HRB	hydraulic road binder (factory blended hydraulic binder for road use)
HRBBM	'hydraulic road binder' bound mixture
IBI	immediate bearing index
Imm_{xx}	immersion category
IPI_{xx}	immediate bearing index category
LA	Los Angeles coefficient
LFA	lime treated fly ash
MCV	moisture condition value
NR	no requirement
OWC	optimum water content
PTR	Pneumatic tyred roller
$Pulv_{xx}$	pulverisation category
R_c	compressive strength
R_t	direct tensile strength
R_{it}	indirect tensile strength
$R_t E$	method of performance classification based on the combination R_t and E. Classes of $R_t E$ are designated T0 to T5, in BS EN 14227, where T designates $R_t E$ and the number indicates the performance class
SBM	slag bound mixture
SC	soil treated by cement
SFA	soil treated by fly ash
SHRB	soil treated by hydraulic road binder
SS	soil treated by slag
t	time (hours) at constant temperature in defining maturity for calculating the construction period
T°C	ambient air temperature in defining maturity for calculating construction period
W_{xx}	water content category

4 (02/16) HBM shall be tested in accordance with Clause 870 and the test methods specified in the following Clauses.

5 (02/16) Before work commences, the Contractor shall submit a statement to the Overseeing Organisation that includes:

(i) The information detailed in the 'Designation and Description' clause of the relevant BS EN Standard for the specified HBM, confirming compliance with the requirements of this Series and contract specific Appendix 7/1.

(ii) Target proportions of constituents, including water.

(iii) Mixture design details and results, in accordance with Clause 880.

(iv) Method statement for the demonstration area and the main works, in accordance with Clause 817.

6 (02/16) When required by contract specific Appendix 7/1, the coefficient of linear expansion of the mixture shall be determined in accordance with Clause 871.

811 (02/16) Binder Constituents

1 (02/16) Binder constituents shall comply with BS EN 14227 except that, unless otherwise agreed by the Overseeing Organisation:

(i) fly ash shall be siliceous fly ash complying with BS EN 14227-4;

(ii) quicklime shall comply with BS EN 14227-11 and have a grading that complies with particle size Category 1.

2 (02/16) The binder content shall comply with Table 8/9, unless otherwise agreed by the Overseeing Organisation. The mixture proportions used for production shall be based on a laboratory mixture design procedure in accordance with Clause 880.

TABLE 8/9: (02/16) **Minimum Binder or Binder Constituent Additions for HBM**

Binder or binder constituent	Application	Minimum addition for mix-in-plant method of construction using batching by mass (by dry mass of mixture)	Minimum addition for mix-in-plant method of construction using volume batching and for mix-in-place construction (by dry mass of mixture)
Lime (quicklime or hydrated lime)	when used with another binder constituent	1.5%	2%
	when used as the only binder in FABM 5	3%	4%
Cement	when used with another binder constituent	2%	3%
	when used as the only binder constituent in CBGM	The appropriate value from BS EN 14227-1, Table 1	1% + (the appropriate value from BS EN 14227-1, Table 1)
	when used as the only binder constituent in soil treated by cement (SC)	3%	4%
Ground granulated blast furnace slag (ggbs)	when used with cement	2%	3%
	when used with lime	3%	4%
Air-cooled steel slag (ASS)	when used with GBS (see Note)	2.5%	3%
Dry fly ash (FA)	when used with cement	4%	5%
	when used with lime	5%	6%
Granulated blast furnace slag (GBS)	when used with lime	6%	8%
	when used with ASS (see Note)	2.5%	3%
Wet (conditioned) fly ash (FA)	All applications	6%	8%
Hydraulic road binder	All applications	3%	4%
NOTE: When GBS and ASS are used in combination, the sum of the two shall be not less than 11%.			

812 (02/16) Storage of Constituents

1 (02/16) Aggregates shall be stored on a firm and clean substrate avoiding contamination with other constituents. Fine aggregate shall be stored at the production location for at least 24 hours before use.

2 (02/16) Lime, cement, ggbs, HRB and dry FA shall be stored in silos.

3 (02/16) Wet (conditioned) FA shall have no agglomerations greater than 10 mm size. This shall be determined by sieving samples through a 10 mm size test sieve using not more than 10 seconds of gentle agitation by hand. Wet (conditioned) fly ash shall be stored at the source or at the production location for at least 72 hours before use, and have a minimum water content of 10%.

4 (02/16) GBS and ASS shall be stored as specified in sub-Clause 812.1 and used within 3 months of delivery to the production location.

813 (02/16) General Requirements for Production and Layer Construction

1 (02/16) HBM shall be produced and laid using one of the following methods, as specified in the following mixture Clauses:

(i) mix-in-plant method of construction using batching by mass, in accordance with Clause 814;

(ii) mix-in-plant method of construction using volume batching, in accordance with Clause 815;

(iii) mix-in-place method of construction, in accordance with Clause 816.

2 (02/16) Construction of layers, including multiple lift layers, and any reworking and reuse, shall be completed within the lesser of 8 hours, the construction period specified in Table 8/10 or the mixture setting time. The time shall be measured from the addition event defined in Table 8/10 to completion of compaction.

3 (02/16) The construction period, in degree hours, shall be the summation of the products of the average air temperature above 3ºC (T ºC) and time for each period (t hours): i.e. construction period limit =Σ(T.t). The air temperature during the interval, t, shall not fluctuate by more than 4ºC.

TABLE 8/10: (02/16) **Construction Period for HBM Layers**

Binder	Addition event defining the start time for calculating maximum construction period	Maximum construction period (ºC hours)
Cement, cement with FA or cement with ggbs	Addition of cement	35
Lime with GBS or FA	Addition of lime	1,600
Lime and gypsum for FABM 5	Addition of lime and gypsum	70
GBS + ASS	Addition of ASS and GBS	3,000
Lime with ggbs	Addition of ggbs	200 if ggbs added after lime 1,600 if ggbs added before lime
HRB	Addition of HRB	Workability Period at 20°C determined in accordance with BS EN 13286-45 multiplied by 17

4 (02/16) Mixtures used in base layers shall be batched by mass and paver laid in a single lift. Construction of bases by other methods shall only be permitted in confined spaces where it is impracticable for a paver to operate, when agreed by the Overseeing Organisation.

5 (02/16) When quicklime is used, full hydration shall be complete prior to final compaction.

6 (02/16) Laying shall be carried out in a way that avoids segregation and drying of the surface. The temporary intermediate surfaces within a multiple lift layer shall be sprayed with water to prevent surface drying.

7 (02/16) The minimum compacted lift thickness in a multiple lift layer shall be 150 mm.

8 (02/16) Making-up of level after initial compaction shall not be permitted for single lift working or the uppermost lift of multiple lift working.

9 (02/16) The edge of previously compacted HBM or other material shall be vertical and straight before fresh HBM is laid against it.

10 (02/16) Compaction of HBM layers, including the intermediate lifts of multiple lift working, shall be completed without drying out and before setting of any part of the layer and shall meet the requirements for density in Clause 870.

11 (02/16) Compaction of HBM, other than FABM 5, shall be carried out by vibrating roller and/or pneumatic-tyred roller (PTR). Where vibrating roller compaction is used on mixtures specified in Clauses 830 to 835 it shall be followed by at least 8 passes of a PTR with a wheel loading of not less than 30kN. Only PTR compaction with a wheel loading of not less than 30kN shall be applied to FABM 5.

12 (02/16) On completion of compaction the surface shall be closed, free from ridges, cracks, loose material, visible voids, ruts, shear planes and other defects. All defective areas shall be rectified within the time period specified in sub-Clause 813.2. If rectification is not completed within the specified time period, the defective area shall be removed to the full thickness of the layer, and new mixture laid and compacted.

(02/16) **Cold and Wet Weather Working**

13 (02/16) During cold weather:

(i) the temperature of HBM shall not be less than 5ºC at the time of laying;

(ii) HBM shall not be laid on a frozen surface;

(iii) laying of HBM shall cease when the air temperature falls below 3ºC, and laying shall not be resumed until the rising air temperature reaches 3ºC;

(iv) the laying of HBM using binders containing less than 3% of CEM 1 cement, by dry mass of mixture, shall be restricted in use to the period from 1 May to 30 September, unless otherwise agreed by the Overseeing Organisation.

14 (02/16) In the case of heavy or persistent rain, production shall cease and any laid material shall be compacted immediately.

(02/16) **Curing, Protection and Trafficking**

15 (02/16) On completion of compaction the layer shall be cured to prevent loss of moisture by:

(i) application of a bitumen emulsion spray complying with Class C40B4, as specified in the National Foreword to BS EN 13808 to produce an even and complete coverage of at least 0.2 kg/m^2 of residual bitumen. Before spraying commences, the surface shall be free of all loose material and standing water. The curing membrane shall be protected from any damage until the construction of the overlaying layer;

(ii) application of a mist/fog/light spray of water, sufficient to keep the surface continuously wet until the specified strength of the HBM has been developed or the layer is overlaid.

16 (02/16) Trafficking of HBM layers shall comply with the requirements set out in Table 8/11 and sub-Clause 813.17. Should any HBM layer exhibit signs of damage, trafficking shall cease immediately and shall only be resumed once the layer has gained sufficient stability to resist damage.

TABLE 8/11: (02/16) **Trafficking of HBM Layers**

HBM Designation	Clause reference	Trafficking
CBGM	821, 822 and 823	Sub-Clause 813.17.
HBM	830, 831, and 835	Not restricted.
	832	Not restricted provided that the IBI requirement of sub-Clause 832.6 is satisfied.
FABM 5 with cement	834	Not permitted for 7 days unless overlaid by at least 150mm of bound material within the construction period.
FABM 5 with lime	834	Only the minimum amount of traffic required to construct the next layer is permitted.
SC, SS, SHRB and SFA	840	Not restricted provided that the IBI requirements of Table 8/13 are satisfied. For mixtures containing cohesive soil or chalk, the test specimens made at the same time as the specimens required in Clause 870 but cured under the same conditions as the insitu treated soil shall also have achieved an average strength of at least Class C0.8/1.0.

17 (02/16) CBGM shall not be trafficked for 7 days unless the layer complies with the following:

(i) the layer is compacted by both vibrating roller and PTR in accordance with sub-Clause 813.11 to comply with the requirements of sub-Clause 813.12;

(ii) the mixture contains at least 50% by mass of coarse aggregate complying with BS EN 13242, Category $C_{90/3}$ for 'crushed or broken particles';

(iii) test specimens made at the same time as the specimens required in Clause 870 but cured under the same conditions as the in-situ CBGM have achieved an average strength of at least Class C3/4.

18 (02/16) Surface contamination shall be avoided as far as is practicable and any unavoidable contamination shall be removed prior to overlaying. Reworking and re-compaction of the layer shall only be permitted within the construction period set out in Table 8/10. Reworking shall only be permitted when the water content requirements of the reworked material are maintained within the limits stated in the method statement.

19 (02/16) Before overlaying, any loose material shall be removed and replaced to the full depth of the layer or, if within the construction period set out in Table 8/10, reworked as specified in sub-Clause 813.18.

20 (02/16) Daily record sheets complying with sub-Clause 817.4 shall be submitted to the Overseeing Organisation by start of work on the next working day, detailing:

(i) spread rate/batching record results;

(ii) depth measurements;

(iii) density test measurements;

(iv) sample and test locations;

(v) construction period records showing the time(s) of mixing, water addition, completion of compaction and application of curing membrane.

814 (02/16) Mix-in-Plant Method of Construction Using Batching by Mass

1 (02/16) The HBM shall be produced in a stationary mixing plant that batches by mass and mixes in a forced-action mixer, allowing sufficient time in the mixer to produce a homogenous mixture.

2 (02/16) The mixing plant shall have an automated surveillance and data collection system.

3 (02/16) HBM shall be transported directly to the point where it is to be laid and protected from the weather during transit and whilst awaiting tipping, unless otherwise agreed by the Overseeing Organisation.

815 (02/16) Mix-in-Plant Method of Construction Using Volume Batching

1 (02/16) The HBM shall be produced in a stationary mixing plant that batches by volume and mixes in a forced action mixer, allowing sufficient time in the mixer to produce a homogenous mixture.

2 (02/16) HBM shall be transported directly to the point where it is to be laid and protected from the weather during transit and whilst awaiting tipping, unless otherwise agreed by the Overseeing Organisation.

3 (02/16) Dispensing accuracy shall be verified by reconciliation between constituent deliveries and the area and depth of completed layer for each 5000 m^2 of work, or part thereof, during each day's operations.

816 (02/16) Mix-in-Place Method of Construction

1 (02/16) Mixed-in-place HBM shall be produced by an in-situ pulverizing-mixing process with the added mixing water injected directly into the mixture during the mixing process. The pulverizing-mixing process shall be repeated until a homogenous mixture is produced.

2 (02/16) When binder constituents are dispensed onto the surface to be pulverized-mixed, the rate of spread shall be confirmed by site checks carried out in accordance with Clause 870. For each group of 5 readings the mean rate of spread of material shall be within ±10% of the stated target rate and each individual value shall be within ±15% of the mean value of the group of 5 readings.

3 (02/16) The accuracy of the system used to dispense binder constituents shall be verified by reconciliation between constituent deliveries and the area and depth of completed layer for each 5000 m^2 of work, or part thereof, during each day's operations.

4 (02/16) Mixing of fresh material shall ensure a minimum overlap of 200 mm with previously mixed material.

5 (02/16) Where lime is used to granulate cohesive soils it shall be added and mixed with the soil using at least two passes of the pulverizer-mixer between 24 and 96 hours before the subsequent addition of cement, FA, HRB or ggbs. The surface of the layer shall be sealed by rolling immediately after adding and mixing lime. The MCV during this period, known as the mellowing period, shall comply with Clause 840.

817 (02/16) Method Statement and Demonstration Area

(02/16) **Method Statement**

1 (02/16) At least 10 days prior to constructing the demonstration area specified in sub-Clause 817.5, the Contractor shall provide a full method statement for the approval of the Overseeing Organisation. The statement shall detail the operatives, plant, materials and procedures for the construction of demonstration area(s) and of the works, including procedures. The statement shall also include procedures for induced cracking, if required by contract specific Appendix 7/1, and the procedures to be applied during inclement weather, plant breakdowns and other unscheduled events.

2 (02/16) The method statement shall include the intended mixture proportions with supporting data from trial mix results and/or historic records to justify the proportions, the water content (or MCV) limits and (if applicable) spread rates for all stages of the work.

3 (02/16) Where multiple lift working is used, the method statement shall detail the methods used to assure that bond between the individual lifts is achieved. The method statement shall also detail the procedures to be used to confirm that bond has been achieved in the demonstration area and in the works.

4 (02/16) The method statement shall include a sample record sheet for the submission of the data required by sub-Clause 813.20.

(02/16) **Demonstration Area**

5 (02/16) Prior to the commencement of the main works, the Contractor shall construct a demonstration area of at least 800 m^2 conforming to the submitted method statement. The demonstration area shall include a transverse end-of-day joint and (if appropriate) multiple lift working. The demonstration area may be accepted into the permanent works, where agreed by the Overseeing Organisation. Where the Contractor can produce documentary evidence of similar work carried out to this specification during the previous 6 months, the Overseeing Organisation may allow the works to proceed without the demonstration area.

6 (02/16) Where multiple lift working is used, the demonstration area shall confirm the effectiveness of the procedures used to assure that bond between the individual lifts can be achieved.

7 (02/16) Where induced cracking is required, the demonstration area shall include crack induction at the specified spacing. The effectiveness of the procedure used shall be checked within 28 days of construction, by recovering four evenly spaced 150 mm dia cores from the line of the induced cracks and assessing each core for compliance with sub-Clause 818.2.

8 (02/16) The mixture constituents, proportions, laying and compaction plant and construction procedures used for the demonstration area shall not be changed unless the Contractor lays a further demonstration area or the changes are agreed by the Overseeing Organisation.

818 (02/16) Induced Cracking of HBM

1 (02/16) Where required by contract specific Appendix 7/1, transverse cracks shall be formed at the specified spacing with a tolerance of ± 150 mm. Where the pavement is made up of two or more layers of HBM with induced cracks, the cracks in the overlying HBM layer shall align with the induced cracks in the layer below with a tolerance of ± 100 mm.

2 (02/16) Cracks shall be induced in fresh material after initial compaction. The transverse cracks shall be induced by grooving the fresh material to form straight vertical grooves not more than 20 mm wide, to a depth of between one half and two thirds of the layer thickness over the full width of the pavement. Bitumen emulsion shall be poured or sprayed into the grooves prior to final compaction, to form a crack inducing membrane. The bitumen emulsion shall comply with Class C40B4, as specified in the National Foreword to BS EN 13808. During final compaction of the mixture, the surface of the groove shall be fully closed throughout its full length. The bitumen in the groove shall be fully encased and remain continuous, with not less than 70% of the sides of the groove coated with bitumen.

3 (02/16) Where required by contract specific Appendix 7/1, longitudinal cracks shall be induced using the procedure specified in sub-Clause 818.2.

819 (02/16) Not Used

820 (02/16) Aggregates

1 (02/16) The aggregates used in HBM shall comply with BS EN 13242 and the selected requirements listed in Table 8/12. Where recycled coarse aggregate or recycled concrete aggregate is used in HBM, it shall also be tested in accordance with Clause 710 and comply with the additional requirements for the proportion of the components listed in Table 8/12.

2 (02/16) When required by contract specific Appendix 7/1, an existing pavement layer that is to used to produce HBM shall be tested to confirm compliance with sub-Clause 820.1.

TABLE 8/12: (02/16) **Aggregate Requirements for HBM**

Clause reference	821	822	823	830	831	832	835
HBM designation	**CBGM A**	**CBGM B**	**CBGM C**	**FABM 1 HRBBM 1**	**SBM B2, FABM 2 HRBBM 2**	**SBM B3, FABM 3 HRBBM 3**	**SBM B1-1, B1-2, B1-3 & B1-4**
Categories for aggregate properties, BS EN 13242							
Crushed or broken particles and totally rounded particles in coarse aggregate	C_{NR} (Note 1)	C_{NR} unless otherwise specified in contract specific Appendix 7/1		$C_{90/3}$ or $C_{50/30}$, as specified in contract specific Appendix 7/1 (Note 2)		C_{NR} (Note 1)	$C_{90/3}$ or $C_{50/30}$ as specified in contract specific Appendix 7/1
Resistance to fragmentation of coarse aggregate	LA_{NR}	LA_{50} or LA_{60} as specified in contract specific Appendix 7/1	LA_{50}	LA_{50} or LA_{60} as specified in contract specific Appendix 7/1	LA_{50}	LA_{NR}	LA_{50}
Acid-soluble sulfate content (Note 3)	Air-cooled blast-furnace slag – $AS_{1,0}$						
	Other aggregates – $AS_{0,2}$						
Total sulfur content (Note 3)	Air-cooled blast-furnace slag – S_2						
	Other aggregates – S_1						
Other requirements, BS 1377-2							
Fines quality (Note 4)	NR (Note 1)	*Non-plastic*				NR (Note 1)	*Non-plastic*
Proportion of components, Clause 710							
Maximum glass content (ClassRgG)	*40*	*40*	*40*	*40*	*40*	*40*	*40*
Maximum impurities content (Class X)	*5*	*3*	*3*	*3*	*3*	*5*	*3*

NOTES:
1. The suffix $_{NR}$ denotes that the 'No requirement' category applies.
2. C_{NR} if FABM 1 contains at least 3% CEM 1 cement by dry mass of the mixture and trafficking is prevented for 7 days.
3. Where the Contractor is able to provide evidence of mixture stability over an extended period then the Overseeing Organisation may consider the use of higher limits.
4. Where required, the size fraction of the aggregate passing the 0.425 mm size test sieve shall be non-plastic as defined by and tested in compliance with BS 1377-2.

821 (02/16) Cement Bound Granular Mixtures A (CBGM A)

1 (02/16) Cement bound granular mixtures A (CBGM A) shall comply with BS EN 14227-1 and have binder constituent proportions complying with the requirements of Clause 811.

2 (02/16) Aggregate shall comply with the requirements of Clause 820 and shall have a combined grading that complies with Envelope A from BS EN 14227-1, Figure 1.

3 (02/16) The strength after immersion shall be at least 80% of the non-immersed strength, when tested in accordance with the laboratory mixture design requirements specified in Clause 880.

4 (02/16) The method of construction shall be in accordance with Clause 813 and either Clause 814, Clause 815 or Clause 816.

5 (02/16) The laboratory mechanical performance shall comply with the requirements of contract specific Appendix 7/1, when sampled and tested in accordance with Clause 870.

822 (02/16) Cement Bound Granular Mixtures B (CBGM B)

1 (02/16) Cement bound granular mixtures B (CBGM B) shall comply with BS EN 14227-1, and have binder constituent proportions complying with the requirements of Clause 811.

2 (02/16) Aggregates shall comply with the requirements of Clause 820 and shall have a combined grading that complies with Envelope B from BS EN 14227-1, Figure 1. Alternatively, the total mixture grading shall comply with the grading envelope Category G2 from BS EN 14227-1, Annex B, Figure B2.

3 (02/16) The strength after immersion shall be at least 80% of the non-immersed strength, when tested in accordance with the laboratory mixture design requirements specified in Clause 880.

4 (02/16) The method of construction shall be in accordance with Clause 813 and Clause 814.

5 (02/16) The laboratory mechanical performance shall comply with the requirements of contract specific Appendix 7/1, when sampled and tested in accordance with Clause 870.

823 (02/16) Cement Bound Granular Mixtures C (CBGM C)

1 (02/16) Cement bound granular mixtures C (CBGM C) shall comply with BS EN 14227-1, and have binder constituent proportions complying with the requirements of Clause 811.

2 (02/16) Aggregates shall comply with the requirements of Clause 820 and shall have a total mixture grading that complies with grading envelope Category G1 from BS EN 14227-1, Annex B, Figure B2 for 0/20 size mixtures, Figure B3 for 0/14 mm size mixtures or Figure B4 for 0/10 mm size mixtures.

3 (02/16) The compacity of the mixture shall be at least 0.8, when calculated in accordance with BS EN 14227-2, Annex C. The maximum dry density value used for the calculation shall be determined in accordance with BS EN 13286-50, using the modified Proctor (4.5 kg rammer) procedure from BS EN 13286-2.

4 (02/16) The strength after immersion shall be at least 80% of the non-immersed strength, when tested in accordance with the laboratory mixture design requirements specified in Clause 880.

5 (02/16) The method of construction shall be in accordance with Clause 813 and Clause 814.

6 (02/16) The laboratory mechanical performance shall comply with the requirements of contract specific Appendix 7/1, when sampled and tested in accordance with Clause 870.

824 to 829 (02/16) Not Used

830 (02/16) Fly Ash Bound Mixture 1 (FABM 1) and Hydraulic Road Binder Bound Mixture 1 (HRBBM 1)

1 (02/16) The mixture shall comply with the requirements of BS EN 14227-3 for Fly Ash Bound Mixture 1 or the requirements of BS EN 14227-5 for Hydraulic Road Binder Bound Mixture 1, as specified in contract specific Appendix 7/1, and have binder constituent proportions complying with the requirements of Clause 811.

2 (02/16) Aggregate shall comply with the requirements of Clause 820.

3 (02/16) The strength after immersion shall be at least 80% of the non-immersed strength, when tested in accordance with the laboratory mixture design requirements specified in Clause 880.

4 (02/16) The method of construction shall comply with Clause 813 and Clause 814.

5 (02/16) The laboratory mechanical performance shall comply with the contract specific requirements of Appendix 7/1, when sampled and tested in accordance with Clause 870.

831 (02/16) Slag Bound Mixture B2 (SBM B2), Fly Ash Bound Mixture 2 (FABM 2) and Hydraulic Road Binder Bound Mixture 2 (HRBBM 2)

1 (02/16) The mixture shall comply with the requirements of BS EN 14227-2 for Slag Bound Mixture B2 or the requirements of BS EN 14227-3 for Fly Ash Bound Mixture 2 or the requirements of BS EN 14227-5 for Hydraulic Road Binder Bound Mixture 2, as specified in contract specific Appendix 7/1, and have binder constituent proportions complying with the requirements of Clause 811.

2 (02/16) Aggregate shall comply with the requirements of Clause 820.

3 (02/16) SBM B2 shall have a total mixture grading that complies with grading envelope Category G1 or G2 from BS EN 14227-2, Figure 5 for 0/20 size mixtures, Figure 6 for 0/14 mm size mixtures or Figure 7 for 0/10 mm size mixtures.

4 (02/16) FABM 2 shall have a total mixture grading that complies with grading envelope Category G1 or G2 from BS EN 14227-3, Figure 3 for 0/20 size mixtures, Figure 5 for 0/14 mm size mixtures or Figure 7 for 0/10 mm size mixtures.

5 (02/16) HRBBM 2 shall have a total mixture grading that complies with grading envelope Category G1 or G2 from BS EN 14227-5, Figure 2 for 0/20 mm size mixtures, Figure 3 for 0/14 mm size mixtures and Figure 4 for 0/10 mm size mixtures

6 (02/16) The strength after immersion shall be at least 80% of the non-immersed strength, when tested in accordance with the laboratory mixture design requirements specified in Clause 880.

7 (02/16) The method of construction shall be in accordance with Clauses 814 and 813.

8 (02/16) The laboratory mechanical performance shall comply with the requirements of contract specific Appendix 7/1, when sampled and tested in accordance with Clause 870.

832 (02/16) Slag Bound Mixture B3 (SBM B3), Fly Ash Bound Mixture 3 (FABM 3) and Hydraulic Road Binder Bound Mixture 3 (HRBBM 3)

1 (02/16) The mixture shall comply with the requirements of BS EN 14227-2 for Slag Bound Mixture B3 or the requirements of BS EN 14227-3 for Fly Ash Bound Mixture 3 or the requirements of BS EN 14227-5 for Hydraulic Road Binder Bound Mixture 3, as specified in contract specific Appendix 7/1, and have binder constituent proportions complying with the requirements of Clause 811.

2 (02/16) Aggregate shall comply with the requirements of Clause 820.

3 (02/16) The strength after immersion shall be at least 80% of the non-immersed strength, when tested in accordance with the laboratory mixture design requirements specified in Clause 880.

4 (02/16) The method of construction shall be in accordance with Clause 813 and either Clause 814, Clause 815 or Clause 816.

5 (02/16) The laboratory mechanical performance shall comply with the requirements of contract specific Appendix 7/1, when sampled and tested in accordance with Clause 870.

6 (02/16) The mixture design procedures specified in Clause 880 shall include the determination of the immediate bearing at the target water and binder content. The mixture shall comply with Immediate Bearing Index Category IPI_{40}. When approved by the Overseeing Organisation, and where the mixture is not subject to direct trafficking, the mixture shall comply with Immediate Bearing Index Category IPI_{25}.

7 (02/16) The requirements of Clause 832.6 shall not apply if the mixture contains at least 3% cement by mass of the dry mixture and traffic is not permitted to use the layer for the first 7 days.

833 (02/16) Not Used

834 (02/16) Fly Ash Bound Mixture 5 (FABM 5)

1 (02/16) The mixture shall comply with BS EN 14227-3 for Fly Ash Bound Mixture 5, and have binder constituent proportions complying with the requirements of Clause 811.

2 (02/16) The strength after immersion shall be at least 80% of the non-immersed strength, when tested in accordance with the laboratory mixture design requirements specified in Clause 880.

3 (02/16) For lime-treated fly ash mixtures with gypsum added as an additional constituent, the method of construction shall be in accordance with Clause 813 and 814. For other mixtures, the method of construction permitted shall comply with Clause 813 and either Clause 814, Clause 815 or Clause 816.

4 (02/16) The laboratory mechanical performance shall comply with the requirements of contract specific Appendix 7/1, when sampled and tested in accordance with Clause 870.

835 (02/16) Slag Bound Mixtures B1-1, B1-2, B1-3 and B1-4 (SBM B1)

1 (02/16) The mixture shall comply with BS EN 14227-2 for SBM B1-1, SBM B1-2, SBM B1-3 or SBM B1-4, as specified in contract specific Appendix 7/1, and have binder constituent proportions complying with the requirements of Clause 811.

2 (02/16) Aggregates shall comply with the requirements of Clause 820.

3 (02/16) The strength after immersion shall be at least 80% of the non-immersed strength, when tested in accordance with the laboratory mixture design requirements specified in Clause 880.

4 (02/16) The method of construction shall be in accordance with Clause 813 and 814.

5 (02/16) The laboratory mechanical performance shall comply with the requirements of contract specific Appendix 7/1, when sampled and tested in accordance with Clause 870.

836 to 839 (02/16) Not Used

840 (02/16) Soil Treated by Cement (SC), Soil Treated by Slag (SS), Soil Treated by Fly Ash (SFA) and Soil Treated by Hydraulic Road Binder (SHRB)

1 (02/16) The mixture shall be as specified in contract specific Appendix 7/1 and comply with the appropriate requirements selected from Table 8/13 and the following:

(i) BS EN 14227-10, for soil treated by cement (SC);

(ii) BS EN 14227-12, for soil treated by slag (SS);

(iii) BS EN 14227-13, for soil treated with hydraulic road binder (SHRB)

(iv) BS EN 14227-14, for soil treated by fly ash (SFA).

The mixture shall also have binder constituent proportions complying with the requirements of Clause 811.

2 (02/16) Not less than 95% of the soil shall pass the 63 mm size test sieve when tested in accordance with BS EN 933-1 and the maximum particle size of the soil shall not exceed 25% of the layer depth.

3 (02/16) When tested in accordance with BS EN 1744-1 clause 10, soil with a total potential sulfate (TPS) content less than 0.25% sulfate (as SO_4) shall be deemed suitable for treatment, if the laboratory mixture design procedure confirms that the mixture complies with the 'resistance to water' requirements specified in Table 8/13. Soil with a total potential sulfate (TPS) equal to or greater than 0.25% sulfate (as SO_4) shall only be deemed suitable for treatment where agreed by the Overseeing Organisation.

4 (02/16) The method of construction shall be in accordance with Clause 813 and either Clause 814, Clause 815 or Clause 816.

5 (02/16) The laboratory mechanical performance shall comply with the requirements of contract specific Appendix 7/1, when sampled and tested in accordance with Clause 870.

TABLE 8/13: (02/16) **Requirements for Soil Treated by Cement (SC), Slag (SS) and Fly Ash (SFA)**

Mixture parameter	Requirement Category		BS EN 14227 -10, -12, -13, -14 reference
	Non-cohesive soil mixtures	Cohesive soil mixtures and chalk mixtures	
Minimum water content (Expressed as a proportion of the optimum water content, determined in accordance with BS EN 13286-4, Vibrating hammer method)	$W_{0,9}$ $W_{1,0}$ for mixtures containing quicklime	W_{NR} (Note 1)	Table 1
Degree of Pulverization (Determined in accordance with BS EN 13286-48)	$Pulv_{NR}$ (Note 1)	$Pulv_{60}$	Table 2
Immediate Bearing Index (Note 2) (Determined in accordance with Clause 880)	IPI_{40} (Note 3)	IPI_{15}	Table 3
Moisture Condition Value (Determined in accordance with BS EN 13286-46)	MCV_{NR} (Note 1)	$MCV_{8/12}$ at final mixing and compaction (Note 4)	Table 4
Laboratory mechanical performance (Compressive strength or tensile strength)	R_c or R_tE, as specified in contract specific Appendix 7/1		Table 6 for R_c Figure 1 for R_tE
Resistance to water – strength after immersion (R_i/R ratio, determined in accordance with Clause 880)	$I_{0,8}$		Table 7
Resistance to water – volumetric swelling (Determined in accordance with BS EN 13286-49)	NR (Note 1)	SC - G_{V5}	Table 9 (BS EN 14227-10)
		SS, SRB and SFA – G_V to be not greater than 5%	Clause 9.1.4 (BS EN 14227-12, -13 and -14)

NOTES:
1. The suffix $_{NR}$ denotes that the 'No requirement' category applies.
2. Where SC is not to be trafficked within 7 days, IPI_{NR} may be used.
3. IPI_{25} where the mixture is not subject to direct trafficking.
4. For cohesive soil mixtures, the requirement also applies during the mellowing period.

841 to 869 (02/16) Not Used

870 (02/16) Testing, Control and Checking of HBM

(02/16) General

1 (02/16) Tests, controls and checks shall be carried out in accordance with the requirements in Table 8/14 and the following sub-Clauses at locations determined by the Overseeing Organisation, unless otherwise stated in contract specific Appendix 1/5. Where the Overseeing Organisation is satisfied that a consistent quality of work is being achieved it may order the frequency of testing to be reduced to half that required in Table 8/14. Where a test reference is shown in Table 8/14, the testing shall be carried out in compliance with the requirements of Clause 105 and be undertaken by an organisation accredited in accordance with BS EN ISO/IEC 17025 for the test method.

(02/16) Sampling

2 (02/16) Sampling shall be in accordance with BS 1924-1. Where a bulk sample of HBM is taken from a layer, it shall be taken from the full depth of the layer, used without further mixing, and not combined with other bulk samples.

(02/16) Spread Checks for the Mix-in-Place Method of Construction

3 (02/16) The rate of spread of added constituents shall be determined by weighing the amount of material retained on five trays (or mats) of known area laid in the path of the spreading machine. The trays (or mats) shall be positioned at points equally spaced along a diagonal bisecting line the area of coverage so as to assess the full width of discharge from the spreading machine.

(02/16) Depth of Mixing for the Mix-in-Place Method of Construction

4 (02/16) The depth of mixing shall be checked by excavation and inspection on completion of each stage of the pulverizing-mixing process. The depth of mixing shall be referenced to the design levels for the pavement by precise leveling of the stabilized soil interface (or other techniques approved by the Overseeing Organisation) to ensure that the level at the underside of the stabilized layer is in accordance with the specified requirements.

(02/16) Standardisation of Nuclear Density Gauges and Measurement of In-situ Wet Density

5 (02/16) The in-situ wet density of a compacted mixture shall be measured using a calibrated nuclear density gauge in accordance with BS 1924-2 and the following sub-Clauses, except that each test shall consist of at least 3 measurements at 120 degrees to each other using the same source rod hole and the density taken as the average of the higher 2 results.

6 (02/16) The operation, warming-up period if any, and standardisation of the gauge shall be carried out in compliance with the manufacturer's recommendations. The gauge shall be calibrated in accordance with BS 1924 immediately prior to the construction of the demonstration area and at least once every 28 days thereafter.

7 (02/16) The gauge shall be used in the direct transmission mode of operation with the source rod lowered to within 25 mm of the bottom surface of the layer. The in-situ wet density shall be determined within two hours of completing compaction.

8 (02/16) The in-situ wet density of a subbase layer shall be taken as the average value of five determinations equally spaced along a line that bisects each 1000 m^2 or part thereof laid each day. The first and fifth positions shall be located 300 mm from the edges of the laid area, or other positions agreed by the Overseeing Organisation.

9 (02/16) For a subbase layer, the average in-situ wet density of the area specified in sub-Clause 870.8 shall be not less than 95% of the average wet density of the test specimens taken to determine the laboratory mechanical performance of the same area.

10 (02/16) For a base layer, the average in-situ wet density of the area specified in sub-Clause 870.8 shall be not less than 95% of the wet density of the HBM at its optimum moisture content, measured using the vibrating hammer method detailed in BS EN 13286-4. The result of each single determination of in-situ wet density shall be not less than 92% of the wet density of the HBM at its optimum moisture content.

(02/16) **Laboratory Mechanical Performance**

11 (02/16) A bulk sample of HBM shall be taken from each of the locations in sub-Clause 870.8, after the in-situ wet density has been determined. Test specimens used to determine laboratory mechanical performance shall be made using vibratory hammer compaction, in accordance with BS EN 13286-51. Where cubes are used for the determination of compressive strength, the specimens shall be 150 mm size, unless agreed otherwise by the Overseeing Organisation.

TABLE 8/14: (02/16) **Requirements for Testing, Control and Checking of HBM**

Test/control/check	Test frequency	Test reference
Water content of aggregate or soil sources on site	3 per 1000 m²	BS 1924-1, Clause 7.1
Grading of aggregate or soil sources on site	1 per 1000 m²	Aggregates: BS EN 1097-5 Soils: BS 1924-1, Clause 7.1
Plasticity of aggregate or soil sources on site	1 per 1000 m²	BS 1924-1, Clause 7.3
Constituents sourced off-site	Aggregates – Results of routine control tests from the factory production control system required by BS EN 13242, Annex C to be provided weekly. Cement – Certificates to be provided monthly for each cement type, in accordance with BS EN 197-1, National Annex NB. Slag – Certificates to be provided weekly to confirm the declared values required by BS EN 14227-2, Clause 5. Fly ash – Certificates to be provided weekly to confirm compliance with the requirements of BS EN 14227-4. Other constituents – certificates to be provided weekly to confirm compliance with the specification agreed as part of the factory production control system for the mixture.	–
Batching records for 'mix-in-plant' method of construction using batching by mass	Continuously using the automated surveillance and data collection system	–
Batching records for 'mix-in-plant' method of construction using batching by volume and mix-in-place	Dispensing accuracy shall be verified by reconciliation between constituent deliveries and the area and depth of completed layer for each 5000m² of work, or part thereof, during each day's operation	–
Spread checks for 'mix-in-place' method of construction at each stage of the mixing process (sub-Clause 870.3)	1 determination per 1000 m² but not less than 4 per day	–
Mixture grading, including binder	1 per 1000 m² but not less than 3 per day	BS EN 933-1
Water content at final compaction	1 per 1000 m² but not less than 3 per day	BS 1924-2, Clause 1.3
MCV at mixing and final compaction and, in the case of cohesive mixtures, during the mellowing period	3 per 1000 m² but not less than 4 per day	BS EN 13286-46
Pulverization (cohesive mixtures only)	2 per 1000 m² but not less than 4 per day	BS EN 13286-48
Depth of mixing for 'mix-in-place' method of construction at each stage of the mixing process (sub-Clause 870.4)	5 per 1000 m² but not less than 4 per day	–
In-situ wet density	5 per 1000 m² or part thereof laid each day (measured at the locations detailed in sub-Clause 870.8)	Sub-Clause 870.5
Laboratory mechanical performance	5 per 1000 m² or part thereof laid each day (with test specimens prepared from a bulk sample taken from each of the locations detailed in sub-Clause 870.8)	As required by Table 8/15
Strength after immersion in water	Laboratory mixture design procedure	As required by Clause 880

TABLE 8/15: (02/16) **Laboratory Mechanical Performance Testing Requirements for HBM**

Clause	Mixture	Curing regime	Curing temperature	Test method	Age at test
821, 822 & 823	GBGM A, CBGM B and CBGM C	Regime A from, BS EN 14227-1, Annex C	20°C	R_C – BS EN 13286-41	28 days – or other age agreed by the Overseeing Organisation (see Note)
830, 831, 832 & 835	SBM, HRBBM and FABM, (except FABM 5)	BS EN 13286-51	40°C		
834	FABM 5 treated with lime	BS EN 13286-51	40°C	R_{it} – BS EN 13286-42	
	FABM 5 treated with cement	BS EN 13286-51	20°C		
840	SC	Regime A1 from BS EN 14227-10, Annex B	20°C	E_c – BS EN 13286-43	
	SS & SFA	BS EN 13286-51	40°C		

NOTE:
For site control purposed, HBM may be assessed on the basis of 7 days strength (or other agreed age) where the Contractor so requests, provided that a robust correlation is established between 7 days and 28 days strength using representative samples of the aggregates and binder used in the works.

12 (02/16) Compliance of the area specified in sub-Clause 870.8 shall be assessed using the results for test specimens that are cured and tested in accordance with Table 8/15 using either compression or indirect tensile testing as appropriate to the class of mechanical performance specified in contract specific Appendix 7/1. Assessment shall be made using the following criteria:

(i) Compressive strength:

The requirement specified in contract specific Appendix 7/1 shall be deemed to be satisfied if the average compressive strength of the group of specimens in Table 8/14 is equal to or greater than the minimum for the specified R_c class and no individual test result is less than 67% of the minimum strength requirement for the R_c class.

(ii) Indirect tensile strength:

The requirement specified in contract specific Appendix 7/1 shall be deemed to be satisfied if the average indirect tensile strength of the group of specimens in Table 8/14 is equal to or greater than the minimum requirement and no individual result is less than 67% of the minimum requirement appropriate to the E value determined during the laboratory mixture design procedure specified in Clause 880.

For the purposes of this specification, any reference to 'characteristic strength' in BS EN14227-1 shall be superseded by the requirements of this sub-Clause.

871 (02/16) Determination of the Coefficient of Linear Thermal Expansion

(02/16) Scope

1 (02/16) The test method described in this Clause shall be used to determine the coefficient of linear thermal expansion of HBM within the normal range of temperature for pavement layers. The test method shall be carried out using hardened specimens.

(02/16) Apparatus

2 (02/16) The following apparatus shall be used:

(i) A water bath with sufficient capacity to accommodate three test specimens and capable of maintaining predetermined temperatures between 15ºC and 60ºC.

(ii) A device capable of measuring linear dimensions of not less than 275 mm to an accuracy of ± 0.002 mm, with a known temperature correction factor.

(iii) Vibrating hammer compaction apparatus capable of producing 150 mm diameter cylindrical test specimens, in accordance with BS EN 13286-51. The apparatus shall be suitably modified to manufacture 300 mm long test specimens.

(02/16) Test procedure

3 (02/16) The following test procedure shall be followed:

(i) Compact three 150 mm diameter test specimens, 300 mm in length, in accordance with BS EN 13286-51 but using six layers, each with a nominal depth of 50 mm.

(ii) Mark each specimen with 3 pairs of permanent reference points, aligned longitudinally. One of each pair shall be at opposite ends of the specimen. Each pair shall be located at 120º around the circumference of the specimens, aligned parallel to the axis, and not more than 30 mm from each end of the specimen.

(iii) Cure the specimens using the procedure specified for the determination of mechanical laboratory performance in Table 8/15.

(iv) Saturate the test specimens, either at atmospheric pressure or under vacuum, until the increase in the surface dried mass of each specimen, determined using two readings taken at least 24 hours apart, is less than 1%.

(v) Immerse the specimens in the water bath at a constant temperature (T1), maintained to an accuracy of ± 2ºC, for 24 ± 2 hours. Then measure the length (L1) of each test specimen at the locations defined by the three pairs of reference points. Repeat the measurement of length every 24 hours, until the change in length between successive measurements is less than 0.004 mm.

(vi) Raise the temperature of the water bath by at least 30ºC and record the temperature (T2). T2 shall not exceed 55ºC. Maintain the temperature at T2 ± 2ºC for 24 ± 2 hours and measure the length (L2) using the procedure in (v).

(vii) Lower the temperature of the water bath by at least 30ºC and record the temperature (T3). Maintain the temperature at T3 ± 2ºC for 24 ± 2 hours and measure the final length (L3) using the procedure in (v).

(02/16) Calculations

4 (02/16) Calculate the Coefficient of Linear Thermal Expansion (C_{LE}) as follows:

(i) For each pair of reference points for the heating sequence calculate:

$C_{LE}' = (L2 – L1) / (T2 – T1)$, giving 9 results in total.

(ii) Reject the highest and lowest results and record the mean value of C_{LE}' for the remaining 7 results.

(iii) For each pair of reference points for the cooling sequence calculate:

$C_{LE}'' = (L2 – L3) / (T2 – T3)$, giving 9 results in total.

(iv) Reject the highest and lowest results and record the mean value of C_{LE}'' for the remaining 7 results.

(v) Calculate:

C_{LE} = 0.5 ((Mean value of C_{LE}') + (Mean value of C_{LE}'')).

(vi) Check that the mean values of C_{LE}' and C_{LE}'' lie in the range $0.95C_{LE}$ to $1.05C_{LE}$. If the mean values lie outside this range, repeat the procedure in sub-Clause 871.3.

(02/16) **Reporting of Results**

5 (02/16) Report the value of C_{LE} using units of $m.10^{-6}/°C$, expressed to the nearest whole number.

872 to 879 (02/16) Not used

880 (02/16) Laboratory Mixture Design Procedure

1 (02/16) Prior to the commencement of the work or any change in mixture constituents, the Contractor shall determine the target proportions of the constituents, including water, for the specified HBM, based on the mixture design procedure described in this Clause.

2 (02/16) The mixture design procedure shall determine the properties of the HBM at a minimum of 3 values of binder contents, and a minimum of 2 values of water content for each value of binder content.

(02/16) **Immediate Stability**

3 (02/16) When required, the mixture design procedure shall include the determination of the immediate bearing index (IBI) at the selected design water and binder content, measured in accordance with BS EN 13286-47. The IBI value shall be taken as the average value for a set of 3 test specimens.

(02/16) **Resistance to Water – Strength After Immersion**

4 (02/16) The strength after immersion in water shall be assessed by comparing the average strength and condition of:

(i) 3 specimens initially cured in a sealed condition for 14 days at the test temperature; and then removed from their moulds and immersed in aerated water for 14 days at the same test temperature.

(ii) 3 specimens cured in sealed condition for 28 days at the same test temperature.

The immersed specimens shall be unconfined and have water in contact with all surfaces. On completion of the immersion stage of the test the specimens shall show no signs of cracking or swelling.

5 (02/16) For mixtures containing less than 3% by dry mass of the mixture of cement, the test temperature shall be (40 ± 2)°C. For mixtures containing 3% or more cement, the test temperature shall be (20 ± 2)°C.

(02/16) **Resistance to Frost Heave**

6 (02/16) HBM shall be deemed resistant to frost heave where the compressive strength class is C3/4 or greater or R_{it} is greater than 0.25 MPa, when cured in accordance with Table 8/15.

MP6 Asbestos Management Plan

MP6 Asbestos Management Plan

Environmental Permit EPR/ZP3899FX

Unit 5 Pengarnddu Industrial Estate
Dowlais, Merthyr Tydfil, CF48 2TA

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merthyr borough recycling centre	ASBESTOS MANAGEMENT PLAN	V1.0

1 AIM

The aim of this Asbestos Management Plan is to ensure that asbestos waste arriving at the site is handled in such a manner so as to minimize the risk of exposure to all personnel working in the transfer station.

2 GENERAL

Asbestos waste should on be brought onto site following completion of the pre-acceptance procedure detailed in **PR9** and confirmation by the Site Manager or competent person that appropriate storage capacity is available.

Only competent persons trained to assess and handle asbestos waste are permitted to implement this procedure.

REMEMBER

- The main hazard from asbestos is inhalation of the fibres.
- Do not attempt any transfer, repackaging or cleaning activities if you have not been trained to do so or do not have the appropriate PPE.
- If in doubt ask.

3 PPE

The following PPE should be worn when handling asbestos:

3.1 Overalls

- Disposable overalls hood Type 5. Cotton overalls should not be worn as these hold dust and require laundering. You may need waterproof overalls if it is raining.
- Wearing overalls one size too big will help to prevent ripping at the seams.
- If cuffs are loose, they should be sealed with tape.
- Overall legs should be worn over footwear as tucking them in enable dust to enter footwear. Legs should be taped if they are too long and may cause a trip hazard.
- The hood should be worn over the respirator straps

3.2 Gloves

- PVC gloves (EN 388 and 374 Complex Design) or equivalent are required. Ensure gloves should have a smooth outer and not have knitted wrists, to ensure that fibres can become trapped within the glove material..

3.3 Footwear

- Standard site rigger boots should be worn. Laced boots should not be worn as fibres may become trapped in the laces.

3.4 Disposable Respirator

- A respirator with an assigned protection factor of 20 or more, this includes a disposable respirator compliant with EN 149 type FFP3 or EN 1827 type FMP3.
- Individuals wearing RPE must be face fit tested and trained in its use. Respirators are not suitable for individuals with beards or respiratory disorders such as asthma.

All PPE must be disposed of as asbestos waste once the task for which it is being worn has been completed.

4 ACCEPTANCE

On arrival asbestos waste will be unloaded from the delivery vehicle using a fork lift truck or telehandler and place the waste in the reception area.

- The Site Manager/Competent Person will check the consignment note to determine the type and form of the asbestos and then ensure that it has been packaged in accordance with The Control of Asbestos Regulations 2012 (CAR2012). The H.S.E. requires that *"any waste where the escape of hazardous quantities of respirable asbestos fibres can occur during carriage should be placed in UN-approved packaging"* and therefore these must be classified, marked, labelled, documented, and transported as UN2212 or UN2590. Where these articles cannot be placed in normal UN packaging without further cutting and disturbance of the asbestos fibres, such as large AIB panels, they must be wrapped twice in heavy gauge polythene and taped securely so that asbestos fibres cannot escape, then labelled with the UN Class 9 hazard diamond and UN2212/2590 (usually by taping a UN bag to the wrapping). It follows that the way they are handled and transported should ensure that the integrity of the wrapping is not compromised.
- The Site Manager/Competent Person will visually inspect the packages to ensure that drums, bags and/or wrapping are intact. Under no circumstances should packages be opened and the waste sampled.
- The Site Manager/Competent Person will check the labelling is correct and clearly visible and if necessary the appropriate labels will be applied.
- The asbestos waste will then be transferred by fork lift truck or telehandler to the lockable asbestos container.

5 TRANSFER TO THE LOCKABLE ASBESTOS CONTAINER

- The Fork Lift Truck or Telehandler will deliver the packages to the side of the skip.
- The area should be cordoned off to prevent unauthorised access.
- Personnel transferring the waste will enter the working area, remove their normal PPE (hi-vis vest, hard hat, etc.) and place these outside of the work area. They will put on disposable overalls, a respirator and wear disposable gloves (as detailed in 3 above).
- The member of staff will unlock the container and will inspect the delivery for broken/damaged bags.
- The asbestos waste will be transferred manually into the skip; bags and wrapped items should be placed and not thrown into the skip.
- If during unloading of asbestos , non-permitted waste, e.g. litter is discovered in the delivery vehicle, that waste will be classed as contaminated and will be double wrapped as in the case of fibrous asbestos and placed in the storage container. A note of action taken should be recorded in the site diary.
- When the transfer is complete the dust suits, dust masks and gloves will be removed and placed into a plastic 'asbestos' bag which will be taped shut and this bag will then be placed inside a second clear bag which will also be taped shut. This bag will then be placed into the skip.
- Following loading, the container will be locked and will remain locked until the next delivery.
- Normal PPE will then be replaced and the cordon removed.

6 DAMAGED PACKAGING/SPILLAGE

6.1 Repacking

- Staff should be evacuated from the affected area and not allowed to return until the incident has been dealt with.

- The area should be cordoned off to prevent unauthorised access.
- The Site Manager is to be notified immediately and weighbridge operator instructed not to allow vehicles to unload in, or downwind, of the affected area.
- Personnel responding to an incident of damaged packaging the waste will enter the working area, remove their normal PPE (hi-vis vest, hard hat, etc.) and place these outside of the work area. They will put on disposable overalls, a respirator and wear disposable gloves (as detailed in 3 above).
- Do not attempt to remove the damaged packaging.
- If the clear outer plastic bag is damaged, place the whole package into an additional clear plastic bag. Seal with tape. Ensure that labels are clearly visible, and if needed, re-label the bag.
- If the inner 'asbestos' bag is damaged, place the original package into a new 'asbestos' bag, seal with tape and then place this into a second clear plastic bag. Seal with tape. Ensure labels are clearly visible, and if needed, re-label the bag.
- If the wrapping on bonded asbestos is damaged wrap the whole package with strong plastic sheeting (shrink wrap is not adequate). 1000 gauge polythene sheeting is suitable. Seal with tape and re-label as appropriate.
- When the transfer is complete the dust suits, dust masks and gloves will be removed and placed into a plastic 'asbestos' bag which will be taped shut and this bag will then be placed inside a second clear bag which will also be taped shut and labelled. This bag should be placed into the skip for disposal.
- A note of action taken should be recorded in the site diary.

6.2 Spillage

- Staff should be evacuated from the affected area and not allowed to return until the incident has been dealt with.
- The area should be cordoned off to prevent unauthorised access.
- The Site Manager is to be notified immediately and weighbridge operator instructed not to allow vehicles to unload in, or downwind, of the affected area.
- Personnel responding to a spillage of asbestos will enter the working area, remove their normal PPE (hi-vis vest, hard hat, etc.) and place these outside of the work area. They will put on disposable overalls, a respirator and wear disposable gloves (as detailed in 3 above).
- Any exposed/dropped material should be sprayed with IDENDEN 30-17 (or equivalent) fibre stabiliser or damped with a fine water spray. Fibre stabiliser is available in the adjacent spill kit, and from the weighbridge office.
- Any damp spilled material should be picked up with a shovel (do not sweep with a brush) and placed in new 'asbestos' bags, sealed, double bagged into a transparent bag, sealed and placed into the asbestos storage container.
- The affected area will be vacuumed clean to remove any remaining loose fibres and sprayed with Idenden 30-17 (or equivalent) to seal any remaining fibres.
- If needed clean the floor area and equipment with damp rags. These should be placed into an 'asbestos' bag and sealed with tape. This should be placed inside a second clear bag which will also be taped shut and labelled. This bag should be placed into the skip for disposal.
- When the spillage has been dealt with non-disposable PPE such as boots should be cleaned with damp rags, and along with the dust suits, dust masks and gloves and placed into a plastic 'asbestos' bag which will be taped shut. This should be placed inside a second clear bag which will also be taped shut and

labelled. This bag should be placed into the skip for disposal.

- A full report of the incident and steps taken should be prepared and made available to Natural Resources Wales.

MP7 Sampling Plan

MP7 Sampling Plan

Environmental Permit EPR/ZP3899FX

Unit 5 Pengarnddu Industrial Estate
Dowlais, Merthyr Tydfil, CF48 2TA

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1 INTRODUCTION

1.1 Purpose of this Plan

This Sampling Plan details the procedure in place for ensuring that sampling and testing of "fines", the residual fraction from the physical and mechanical sortation of wastes for recovery that takes place on site.

It is designed to ensure that waste "fines" arising from screening of wastes arising from predominantly construction and demolition sources are correctly classified in accordance with Technical Guidance WM3 Waste Classification and that they are classified under an appropriate waste code to meet duty of care obligations. In the case of "fines", this will be either:

- 19 12 12 other wastes (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 19 12 11);
- 19 12 11* other wastes (including mixtures of materials) from mechanical treatment of waste containing hazardous substances, its hazardous mirror code.

Following classification in accordance with WM3, HMRC-compliant Loss on Ignition (LOI) testing is undertaken to confirm that the waste meets the definition of Qualifying Fines, with an LOI of <10%.

1.2 Definition of Fines

The process giving rise to "fines" is the trommeling and/or screening of mixed non-hazardous wastes. This is received from predominantly construction and demolition sources in chain-lift skips. Screening is a continuous process that produces a <20mm, fine dark soil type granular solid. This material is referred to in this plan as "fines". It may be referred to more generally within the sector as "trommel fines".

Typically "fines" will contain <10% organic materials.

1.3 Involved Parties

Party	Role
Merthyr Borough Recycling Centre Ltd (Producer)	Directly involved as responsible for the waste classification and assessment (and completion of waste documentation)
ALS Laboratories (UK) Limited (Laboratory/ Sampler/ Consultants engaged in sampling and analysis)	Directly involved as responsible for conducting parts of the testing programme.
Merthyr Borough Recycling Centre Ltd (Carrier and Consignee)	Directly involved, as the information is pertinent to carriage and completion of waste documentation.
Biffa Waste Services Limited, Trecatti Landfill Site (Consignee)	Directly involved, as the information is pertinent to the management of waste and completion of waste documentation.
Natural Resources Wales (Regulator)	Indirectly involved via provision of advice and guidance. May become directly involved through compliance checks.

Table 1 Involved parties.

1.4 Objectives and Technical Goals

1.4.1 Objective

The objective of the testing programme is to obtain sufficient information on the nature, composition and properties of the waste to determine if it is a hazardous or non-hazardous waste, to assign hazardous properties

where required, and to inform allocation the appropriate List of Waste (LoW) code.

1.4.2 Technical Goal

The technical goal of this sampling plan is to establish a process to representatively test the materials and assess any potential variability of the waste.

The testing programme for hazardous waste assessment seeks to:

- identify which hazardous substances are present; and
- determine the concentration of hazardous substance present

Detailed instructions and technical specifications provided within the Sampling Plan:

- define the population to be sampled;
- assess variability;
- select the sampling approach;
- select constituents to be studied;
- identify the scale; and
- choose the statistical approach.

2 BACKGROUND INFORMATION

2.1.1 Site Details

The Merthyr Borough Recycling Centre Ltd site currently operates under a Tier 3 Bespoke Environmental Permit number EPR/ZP3899FX.

Activities regulated under the bespoke environmental permit are:

- Hazardous & non-hazardous household, commercial and industrial waste transfer station with treatment and asbestos storage;
- End-of-Life (ELV) storage, depollution & dismantling;
- Inert and excavation waste transfer station with treatment; and
- Dewatering of street sweepings/gully suckings.

Currently, End-of-Life (ELV) storage, depollution & dismantling, and the dewatering of street sweepings/gully suckings are not carried out.

The site has a maximum annual throughput of 252,000 tonnes per annum, consisting of 167,500 tonnes of non-hazardous waste, 10,000 tonnes per annum of hazardous waste and 75,000 tonnes of inert waste.

2.1.2 Nature and Quantity of Waste Arisings

This sampling plan is focussed on the management of fines from the physical and mechanical sortation of wastes for recovery arising from predominantly construction and demolition sources as mixed and source-segregated “skip” waste from domestic sources and larger hooklift/tipper deliveries from larger construction and demolition works.

The site produces on average around 500 tonnes per month of process fines, with monthly volumes being lower during the late autumn, winter and early spring months when construction works are hampered by weather.

2.1.3 Current Situation

At present the company samples and tests fines on a quarterly basis.

Random sampling and testing is carried out by Biffa Waste Services Limited based on a schedule determined by the quantities and visual characteristics of the waste delivered to the Trecatti Landfill Site.

3 CHARACTERISATION OF WASTE

3.1 Basic Characterisation

An initial set of six samples shall be analysed to determine the composition and variability. These shall be collected over the course of one day, for three days in total, over a period of three weeks. Samples shall be collected directly from the screen discharge chute from within the flow of the material.

A site specific risk assessment shall be carried out before sample collections. Appropriate PPE as detailed in the risk assessment should be worn. As a minimum hi-viz, hard hat, gloves, safety glasses and face mask shall be worn when collecting samples. Where safe access to the discharge chute is difficult, samples should be collected using suitable equipment, such as a collection container affixed to a long rod or pole.

Containers shall securely hold the sample and protect it from damage (impacts, severe changes in humidity, temperature, etc.) and maintain its integrity. Containers should be fully filled unless instructed by the testing laboratory to leave free space above the contents.

WM3-compliant testing and classification shall be completed by an analytical laboratory accredited by the United Kingdom Accreditation Service (UKAS) (or equivalent) to BS EN ISO/IEC17025 'General requirements for the competence of testing and calibration laboratories' for the scope of the work.

Analytical methods must be consistent with that set out in Appendix C of technical guidance WM3

Initial assessment shall include total content analysis to determine the constituents of the waste. As a minimum testing shall include:

- Arsenic, Cadmium, Chromium, Cobalt, Copper, Iron, Mercury, Manganese, Molybdenum, Nickel, Lead, Selenium, Antimony, Tin, Thallium, Vanadium, Zinc;
- Water soluble boron;
- Chrome VI;
- Total cyanide;
- Sulphur;
- Ammonia;
- pH;
- Alkali reserve;
- Moisture Content;
- Total Organic Carbon;
- Total Petroleum Hydrocarbons (TPH);
- Speciated Polycyclic Aromatic Hydrocarbons (PAH);
- Phenols, Cresols and Xylenols;
- Persistent Organic Pollutants (POPs)
- Asbestos identification and quantification if detected;
- Water soluble sulphate;
- Total sulphate (acid soluble);

- Chloride; and
- Loss on ignition (LOI).

A record of fines production over the testing period shall be kept.

A Fines Characterisation Report detailing the results of the testing and variability between samples shall be produced and made available to the regulator for review. The results of the characterisation detailed in this report shall inform the ongoing sampling and compliance testing detailed in this plan.

3.2 Ongoing Compliance Testing

Periodic sampling of the ”fines” is carried out on a quarterly basis.

The sample of fines sent for testing must be representative of the whole quantity.

This will be achieved by taking at least 6 sub-samples, selected at random locations around the perimeter of the stockpile, at varying heights above the ground and from within the bulk of the fines stockpile (taken at a depth of at least 200mm below the surface of the stockpile using a trowel or scoop). Where samples are taken at depth, a hole should be cleared using a shovel prior to collection of the sample.

Where stockpiles exhibit a high degree of heterogeneity, additional sub-samples should be collected.

The sub-samples shall be thoroughly mixed in a bucket or similar container and a representative 1kg sample (or quantity specified by the testing laboratory) removed from the composite mix and transferred to a suitable container(s) for transport to the testing laboratory.

Containers shall securely hold the sample and protect it from damage (impacts, severe changes in humidity, temperature, etc.) and maintain its integrity. Containers should be fully filled unless instructed by the testing laboratory to leave free space above the contents.

WM3-compliant testing and classification shall be completed by an analytical laboratory accredited by the United Kingdom Accreditation Service (UKAS) (or equivalent) to BS EN ISO/IEC17025 ‘General requirements for the competence of testing and calibration laboratories’ for the scope of the work.

Analytical methods must be consistent with that set out in Appendix C of technical guidance WM3.

As a minimum testing shall include:

- Arsenic, cadmium, chromium, hexavalent chromium, copper, lead, mercury, nickel and zinc;
- pH;
- Total Petroleum Hydrocarbons (TPH);
- Speciated Polycyclic Aromatic Hydrocarbons (PAH);
- Moisture Content;
- Phenols, Cresols and Xylenols
- Asbestos identification and quantification if detected;
- Total Organic Carbon;
- Total sulphate (acid soluble); and
- Loss on ignition (LOI).

Additional sampling and testing shall be carried out where significant changes in the sources of waste occur.

Where ongoing sampling identifies greater variability than expected, the monitoring frequency shall be increased from quarterly to monthly (or other frequency as determined at the time).

4 SAMPLE RECORDS

On completion of sampling a sampling record (Appendix A) and chain of custody form should be completed by the sampler.

The key information that must be recorded include:

- a unique sampling number (e.g. reflect site location, material and date);
- date and time of sampling;
- place and point of sampling;
- persons present (if witnesses are present, including name and address);
- difficulty of access (obstacles), including information on those areas or volumes of the material that sampled or not sampled;
- condition of material:
- colour;
- consistency/homogeneity/grain size (uniform or diverse);
- observations during sampling (e.g. gassing out, reactions, development of heat, odour);
- details of on-site determinations;
- identify sample amount (estimate volume and mass);
- sub-sampling methodology (recording which samples are mixed, in what volumes, time and date) (if undertaken);
- name of sampling personnel;
- place, date and signature.

Any changes to the agreed final sampling plan must be recorded in the sampling record.

APPENDIX A – SAMPLING RECORD

SAMPLING RECORD	
Sample code: (Reflect site location, material type and date of collection)	
Date of sampling:	
Signature of sampler:	
GENERAL INFORMATION	
Waste producer and Contact:	Client (Company) and Contact:
Location of sampling:	Carried out by (Company): Sampler:
SAMPLING OBJECTIVE	
MATERIAL	
Type of Material:	Estimated moisture content:
Description:(colour, odour, consistency/homogeneity/grain size – uniform or diverse)	
SAMPLING METHODOLOGY	
Describe/define batch or consignment sampled:	
Place and point of sampling:	
Access problems that affected areas or volumes of material sampled:	
Date and time of sampling:	
Persons present (record name and address of witnesses present where appropriate):	
Procedure (describe procedure adopted):	
Equipment used:	
Number of increments/samples collected:*	
Increment size/sample size:*	
Observations during sampling: (e.g. gassing out, reactions, development of heat)	
Details of on-site determinations: (if undertaken complete field record sheet and append to Sampling Record, see Table B.2)	
Safety measures taken:	
SUB-SAMPLING & PRE-TREATMENT	
Identify location: e.g. on-site or fixed laboratory facility (describe whether open air or enclosed)	
Procedure:	
PACKAGING, PRESERVATION, STORAGE AND TRANSPORT DETAILS	
Packaging:	
Preservation:	
Storage:	
Transport:	
DEVIATIONS FROM SAMPLING PLAN	
Detail:	
DELIVERY TO ANALYTICAL LABORATORY	
Company: Delivery Date:	
Received by:	Signature:

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PR1 Accident/Pollution Incident Procedure

PR1 - Accident/Pollution Incident Procedure

Contents

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Introduction

Scope
This procedure is used by all employees dealing with potential or actual emergency environmental incidents which could lead to pollution of the environment, or danger to human health.

Purpose
This procedure describes the requirements to manage and report environmental incidents and emergencies in order to minimise the impact on the environment. This is necessary to prevent pollution, identify and manage risks, and protect the environment. Refer to **RA1** and **RA2** for further details.

Environmental Risk Assessment
An Environmental Risk Assessment must be carried out for all permanent locations occupied or used, whether manned or unmanned to assess the level of risk to the environment from activities or operations carried out by the Company.

Environmental Incidents
Environmental incidents are defined as any actual or potential threat to the environment, such as spills or leaks of chemicals, sludges or wastes, tank ruptures or leaks, contamination of land, vandalism resulting in a threat to the environment, process failure resulting in a potential or actual loss of compliance. This procedure outlines the actions and reporting required in the event of such an incident.

Accident/Pollution Incident Management Plan (Site Emergency Plan)

An Emergency Plan shall be completed for all sites operated by the Company.

The Site Emergency Plan shall contain:

- Full postal address of the site including post code,
- Map reference of main entry point to the site
- Contact name of person responsible for the site
- Site Plan as above

Plans will include a site plan showing the permanent locations of:

- Emergency exits
- Spill kits

- Fire extinguishers
- First aid kits
- Drain covers (foul, surface water and interceptor) with direction of flow
- Any nearby watercourse that may be at immediate risk should a spillage occur

Refer to the site emergency plan for further detail (**MP2**).

The plan shall cover all foreseeable emergency situations for normal and abnormal operating conditions. Emergency procedures identified will be tested at intervals appropriate to the level of risk and the nature of the activities being undertaken at the site. A schedule of emergency testing will be produced to identify test periods and dates when drills are expected to be carried out. Records of tests and any recommendations for improvement will be forwarded to the Company Secretary for storage.

Accident

/Pollution Incident Response Procedures

Site-specific Accident/Pollution Incident Response procedures must contain all necessary information identified within the environmental risk register for the site. They must be communicated to all persons who are responsible for managing any incidents, and must be reviewed after any significant change in operations, activities or aspect/impact relating to that site. Emergency Procedures and Plans should also be communicated to contractors working for or on behalf o

f the Company.

Refer to the site Accident/Pollution Incident Response Procedures for further detail:

- **PR2** - Accident/Pollution Incident Response Procedure - Fire & Explosion
- **PR3** - Accident/Pollution Incident Response Procedure - Spillage
- **PR4** - Accident/Pollution Incident Response Procedure - Flood
- **PR5** - Accident/Pollution Incident Response Procedure - Utility Failure
- **PR6** - Accident/Pollution Incident Response Procedure - Odour
- **PR7** - Accident/Pollution Incident Response Procedure - Fugitive Emissions
- **PR8** - Accident/Pollution Incident Response Procedure - Discovery of Suspicious Items

Emergency "Grab Pack"

A Grab Pack shall be prepared for all sites operated by the Company. The pack will contain information to assist site staff and the emergency services in the event of an incident. In addition to copies of the Accident/Pollution Incident Management Plan and Emergency Procedures the Emergency Grab Pack shall include other information relevant to the site. Pertinent information should be identified on a site by site basis and may include:

- Site Emergency Plan
- Fire Prevention Plan
- Copies of relevant site drawings e.g. drainage plan, services plan, etc.
- HACCP Plans
- Other hazard information that may be relevant e.g. COSHH assessments
- Copy of discharge consents, waste management licences and/or exemptions that may apply to the activities being undertaken

Emergency Response Materials

Spill kits appropriate to the operations being undertaken shall be available on site and stored indoors or in suitable waterproof containers near locations where they may be required.

Spill kit contents should be inspected and recorded on a monthly basis. Where kits are opened, a checklist of contents should be drawn up and any items found to be missing should be replaced following inspection.

All HACCP site staff should be fully trained in the use of spill kits via toolbox talks, a record of this training will be kept on each member of staff's Training Record (**FR8**).

Pollution of the Environment

In the case of an actual or potential environmental incident, **FR10** Accident (and Incident) Record should be used to record the incident. All relevant sections should be completed and any negative impacts upon the environment should be listed together with actions taken to correct and prevent a reoccurrence. Completed forms should be forwarded to the Directors for review.

Corrective and Preventative Actions and Reporting

The appropriate corrective and preventative actions should be taken according to the site-specific emergency procedures. The table below shows the reporting routes for various incidents:

Incident	Form	Reporting Route
Potential pollution of the environment/near miss	Accident (and Incident) Record **FR10**	Site Manager
Health & Safety hazard, near miss	Accident (and Incident) Record **FR10**	Site Manager
H&S Accident (including RIDDOR)	Accident (and Incident) Record **FR10**	Site Manager, HSE
Pollution of the environment	Accident (and Incident) Record **FR10**	Site Manager, NRW
Minor spills	Accident (and Incident) Record **FR10**	Site Manager

Amendment of Procedures

Where a review of incidents indicates that a review of procedures is necessary, the designated person shall update the procedure and communicate any changes to all members of staff who may be affected by the changes.

Records

Records will be retained for the periods and disposed of by the methods identified in the following table:

Record	Reference	Retained by	Retention Time	Disposal Method
Environmental Incident Form	Accident (and Incident) Record **FR10**	Head Office	5 years	Secure shred and recycle
Emergency/Incident Response Training	Training Record **FR8**	Head Office	2 years after employee has left company	Secure shred and recycle

PR2 Emergency Incident Procedure - Fire

PR2 - Emergency Incident Procedure - Fire & Explosion

Firefighting Methods

Firefighting methods for burning solid waste include spraying with water from fire extinguishers and fire hoses, smothering the waste (with material from the inert waste stockpile) and separating burning material from other waste in a safe area outside of the building.

Fire extinguishers and hoses fed from the mains potable water supply are available for use as a first response measure to suppress fires. Additional fire hoses, linked to IBC water storage tanks, are also located in the vicinity of combustible waste stockpiles. The hoses provide a flow of around 20l/min. The locations of fire extinguishers and fire hoses are shown on drawing **10915 - 000 - J** Emergency Plan.

Approximately 250m^3 of soil/inert material will be stockpiled adjacent to the Residual Waste storage area (K) for use as a fire suppressant.

A further 250m^3 of soil/inert material shall be stockpiled adjacent to the opening in the central section of the site for use to construct fire water containment bunds to direct fire water into the temporary firewater containment booms (if required)

Fire and Rescue Service Access to Fire Water

Mains water hydrants are located at grid reference E307982 N208799 and E307787 N208802.

5 no. water storage tanks, holding a total of 218,000 litres are installed on-site; 2 no. 64,000 litre steel tanks to the north east of the site, 1 no. 30,000 litre HDPE tank located centrally, and 2 no. 30,000 litre HDPE tanks to the of the site. Several IBC water tanks are also available on the site to provide additional water for firefighting, the tanks are shown on drawing **10915 - 000 - J**.

Activation Plan

The following emergency fire plan will be followed when fire or smoke is suspected or discovered.

The sequence of these steps may vary according to the circumstances of the fire emergency, but priority must always be given to the safety of staff and visitors, followed by the prevention of impact on local human or environmental receptors.

The following procedures are to be followed on the discovery of fire or smoke;

- Upon discovering smoke or fire the alarm must be raised via the site radio/m
- obile phone call to the Site Manager or Main Office, or by repeated horn blasts and/or shouting to indicate a fire has been discovered.
- The person discovering a fire should inform the Site Manager/Supervisor immediately (or if not immediately contactable a Fire Marshall) and provide an assessment of the situation.
- The person discovering a fire should then call the fire brigade on ‘’999” providing details of the fire’s location and scale.
- The person or persons discovering the fire should seal off the area and delegate tasks to available staff members in relation to alerting staff, fighting and/or preventing the spread of fires.

Call the emergency services by dialling **999** and ask for the **FIRE SERVICE**

Give the telephone number **01685 370188 and/or the mobile number you are using** as appropriate.

When connected, state the address slowly and clearly as **Merthyr Borough Recycling Centre Ltd, Unit 5, Pengarnddu Ind Estate, Dowlais, Merthyr Tydfil, CF48 2TA**, provide details as requested and follow the instructions of the Operator.

- All non-essential persons should be instructed to leave the area and report to the designated site assembly point outside the western entrance to the site.

Outside the western entrance to the site

- Persons evacuating must
  - obey Fire Marshals' instructions;
  - ensure others in the vicinity also evacuate;
  - assist any person who needs help, if safe to do so;
  - not stop to collect any personal belongings;
  - proceed directly to the Assembly Point outside of the western entrance of the site; and
  - remain there until officially instructed otherwise.
- Where possible, machine operators are to move their machines to a safe area only returning to assist in the movement of waste at the direction of the senior fire officer.
- The Site Supervisor or available staff may attempt to extinguish a fire using appropriate firefighting equipment if:
  - It is safe to do so;
  - It is a small fire that can be managed by the on-site staff (e.g. a smouldering waste, overheating/smouldering electrical equipment, small isolated area of waste);
  - Staff and Visitors have been moved from the danger area and an evacuation has commenced;
  - The fire brigade has been called; and,
  - The person using the extinguisher or fire appliance has been trained in their use.
- Persons with no specific training are not expected to fight a fire, but all staff should familiarise themselves with the location and basic operating principles of the equipment, in case they need to use it.
- The designated Fire Marshall will collect the roll call list and confirm the presence of staff and visitors at the assembly point.
- In the event of a member of staff or visitor remaining unaccounted for, and where it is safe to do so, a search of all effective areas of the site shall be undertaken by the Site Manager/Supervisor to ensure that everybody has evacuated the site.

- The Site Manager/Supervisor shall instruct the weighbridge operator to hold all incoming traffic. The weighbridge operator shall attempt to contact customers by mobile telephone to advise them that the site is unavailable and that they should take their waste to an alternative waste facility. The closest sites with similar waste processing capabilities are:
    - Bryn Recycling Limited, Gelliargwellt Farm, Gelligaer Rd, Hengoed, CF82 8FY (10 miles);
    - Pritchard Recycling Limited, Pantybrad Lane, Llantrisant, Pontyclun, CF72 8YY (20.5 miles); or
    - Derwen Recycling Limited, Neath Abbey Wharf, Neath Abbey, Skewen, Neath, SA10 6BL (26.5 miles).
- Vehicles arriving at site should be directed to park to the west of the site on the access road leading to B&M Homestore in the vicinity of the wind turbine, on the Pant Industrial Estate or in the layby northbound on the A470 (300m before the Brecon roundabout) while alternative arrangements are made. The industrial estate access road itself should not be used (unless instructed by the Fire and Rescue Service) to maintain emergency vehicle access.
- The Site Manager/Supervisor is to ensure that firewater management measures (bund construction and boom deployment are implemented at the earliest opportunity to prevent firewater from exiting the site, or entering the surface water or foul sewers.
- The Site Manager/Supervisor is to ensure that the fire quarantine areas are free of waste, vehicles, plant or other obstructions. If they are not, and where safe to do so, these areas should be cleared, or alternative locations >6m from the fire (and wherever po
- ssible located on the impermeable concrete yard area) identified for this purpose.
- Upon arrival, the Site Manager will issue the Emergency services with the site accident plan and the emergency services will assume control of the situation, all instructions/advice given by them shall be followed, including any instructions that are not in accord with this FPMP due to operational considerations.
- The Site Manager/Supervisor is to advise the Officer in Charge of the emergency services if someone is missing.
- Upon arrival the Site Manager will issue the Emergency services with the site accident plan and the emergency services will assume control of the situation, all instructions/advice given by them will be followed.
- The Site Manager/Supervisor is to advise the Officer in Charge of the emergency services if someone is missing.
- After all occupants are evacuated, and visitors and staff are accounted for, the Site Manager will be responsible for contacting residents and businesses within 500m of the site, starting with those downwind of the fire to advise them of any particular measures required while the fire in being brought under control (e.g. the evacuation of nearby premises, closing of windows, etc.). Table 1 provides details of receptors and precautions to be advised, with locations and contact details shown on drawing **10915 – 000 – K**. Any instruction given on-site by the Emergency Services over-rule any guidance in Table 1.
- After all occupants are evacuated, and visitors and staff are accounted for, wait for the 'all–clear' from the fire brigade before returning staff to any affected area.
- The Site Manager is responsible for ensuring the conditions that led to the fire are investigated (in association with the Fire and Rescue Service and South Wales Police as appropriate), plant is

safely recommissioned, accident plans and management systems documents are reviewed and improved, training requirements for staff personnel are reviewed and that any remedial measures (including further fire reduction measures and new procedures) are implemented.

Vehicle Fires

If a fire occurs on a vehicle:

- Bring the vehicle to a safe stop, engage the handbrake, switch off engine and put the vehicle into a high gear in case of accidental engine re-ignition. If safety of personnel will allow, the vehicle should be parked centrally within the WTS concrete yard area and wherever parked, away from fuel supplies, uncovered solid wastes, and other vehicles.
- Your priority should be your own safety, the safety of any passengers and the safety of those around you.
- The engine should be shut off and the brake engaged to prevent movement of the vehicle or piece of equipment.
- The driver and any passengers should leave the vehicle as quickly as possible and move to a safe distance away from the fire.
- If you believe the engine is on fire, release the bonnet catch if it is safe to do so, but **DO NOT OPEN THE BONNET!**
- When the emergency services arrive, inform them if there is any flammable hazardous material on the load e.g. gas canisters, aerosol cans, etc.
- Contact the office to inform them of the incident, including load details, location, etc.

Equipment Fires

If a fire occurs in a piece of equipment

- Stop the equipment immediately using the emergency stop button or key switch.
- Shut off fuel valves if safe to do so.
- Follow the procedure above for Site Fires.
- When the emergency services arrive, inform them if there is any flammable hazardous material on the load e.g. gas canisters, aerosol cans, etc.

Moving Wastes and Quarantine Areas

Only staff that have received specific training to remove waste and/or containers in the event of a fire should attempt to do so.

Three Fire Quarantine Areas (labelled A, B and C drawing **10915 – 000 - J**) are available for the purpose of separating and quenching burning waste. Based on a requirement to hold 50% of the largest combustible waste stockpile (residual waste stockpile (K) to the north east of the site) the quarantine area(s) must hold 800m3 of combustible waste. Quarantine area A holds 349m3 of waste, B holds 487m3 of waste, and C holds 817m3 of waste.

If using area C for quenching of burning waste, a bund must be constructed to the south of the quarantine area (where shown on drawing 10915 – 000 - J to contain fire water and stop it reaching the surface water sewer (via the silt trap and class I full-retention interceptor to the south). Failure to do so will result in pollution of nearby surface watercourses. Additional bunds should be constructed

where shown to stop firewater entering, and potentially overwhelming, the foul sewer network, and to enable it to be recirculated onto the fire.

If a fire is present in containerised wastes, and unless directed otherwise by the F&RS, the container and/or any adjacent containers should be moved where safe to do so to reduce the risk of fire spreading. Any movement of waste should be agreed with the Site Manager (in the absence of the F&RS) and appropriate actions in the event of an emergency (fire spread, equipment failure, etc.) agreed to ensure staff safety prior to any action taking place.

A telehandler with bucket and bale handling attachments, and an excavator and grab shall be available on site at all times. Both vehicles have enclosed cabs and are fitted with heat-protected hydraulic systems.

Containers shall first be removed to the fire quarantine areas, or a location >6m away from the fire if these are unavailable. This may be within the site, or outside of the site (such as the verges of the industrial estate access road or the car park of the adjacent abattoir or adjacent units – subject to agreement). The industrial estate access road itself should not be used (unless instructed by the Fire and Rescue Service) to maintain emergency vehicle access. Removed containers shall subsequently be returned to site following the fire if safe to do so, or, if this is not possible within 72 hours, relocated to another waste management facility (Bryn Recycling Limited, Pritchard Recycling Limited or Derwen Recycling Limited).

Similarly, where any risk of fire spread exists and unless directed otherwise by the F&RS, and where safe to do so, the Site Manager/Supervisor is to ensure that any wastes within the hazardous storage and quarantine areas are removed to a safe location.

Reporting

Any incidents should be recorded in the site diary and a CAR (**FR11**) raised in accordance with **PR15** as necessary, along with the details of any actions taken.

Notification of Fires to NRW

NRW should be informed of any fire arising on site. The Site Manager will provide NRW with as much information as possible regarding the fire and fire-fighting efforts, as soon as is practicable and no later than the following day (Tel. 0800 807060).

A written description of the cause and extent of the fire and the resulting fire response should be provided within 14 days of fire detection.

Fire Prevention and Mitigation Plan

The site operates to a Fire Prevention and Mitigation Plan (**MP4**) which provides further information relating to the prevention and management of fires at the site.

Post-Incident Actions

The Site Manager/Supervisor is responsible for reviewing the fire prevention and fire control procedures for the facility following the occurrence of a fire to determine if modifications to procedures or systems are required.

The site's Fire Prevention and Mitigation Plan shall be reviewed and updated where required to reflect any changes.

Receptor Reference	Type	Distance from Site Boundary	Direction	Potential Impact	Likelihood	Response Measures
G	Groundwater	0m	Independent	Groundwater contamination from pollutants in fire water run off	Site largely impermeably surfaced, although firewater could enter groundwater through an area of hardstand surfacing to south east of site, or to a lesser extent from ash deposition and mobilisation of contaminants following rain.	Combustible waste storage only in areas of impermeable surface with sealed drainage. Emergency response to ensure firewater from combustible waste storage areas is contained within impermeably surfaced area.
C1	Storage Yard	0m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments Business would be impacted by restrictions on customer and staff movement/evacuation. Bund would stop firewater reaching receptor. Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely. Possible secondary fire risks due to combustible materials in yard. Wall between the sites reduces risks.	Possible smoke-related impacts - not normally in line with prevailing winds.	Contact receptor as soon as practical after fire discovered and advise people to evacuate the site.
C2	Salvage Yard	0m	South East	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments Business would be impacted by restrictions on customer and staff movement/evacuation. Bund would stop firewater reaching receptor. Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely. Possible secondary fire risks due to combustible materials in yard. Wall between the sites reduces risks.	Possible smoke-related impacts - not normally in line with prevailing winds.	Contact receptor as soon as practical after fire discovered and advise people to evacuate the site.
C3	Salvage Yard	0m	South East	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments Business would be impacted by restrictions on customer and staff movement/evacuation. Bund would stop firewater reaching receptor. Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely. Possible secondary fire risks due to combustible materials in yard. Wall between the sites reduces risks.	Possible smoke-related impacts - not normally in line with prevailing winds.	Contact receptor as soon as practical after fire discovered and advise people to evacuate the site.
I1	ELV ATF	0m	West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments Business would be impacted by restrictions on customer and staff movement/evacuation. Topography would stop firewater reaching receptor. Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - not normally in line with prevailing winds.	Contact receptor as soon as practical after fire discovered and advise people to evacuate the site. Fire breaks between waste stockpiles and boundary.

				Possible secondary fire risks due to combustible materials in yard. Wall between the sites reduces risks.		
W1	Watercourse	2m	North West	Not impacted by smoke. Topography would stop firewater reaching receptor. Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Not likely	None
E1	Mynyddoedd Llangynidr a Llangatwg, Cefn yr Ystrad a Chomin Merthyr SSSI Merthyr Common North SINC	29m	North	A large area of mostly upland common land located to the south of Llangynidr, south west of Crickhowell and north of Tredegar and Ebbw Vale. It covers an area of 7212.87 hectares. The SSSI is closest to the Site at its south western extremity. The site is of special interest for 56 different features, including its geology interest (Non-marine Devonian outcrops, Dinantian of southern England and South Wales, Westphalian outcrops, Karst and Cave), its habitat interest (including blanket and raised bog, acid fen/valley bog, wet and dry dwarf shrub heath, acid and base-rich spring-fed mire, dystrophic standing water, calcareous grassland) and its species interest (vascular plants, bryophytes, lichens, fungi, invertebrates, birds and bats). Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Topography would stop firewater reaching receptor. Possible land contamination from ash deposition and mobilisation of contaminants following rain. Possible smothering of flora by ash. Long-term effects unlikely.	Possible smoke-related impacts - generally transient use, although more prolonged use by people tending livestock/walking is possible - not normally in line with prevailing winds and people can easily move away from any smoke plume.	Following a fire assess deposition of ash within SSSI and any potential impacts.
O1	Open Access Land	31m	North	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. People can easily move away from any smoke plume Topography would stop firewater reaching receptor. Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - generally transient use, although more prolonged use by people tending livestock/walking is possible - not normally in line with prevailing winds and people can easily move away from any smoke plume.	None
C4a	Abattoir (Offices)	33m	East	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Business would be impacted by access restrictions on customers and staff. Smoke and ash may force operations to cease due to animal stress and food hygiene considerations. Possible requirement for decontamination, particularly if hazardous materials are involved in the fire. Topography would stop firewater reaching receptor. Bund between the Site and Abattoir reduces secondary fire risks. Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - not normally in line with prevailing winds.	Contact receptor as soon as practical after fire discovered and advise people to stay indoors with windows closed. Post-fire clean up to include an assessment of impacts at the abattoir.
U1	STOR Energy	34m	West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Topography/intervening highway drains would stop firewater reaching	Possible smoke-related impacts - generally transient use, although more prolonged use by staff maintaining generators possible - not	Staff generally not present, however, contact receptor as soon as practical after fire discovered and advise people to stay indoors with windows closed.

				receptor (risk to Bleanmolais SINC due to firewater entering surface water drain, see below). Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	normally in line with prevailing winds..	
I2	Automotive Parts Manufacturer	35m	South West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Business would be impacted by access restrictions on customers and staff. Topography/intervening highway drains makes pollution risk (to receptor) from firewater negligible (risk to Bleanmolais SINC, see below). Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - not normally in line with prevailing winds.	Contact receptor as soon as practical after fire discovered and advise people to stay indoors with windows closed.
C4b	Abattoir (Security Office)	37m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Business would be impacted by access restrictions on customers and staff. Smoke and ash may force operations to cease due to animal stress and food hygiene considerations. Possible requirement for decontamination, particularly if hazardous materials are involved in the fire. Topography/intervening highway drains makes pollution risk (to receptor) from firewater negligible (risk to Bleanmolais SINC, see below). Bund between the Site and Abattoir reduces secondary fire risks. Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - not normally in line with prevailing winds.	Contact receptor as soon as practical after fire discovered and advise people to stay indoors with windows closed. Post-fire clean up to include an assessment of impacts at the abattoir.
C5	Waste Transfer Station	45m	West North West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Business would be impacted by restrictions on customer and staff movement/evacuation. Topography/intervening highway drains makes pollution risk (to receptor) from firewater negligible (risk to Bleanmolais SINC, see below). Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - not normally in line with prevailing winds.	Contact receptor as soon as practical after fire discovered and advise people to stay indoors with windows closed.
C4c	Abattoir (Food Packaging)	64m	South South East	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Business would be impacted by access restrictions on customers and staff. Smoke and ash may force operations to cease due to animal stress and food hygiene considerations. Possible requirement for decontamination, particularly if hazardous materials are involved in the fire. Business would be impacted by access restrictions on customers and staff. Smoke and ash may force operations to cease due to animal stress and food hygiene considerations. Possible requirement for	Possible smoke-related impacts - not normally in line with prevailing winds.	Contact receptor as soon as practical after fire discovered and advise people to stay indoors with windows closed. Post-fire clean up to include an assessment of impacts at the abattoir.

				decontamination, particularly if hazardous materials are involved in the fire. Topography makes pollution risk from firewater negligible. Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.		
U2	STOR Energy	100m	West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Topography/intervening highway drains would stop firewater reaching receptor (risk to Bleanmolais SINC due to firewater entering surface water drain, see below). Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - generally transient use, although more prolonged use by staff maintaining generators possible - not normally in line with prevailing winds..	Staff generally not present, however, contact receptor as soon as practical after fire discovered and advise people to stay indoors with windows closed.
U3	33kV O/H Power Lines	121m	North	Not impacted by smoke, ash, firewater.	Not likely at this distance.	None
C6	Salvage Yard	146m	West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Business would be impacted by restrictions on customer and staff movement/evacuation. Topography/intervening highway drains makes pollution risk (to receptor) from firewater negligible (risk to Bleanmolais SINC, see below). Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - not normally in line with prevailing winds.	Contact receptor as soon as practical after fire discovered and advise people to stay indoors with windows closed.
I3	ELV ATF	221m	South East	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Significant impact to business trading unlikely. Topography/intervening highway drains makes pollution risk (to receptor) from firewater negligible (risk to Bleanmolais SINC, see below). Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - not normally in line with prevailing winds.	Contact receptor as soon as practical after fire discovered and advise people to stay indoors with windows closed.
U4	Reservoir (Underground)	241m	West	Not impacted by smoke, ash, firewater.	Not likely at this distance.	None
E2	Blaenmorlais SINC	248m	West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Highway drains on industrial estate access road to south of Site discharge surface water to a small watercourse to the south of the SINC. - pollution risk from firewater possible were it to enter the surface water sewer via the site drainage system, or exit site and enter the surface water sewer via the highway drains. Possible land contamination from ash deposition and mobilisation of contaminants following rain. Smothering of flora by ash unlikely at this distance due to dispersion	Possible smoke-related impacts - generally transient use, although more prolonged use by people tending livestock/walking is possible - not normally in line with prevailing winds and people can easily move away from any smoke plume. Possible pollution from firewater if not contained.	Combustible waste storage only in areas of impermeable surface with sealed drainage. Emergency response to ensure firewater from combustible waste storage areas is contained within impermeably surfaced area.

				and reduced deposition rates. Long-term effects unlikely.		
U5	Reservoir (Above Ground)	264m	West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Topography/intervening highway drains makes pollution risk (to receptor) from firewater negligible (risk to Bleanmolais SINC, see above). Possible water/land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - generally transient use, although more prolonged use by staff possible - not normally in line with prevailing winds.	Staff generally not present, however, contact receptor as soon as practical after fire discovered and advise people to stay indoors with windows closed.
C7	Caravan Storage	264m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Significant impact to business trading unlikely. Topography/intervening highway drains makes pollution risk (to receptor) from firewater negligible (risk to Bleanmolais SINC, see above). Possible water/land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - generally transient use, although more prolonged use by staff and customers possible - not normally in line with prevailing winds.	Staff and customers generally not present, however, contact receptor as soon as practical after fire discovered and advise people to stay indoors with windows closed.
C8	Furniture Retailer	277m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Significant impact to business trading unlikely. Topography/intervening highway drains makes pollution risk (to receptor) from firewater negligible (risk to Bleanmolais SINC, see above). Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - not normally in line with prevailing winds.	Contact receptor as soon as practical after fire discovered and advise people to stay indoors with windows closed.
C9	Furnishings Retailer	286m	South West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Significant impact to business trading unlikely. Topography/intervening highway drains makes pollution risk (to receptor) from firewater negligible (risk to Bleanmolais SINC, see above). Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - not normally in line with prevailing winds.	Contact receptor as soon as practical after fire discovered and advise people to stay indoors with windows closed.
P1	Public Right of Way	293m	South West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. Topography/intervening highway drains makes pollution risk (to receptor) from firewater negligible (risk to Bleanmolais SINC, see above). Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.	Possible smoke-related impacts - transient use,- not normally in line with prevailing winds and people can easily move away from any smoke plume.	Contact receptor as soon as practical after fire discovered and advise people to stay indoors with windows closed.
C10	MOT Centre	295m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments.	Possible smoke-related impacts - not normally in line with prevailing winds.	Contact receptor as soon as practical after fire discovered and advise people to stay indoors with windows closed.

				Significant impact to business trading unlikely. Topography/intervening highway drains makes pollution risk (to receptor) from firewater negligible (risk to Bleanmolais SINC, see above). Possible land contamination from ash deposition and mobilisation of contaminants following rain - long-term effects unlikely.		
T1	A465 Heads of the Valleys Road	309m	South East to South West	Human receptors using this road would be exposed to smoke plumes for short periods. Reduction in driver visibility due to smoke. No impacts from other factors.	Smoke-related impacts – unlikely. In the presence of a large fire, with high wind speeds blowing towards the receptor, it is possible that smoke will cause a loss of visibility on the dual carriageway.	Advise emergency services of potential issue when calling 999 if plume is blowing towards the A465.
R1	Residential Property	320m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.	Remain vigilant of plume direction and dispersion and follow guidance from emergency services.
C11	Groceries Retailer	326m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.	Remain vigilant of plume direction and dispersion and follow guidance from emergency services.
C12	Groceries Retailer	326m	South West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.	Remain vigilant of plume direction and dispersion and follow guidance from emergency services.
C13	Storage Yard	334m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts – generally transient use by staff - not normally in line with prevailing winds. Topography and dispersion would reduce impact.	Remain vigilant of plume direction and dispersion and follow guidance from emergency services.
C14	Carpet Retailer	343m	South West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.	Remain vigilant of plume direction and dispersion and follow guidance from emergency services.
R2	Residential Property	346m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.	Remain vigilant of plume direction and dispersion and follow guidance from emergency services.
R3	Residential Property	348m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.	Remain vigilant of plume direction and dispersion and follow guidance from emergency services.
C15	Storage Yard	357m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts – generally transient use by staff - not normally in line with prevailing winds. Topography and dispersion would reduce impact.	Remain vigilant of plume direction and dispersion and follow guidance from emergency services.
P2	National Cycle Route	374m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts – transient use by cyclists - not normally in line with prevailing winds. Topography and dispersion would reduce impact.	None
C16	Homewares Retailer	391m	South West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and	Remain vigilant of plume direction and dispersion and follow guidance from emergency services.

				No significant impacts from other factors.	dispersion would reduce impact.	
O2	Stables/ Storage/ Allotments	416m	West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.	Remain vigilant of plume direction and dispersion and follow guidance from emergency services.
C17	Flooring/ Furniture Retailer	428m	South West	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.	Remain vigilant of plume direction and dispersion and follow guidance from emergency services.
C18	Service Station	442m	South	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.	Remain vigilant of plume direction and dispersion and follow guidance from emergency services.
W3/L1	Pond (Leisure Use)	445m	North East	Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.	None
R4	Residential Property	549m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.	Remain vigilant of plume direction and dispersion and follow guidance from emergency services.
O3	Stables/Storage Yards	565m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.	Remain vigilant of plume direction and dispersion and follow guidance from emergency services.
O4	Farm	606m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.	Remain vigilant of plume direction and dispersion and follow guidance from emergency services.
R5	Residential Properties	608m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.	Remain vigilant of plume direction and dispersion and follow guidance from emergency services.
P3	Footpath	609m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts – transient use - not normally in line with prevailing winds. Topography and dispersion would reduce impact.	None
U6	Electricity Substation	682m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts – generally short-term use by maintenance staff - not normally in line with prevailing winds. Topography and dispersion would reduce impact.	None
L3	Park/ Recreation Area	688m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts – not normally in line with prevailing winds. Topography and dispersion would reduce impact.	None
R6	Residential Properties	700m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.	Remain vigilant of plume direction and dispersion and follow guidance from emergency services.
W4/L2	Reservoir (Angling)	705m		Potential smoke inhalation leading to short-term health problems,	Possible smoke-related impacts – not normally in line with prevailing winds. Topography and	None

				exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	dispersion would reduce impact.	
U7	Reservoir (Underground)	745m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.	Remain vigilant of plume direction and dispersion and follow guidance from emergency services.
L4	Playing Fields	762m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts – not normally in line with prevailing winds. Topography and dispersion would reduce impact.	None
W5/L5	Reservoir (Angling)	816m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts – not normally in line with prevailing winds. Topography and dispersion would reduce impact.	None
I5	Landfill	862m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts – not normally in line with prevailing winds. Topography and dispersion would reduce impact.	Remain vigilant of plume direction and dispersion and follow guidance from emergency services.
R7	Residential Properties	878m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.	Remain vigilant of plume direction and dispersion and follow guidance from emergency services.
L6	Playing Fields	948m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts – not normally in line with prevailing winds. Topography and dispersion would reduce impact.	None
R8	Residential Property	958m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts - not normally in line with prevailing winds. Topography and dispersion would reduce impact.	Remain vigilant of plume direction and dispersion and follow guidance from emergency services.
L7	Playing Fields	964m		Potential smoke inhalation leading to short-term health problems, exacerbated in people with asthma or other respiratory ailments. No significant impacts from other factors.	Possible smoke-related impacts – not normally in line with prevailing winds. Topography and dispersion would reduce impact.	None

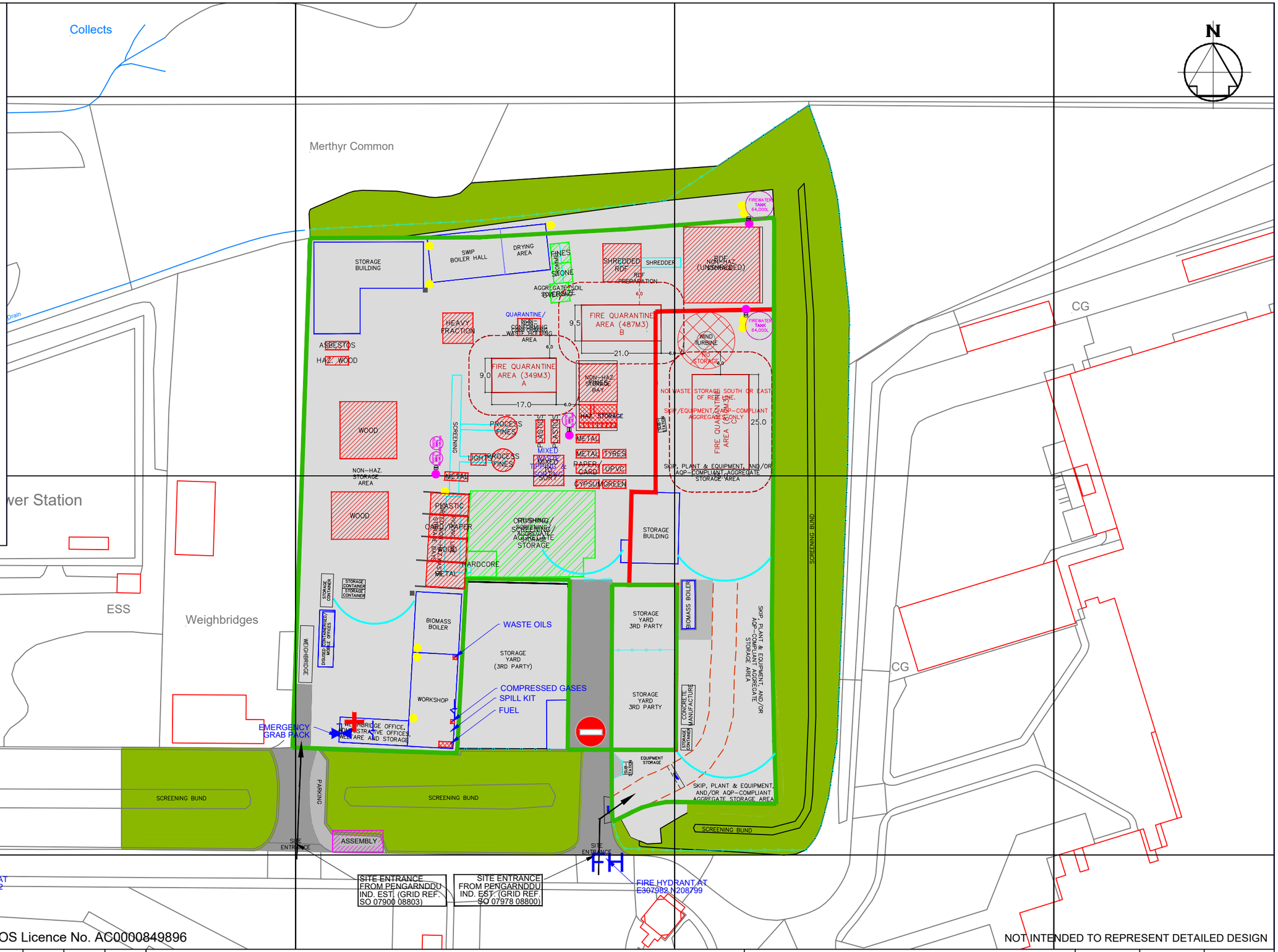
Table 1. Potential Impacts and response measures

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- PERMIT BOUNDARY
- HAZARDOUS WASTE/ CHEMICALS/ COMPRESSED GASES
- COMBUSTIBLE WASTES
- NON-COMBUSTIBLE WASTE
- FH — FIRE HYDRANT
- FE — FIRE ESCAPE
- ASSEMBLY — FIRE ASSEMBLY POINT
- FIRE EXTINGUISHER
- FIRE HOSE
- TANK — FIREWATER TANK
- IBC WATER TANK
- FIRST AID KIT
- MAIN ELECTRICAL BREAKER
- MAINS WATER STOPCOCK
- FIRE QUARANTINE AREA
- FIREWATER CONTAINMENT BOOM

REFER TO STORAGE PLAN FOR DETAILS OF WASTES



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NOT INTENDED TO REPRESENT DETAILED DESIGN

AMENDMENTS

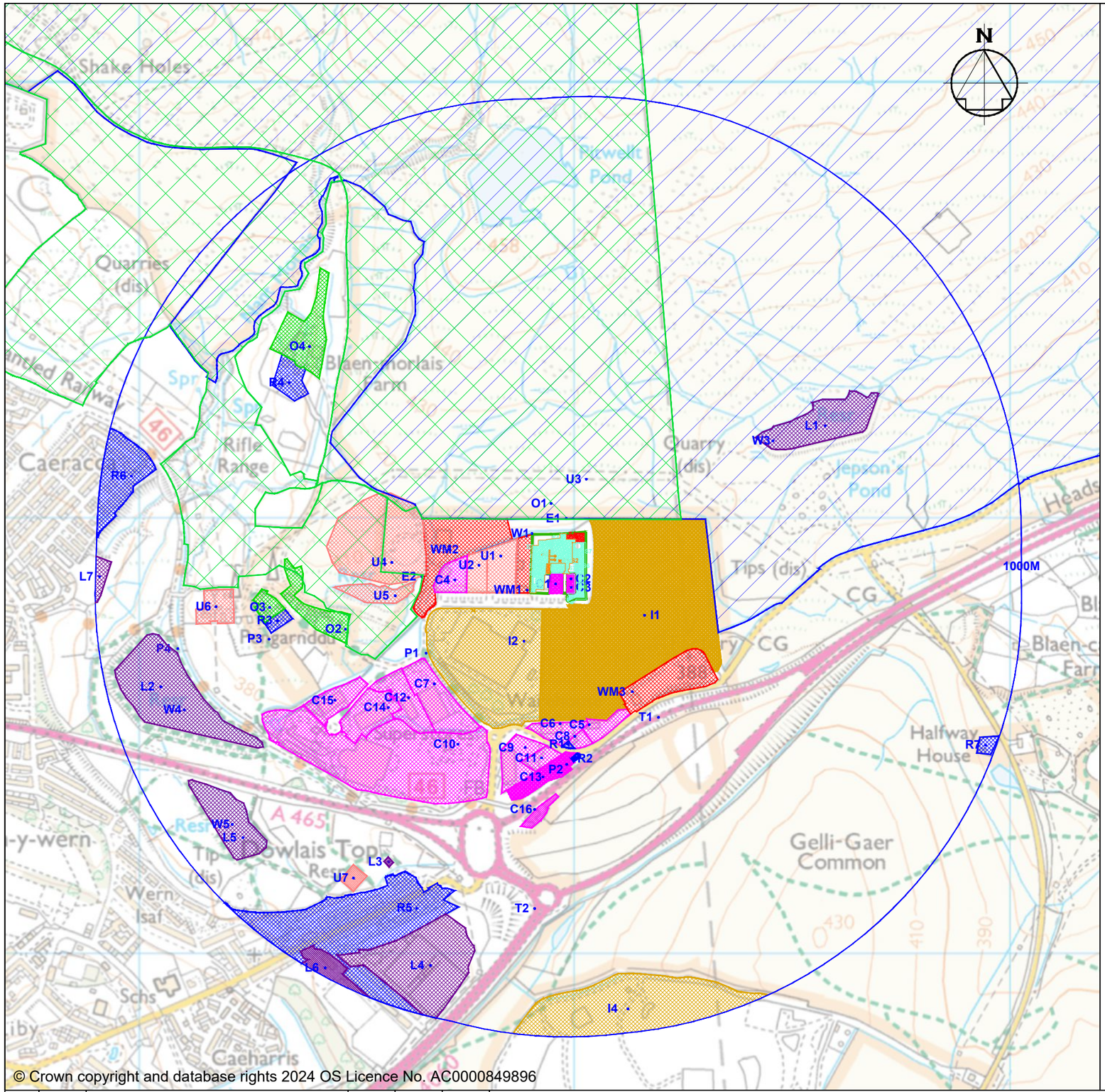
REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	UPDATE STORAGE ARRANGEMENTS	25/07/25	SCW	NB

TEPL

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MERTHYR BOROUGH RECYCLING COMPANY LTD	Drawn	SCW	Scale
	Ch'kd	NB	1:1,000
EMERGENCY PLAN	Appr'd	NB	@A3
	Date	25/07/25	
Job No. MBRC	Drg No.	10915 - 000 - J	

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		RECEPTOR TYPE	PROPERTY/ORGANISATION	CONTACT NUMBER
G	0M	GROUNDWATER	GROUNDWATER	NO CONTACT NUMBER
C1	0M	STORAGE YARD	PAUL BROGDAN	NO CONTACT NUMBER
C2	0M	STORAGE YARD	UNKNOWN	NO CONTACT NUMBER
C3	0M	SALVAGE YARD	MERTHYR RECLAMATION	07702 399711
WM1	0M	ELV ATF	ABBA SCRAP METALS	01685 722758
W1	2M	WATERCOURSE	WATERCOURSE	NO CONTACT NUMBER
I1	8M	ABATTOIR	ST MERRYN/KEPAK	01685 354800
E1	29M	SSSI	MYNYDDOEDD LLANGYNIDR A LLANGATWG	NO CONTACT NUMBER
E2	29M	SINC	MERTHYR COMMON NORTH	NO CONTACT NUMBER
O1	31M	OPEN ACCESS LAND	GELIGAER AND MERTHYR COMMON	NO CONTACT NUMBER
U1	34M	STOR ENERGY	CONRAD ENERGY	01235 427290
I2	36M	AUTOMOTIVE PARTS MANUFACTURER	TENNECO WALKER UK	01495 711211
WM2	45M	WASTE TRANSFER STATION	HAMPSHIRE DEMOLITION AND RECYCLING	01685 725000
U2	100M	STOR ENERGY	PULSE CLEAN ENERGY	01675 437777
U3	121M	33KV OVERHEAD POWER LINES	NATIONAL GRID	0800 096 3080
C4	146M	SALVAGE YARD	MERTHYR SALVAGE	01685 375406
WM3	221M	ELV ATF	HEADS OF THE VALLEYS SALVAGE	01685 386649
U4	241M	RESERVOIR (UNDERGROUND)	DWR CYMRU WELSH WATER	0800 052 0145
E3	248M	SINC	BLAENMORLAIS	NO CONTACT NUMBER
U5	264M	RESERVOIR (ABOVE GROUND)	DWR CYMRU WELSH WATER	0800 052 0145
C5	264M	CARAVAN STORAGE	ROBINS CARAVAN STORAGE	01685 384264
P1	276M	PUBLIC RIGHT OF WAY	PUBLIC ACCESS ROUTE	NO CONTACT NUMBER
C6	277M	FURNITURE RETAILER	COMFORTZONE	01685 377880
C7	286M	FURNISHINGS RETAILER	DUNELM	01685 490043
C8	295M	MOT CENTRE	BLAKEY'S MOT CENTRE	01685 384264
T1	309M	A465 HEADS OF THE VALLEYS ROAD	SOUTH WALES TRUNK ROAD AGENT (SWTRA)	0300 123 1213
R1	320M	RESIDENTIAL PROPERTY	BLAKEY'S MOT CENTRE	01685 384264
C9	326M	GROCERIES RETAILER	LIDL	020 3966 5566
C10	326M	GROCERIES RETAILER/PETROL STATION	ASDA	01685 379981
C11	334M	STORAGE YARD	PINNACLE CONSTRUCTION	07494 446260
C12	343M	CARPET RETAILER	CARPETRIGHT	01685 707080
C13	357M	OFFICE/STORAGE YARD	PENGARNDDU HIGHWAYS	NO CONTACT NUMBER
R2	348M	RESIDENTIAL PROPERTY	STATION HOUSE	NO CONTACT NUMBER
P2	374M	NATIONAL CYCLE ROUTE 46	WALK WHEEL CYCLE TRUST	0117 926 8893
C14	391M	HOMEWARES RETAILER	B&M HOME STORE	0330 838 9521
O2	416M	STABLES/STORAGE/ALLOTMENTS	CASTLE ROW, PENGARNDDU	NO CONTACT NUMBERS
C15	428M	FLOORING/FURNITURE RETAILERS	CARPET & BED CO, TRADE PRICE SOFAS, FLOOR GIANTS	01685 388340
C16	442M	PETROL STATION	TEXACO, VALLEY HEIGHTS	01685 374792
W3/L1	445M	POND	JEPSON'S POND (MERTHYR TYDFIL ANGLING ASSOCIATION)	01685 723520
R3	549M	RESIDENTIAL PROPERTY	CASTLE ROW, PENGARNDDU	NO CONTACT NUMBER
O3	565M	STABLES/STORAGE YARDS	CASTLE ROW, PENGARNDDU	NO CONTACT NUMBERS
O4	606M	FARM	BLAEN-MORLAIS FARM	NO CONTACT NUMBER
R4	608M	RESIDENTIAL PROPERTIES	BLAEN-MORLAIS FARM	NO CONTACT NUMBER
P3	609M	PUBLIC RIGHT OF WAY	FOOTPATH	NO CONTACT NUMBER
U6	682M	ELECTRICITY SUBSTATION	DOWLAIS GRID STATION (NATIONAL GRID)	NO CONTACT NUMBER
L3	688M	PARK/RECREATION AREA	PLAYGROUND	NO CONTACT NUMBER
R5	700M	RESIDENTIAL PROPERTIES	DOWLAIS TOP	NO CONTACT NUMBERS
W4/L2	705M	RESERVOIR (ANGLING)	PENYWERN POND - TOP POND (MTAA)	07931 512483
U7	745M	RESERVOIR (UNDERGROUND)	DOWLAIS TOP RESERVOIR (DCWW)	0800 052 0145
L4	762M	PLAYING FIELDS	DOWLAIS RFC AND PLAYGROUND	01685 382322
W5/L5	816M	RESERVOIR (ANGLING)	PENYWERN POND - MIDDLE POND (MTAA)	07931 512483
P4	820M	PUBLIC RIGHT OF WAY	FOOTPATH	NO CONTACT NUMBER
I5	862M	LANDFILL	BIFFA, TRECATTI LANDFILL	0800 307307
R6	878M	RESIDENTIAL PROPERTIES	CAERACCA, PANT	NO CONTACT NUMBERS
L6	948M	PLAYING FIELDS	DOWLAIS RFC	01685 382322
R7	958M	RESIDENTIAL PROPERTY	HALFWAY HOUSE	NO CONTACT NUMBER
L7	964M	PLAYING FIELD	CAERACCA PLAYING FIELDS	NO CONTACT NUMBER
E4	1920M	SINC	BLAENMORLAIS	NO CONTACT NUMBER
E5	1967M	SINC	BRYNIAU	NO CONTACT NUMBER
E6	1993M	SINC	TYLE HAIDD	NO CONTACT NUMBER

AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY

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MERTHYR BOROUGH RECYCLING COMPANY LTD

RECEPTOR PLAN (FIRE RESPONSE)

Drawn	SCW	Scale	1:10,000
Ch'kd	NB		
Appr'd	NB		@A3
Date	25/07/25		

Job No.	MBRC	Drg No.	10915 - 000 - K

PR3 Accident/Pollution Incident Response Procedure - Spillage

PR3 Accident/Pollution Incident Response Procedure - Spillage

The safety policy will be adhered to at all times and the following particular procedure will be the subject of training in order to ensure that all employees are known and practised.

Possible pollution may result from accidental leaks or spillages from plant and vehicles or from liquid wastes discovered in loads and destined for quarantine as an unacceptable waste.

As well as identifying the possible source of pollution arising from liquid spillages, the potential target is identified as groundwater and any nearby water courses. The measures required to mitigate against the spillage causing such pollution are shown below.

In the event of a spill or an incident, initial action should be to:

- Stop any contamination/spill at source.
- Contain the spill/area.
- Implement the requirements of the emergency procedures.
- Inform site supervisors/managers and the relevant external agencies e.g. Natural Resources Wales.
- Ensure that the health, safety and wellbeing of individuals or groups is not put at risk whilst managing the spill.

The secondary impacts of a spill should be contained by ensuring that:

- PPE, equipment and tools should be correctly decontaminated or disposed of.
- All contaminated containment materials are securely stored and labelled prior to correct disposal or treatment.

Accidental Spillage - Steps to be taken

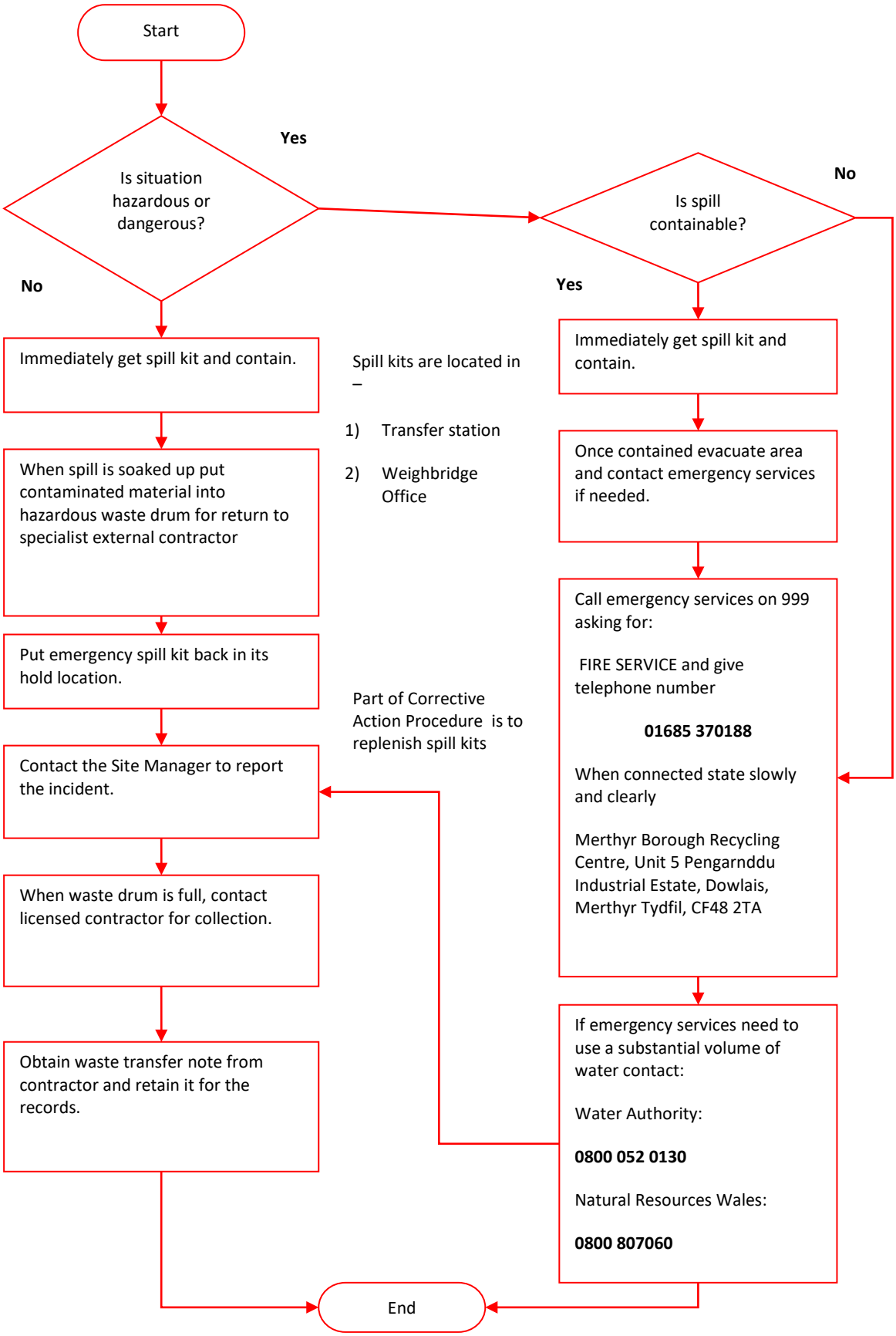
The following procedure is adopted for all accidental spillages of liquids whether inside buildings or in yard areas. Responsibility for any spillage lies with the first person noticing or finding the spill and they must take steps to contain it by taking action as follows:

- Area surrounding spillage to be isolated by application of absorbent granules or clean sand (stored in Processing Building) to prevent vehicles or personnel from passing over the area and thus spreading the spilled liquid.
- For larger spills any local discharge points e.g. drains are to be “blocked off” using sand bags (held in Processing Building).
- Site manager notified as soon as reasonably practical.
- Spill mats and spill kits, including absorbent granules are to be spread on the spilled liquid until all is absorbed.
- When all the liquid is absorbed, the contaminated absorbent granules and spill kits should be loaded into a suitable drum for removal by a suitably licensed carrier to a licensed disposal or recovery facility.
- Details of the liquid spilled is noted for assistance with disposal/recovery for an action plan to prevent a similar occurrence being repeated.

- Every instance of spill MUST be recorded and investigated as an accident or incident.
- In the event of a significant spill the site's Natural Resources Wales Officer should be notified in accordance with permit conditions..

In order to minimise the likelihood of spillages or leaks the following will be undertaken:

- All drums/tanks inspected daily for leaks and kept in bunded areas to prevent leaks from spreading.
- Drums/tanks to undergo regular maintenance to ensure they are fit for purpose.
- Liquid storage level checked daily/weekly to ensure capacity is not reached and overfilling does not occur.
- Use of appropriate equipment when removing and handling liquids to minimise likelihood of spillage.
- Use of drip trays when draining liquid and drip trays regularly cleaned.
- All personnel involved with draining of liquids suitable trained.
- Care taken when driving vehicles or moving objects close to storage drums/tanks to avoid damage and breaking of tanks.


Start
Is situation hazardous or dangerous?
Yes
No
Is spill containable?
No
Yes
Immediately get spill kit and contain.
When spill is soaked up put contaminated material into hazardous waste drum for return to specialist external contractor
Put emergency spill kit back in its hold location.
Contact the Site Manager to report the incident.
When waste drum is full, contact licensed contractor for collection.
Obtain waste transfer note from contractor and retain it for the records.
Spill kits are located in –
1) Transfer station
2) Weighbridge Office
Part of Corrective Action Procedure is to replenish spill kits
Immediately get spill kit and contain.
Once contained evacuate area and contact emergency services if needed.
Call emergency services on 999 asking for:
FIRE SERVICE and give telephone number
01685 370188
When connected state slowly and clearly
Merthyr Borough Recycling Centre, Unit 5 Pengarnddu Industrial Estate, Dowlais, Merthyr Tydfil, CF48 2TA
If emergency services need to use a substantial volume of water contact:
Water Authority:
0800 052 0130
Natural Resources Wales:
0800 807060
End

PR4 Accident/Pollution Incident Response Procedure - Flood

PR4 - Accident/Pollution Incident Response Procedure - Flood

The site is at low risk of flooding from surface or coastal waters.

The predominant flooding risk is as a result of burst/broken water pipes or blockage of the drainage systems within the site itself.

Were the site to flood, the nature of some of the materials on site could pose a hazard to the environment were they to enter the watercourse or contaminate the land.

The Environment Agency (EA)/Natural Resources Wales and Met Office provide flood warnings up to five days in advance.

	What it means	When it's used
	Flooding is possible. Be prepared	Two hours to two days in advance of flooding.
	Flooding is expected. Immediate action required	Half an hour to one day in advance of flooding
	Severe flooding. Danger to life.	When flooding poses a significant threat to life.

If a severe weather or flood warning is issued the following will be undertaken:

- All hazardous materials secured or moved to a suitable and safe location where they will not be affected by flood water.
- Drains and pipes checked and cleared of any debris to aid flow of water.
- Sand bags placed around designated areas.
- Monitoring of local water levels and flood forecast undertaken.
- Electricity supply turned off if water levels increase or likely to increase to a dangerous level.

In the event of a flood the following will be undertaken:

- All electricity to site turned off if safe to do so and staff instructed to stay away from electrical outputs and devices.
- Water mains turned off if flood is as a result of burst/broken water pipe.
- Evacuation alarm sounded.
- Site evacuated and staff to report to the assembly point outside the western entrance to the site.
- Visitor's books and employee clock in reports checked to ensure everyone is off site and at the assembly point.
- Emergency services, Natural Resources Wales and other related agencies notified.

Before site re-occupation, potential hazards and issues will be identified and guidance from Natural Resources Wales and Local Emergency Services will be sought.

PR5 Accident/Pollution Incident Response Procedure –Utility Services Failure

PR5 Accident/Pollution Incident Response Procedure –Utility Services Failure

The site has the following utility services:

- Electricity
- Water

Any member of staff discovering a failure of the utility services should report it immediately to the Site Manager.

If the failure occurs in the electrical supply the Site Manager should instruct staff to switch-off electrical equipment to avoid unexpected restarting of equipment when the supply is restored, or surges that could damage ensitive electrical equipment. The mains supply should also be isolated at the main incoming switch panel.

If the failure is in the mains water supply all permanantly connected equipment should be isolated from the supply by closing stopcocks and valves such that any pressure increase does not damage equipment or contaminated water flow into equipment on reconnection.

The Site Manager should investigate whether the service provider has notified customers of the failure on their web site (using a mobile devices). If there is no indication of a failure, or it is not possible to access the utility provider's web

site, the Site Manager should telephone the utility provider to notify them of the failure.

Where backup services e.g. generators are available the Site Manager is responsible for authorising their use.

The Site Manager and staff should follow the instructions of the utility provider in all cases.

On restoration of the utility the Site Manager will instruct staff to restore power firstly to the site and subsequently to separate items of equipment. Similarly, water supplies can be restored subject to any flushing of the system recommended by the utility provider.

In the event of a prolonged failure of service the Site Manager is responsible for arranging the hire of generators and tankers to provide for the needs of the site.

PR6 Accident/Pollution Incident Response Procedure –Odour

PR6 - Accident/Pollution Incident Response Procedure - Odour

Odour Complaints

Complaints relating to odour are to be immediately investigated by the Site Manager. The nature and details of the complaint will be logged on the External Odour Complaints Form (FR3), along with the findings of the investigations and any action required.

The Site Manager is responsible for determining the appropriate action to be taken in accordance with the corrective actions section below and will communicate the nature of the actions to be taken and timescales with the Complainant.

The table of Action Levels below provides further information regarding steps to be taken where odour is identified during olfactory surveys:

Action Level	Control Measure
On receipt	Investigate wind conditions and use of odour suppression systems. Identify and implement additional mitigation measures if odour complaint verified.

Detection of Odour during Operations

The Site Manager (or designated responsible person should be informed immediately if anything more than a Moderate Odour is identified by members of staff during normal operations.

The Site Manager is responsible for identifying and implementing short-term mitigation measures to minimise the risk of off-site transport of odour and potential complaints arising.

Detection of Odour during Olfactory Surveys (Sniff Tests)

Detection of anything more than a Moderate Odour at the site boundary will initiate a more extensive olfactory survey to determine the extent of the odour plume. The Site Manger (or designated responsible person) will be notified immediately and an olfactory survey will be undertaken utilising the Internal Odour Investigation Record (**FR4**) in order to attempt to determine the scope and extent of the odour plume.

The table of Action Levels below provides further information regarding steps to be taken where odour is identified during olfactory surveys:

Action Level	Control Measure
Moderate Odour identified at site boundary.	Implement Internal Odour Investigation. Site Manager to undertake appropriate steps to stop odour issues escalating.
Moderate Odour at site boundary sustained over 15 minutes	Establish wind direction and undertake an off-site assessment of odour at human receptors upwind of the odour. If greater than Faint odour at nearest human receptors - advise them to close windows and doors while the business addresses the source of the odour.
Strong Odour at site boundary.	Establish wind direction and undertake an off-site assessment of odour at human receptors upwind of the odour, starting with the closest. Receptors locations are shown in Drawing **10915 – 000 - G**. If greater than Moderate odour at nearest human receptors - advise them to close windows and doors while the business addresses the source of the odour. Cease operations until mitigation measures implemented and/or wind direction/speed reduces.

The Site Manager is responsible for identifying and implementing short-term mitigation measures to minimise the risk of off-site transport of odour and potential complaints arising.

Repeated Detection of Odour during Olfactory Surveys (Sniff Tests)

The table of Action Levels below provides further information regarding steps to be taken where odour is repeatedly identified during olfactory surveys:

Action Level	Control Measure
Repeated odour arising outside of site boundary	Identify and implement additional mitigation measures. Investigate wind conditions and use of odour suppression systems. Establish wind direction/speed parameters to cease operations if mitigation measures cannot be made effective.

Corrective Actions

Actions to be taken shall be consummate with the nature of the odour problem and may include:

Incoming Waste

- Depending upon the severity of the odour the incoming waste will be rejected from site;
- Where excessive odour is identified during tipping, loads will be reloaded onto the delivery vehicle and rejected from site; and
- Further waste will be banned from the offending site(s) until such time as it can be demonstrated that odour has been reduced to acceptable levels.

Accepted Waste

- Immediate segregation of odorous waste to containment where appropriate;
- Relocation of wastes to a position more distant from receptor where such movement will not exacerbate the odour problem;
- Materials transferred to a suitably licensed facility for treatment or disposal within 48hrs of identification, or immediately if odour cannot be appropriately contained;
- Cessation of operations giving rise to odour; and
- Cleansing of contaminated areas.

Monitoring

The efficacy of any mitigation measures will be confirmed through further monitoring at the relevant position along the site boundary.

Notifications

Natural Resources Wales will be informed of the results of the investigations and of the actions that are to be taken in line with the requirements of the Environmental permit.

Odour Management Plan

The site is managed in accordance with a written Odour Management Plan (**MP3**). This plan provides further information relating to the management and control of odours at the site.

PR7 Accident/Pollution Incident Response Procedure - Fugitive Emissions

PR7 - Accident/Pollution Incident Response Procedure - Fugitive Emissions

Releases of particulate matter (dust) and vapours in to the air can cause harmful effects including respiratory problems and fire.

Particulate matter such as dust can be released in to the air as a result of a number of activities on site including cutting, grinding, transfer of material and baling.

Vapours can be released in to the air as a result of removal of petrol/diesel, removal of other fluids and equipment.

The Company's Health and Safety Policy, Risk Assessments and Method Statements will be adhered to at all times and the following procedure will be the subject of training in order to ensure that all employees are aware of its contents and practised in its implementation.

In order to minimise the effects of the above mentioned the following will be undertaken:

- All procedures carried out in accordance with training and best practice guidelines.
- PPE including Hi-Viz vests, safety shoes and hard hats to be worn. Dust masks and safety glasses/goggles to be worn for specified operations e.g. granulating, grinding, etc. as required.
- Appropriate ventilation available when carrying out activities e.g. doors open, extractors used.
- Activities involving flammable liquids e.g. refuelling, to be carried out away from any sources of ignition.
- No smoking except in the designated smoking area. This includes electronic cigarettes.
- No fires on-site.
- Dampening down of areas susceptible to dust creation, particularly during dry conditions.
- Checks undertaken to identify large concentrations of vapours in the air e.g. sniff test to check for petrol/diesel fumes, etc.

PR8 Emergency Incident Procedure - Discovery of Suspicious Items

PR8 - Emergency Incident Procedure - Discovery of Suspicious Items

The safety policy will be adhered to at all times and the following particular procedure will be the subject of training in order to ensure that all employees are aware of its contents and practised in its implementation.

In the event of a suspicious item being discovered on site, the following procedures will be adopted.

- Senior Manager on site to be notified immediately.
- Location cleared of all personnel.
- Emergency services notified.
- Natural Resources Wales notified.
- Site to remain under the control of the senior emergency officer until the emergency/incident is over.
- Report of the incident prepared by the senior manager and a CAR (**FR11**) raised in accordance with **PR15**.

To minimise the likelihood of suspicious items being delivered on site the following will be undertaken:

- Waste transfer and delivery notes detailing type of material/s and source to accompany every delivery on site.
- Thorough inspection of deliveries and any suspicious items immediately rejected.
- Daily walk around of site undertaken to identify suspicious items.
- Staff suitably trained in the identification of suspicious items.

PR9 Waste Acceptance Procedure

PR9 - Waste Acceptance Procedure

1 General

Staff must ensure compliance with the Environmental Permit at all times.

2 Pre-acceptance

Prior to the acceptance of hazardous waste the Site Manager (or other competent person on-site) must obtain the following information:

- the nature of the hazardous waste;
- the process producing the waste, including the variability of this process; and
- the composition of the waste (chemicals present and individual concentrations).

The waste producer is responsible for correctly characterising the waste.

If for any reason the company is not dealing directly with the waste producer, the Site Manager/competent person should carefully verify the information received, which, in addition to the minimum Duty of Care information, should include the contact details for the waste producer and a full description of the waste.

If all necessary information is not already available from the waste producer or current holder of the waste, waste characterisation must be completed by Greenacres Skip Hire (and recharged to the customer) prior to delivery, or the load refused. If Greenacres Skip Hire agrees to undertake the characterisation a representative sample(s) of the waste should be taken from the production process by a person who is technically competent to undertake the sampling process and analysed by an accredited third party laboratory who are to determine the scope of the analysis required based on the nature of the waste and the proposed treatment method (if relevant). The results should be compared against the written description and any preliminary EWC classification for consistency.

Wastes should not be accepted unless the Site Manager/competent person is satisfied that the characterisation is sufficient and the waste can be stored in accordance with the site's permit conditions. Furthermore, no waste will be accepted unless the facility has a defined treatment and disposal route with a full costing.

The information shall be recorded on a Waste Pre-Acceptance Record (**FR12**) and referenced to the waste stream so that it is available at all times.

The information must be regularly reviewed and kept up to date with any changes to the waste stream.

All records relating to pre-acceptance shall be kept for a minimum of 3 years.

3 Acceptance

Hazardous waste should not be received on site unless pre-acceptance procedures detailed above have been followed. Waste arriving on site should be labelled in accordance with The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009.

All waste, as allowed under the terms of the site's Environmental Permit and the conditions of the planning consent, enters the facility via the secure main access gates as shown on the site layout plan (Drawing **10915 – 000 - C**).

The acceptance criteria for incoming waste is that it must be within the list of permitted materials shown in the site's environmental permit and be free of significant contamination and odour.

All waste carrying vehicles entering the facility via the site main entrance, pass over the weighbridge and are weighed. The driver is required to attend at the site office where all waste transfer notes are inspected by the Site Manager (or other competent person on-site) and the information is recorded.

A schedule of permitted wastes is clearly displayed at the site office for ease of reference by the designated member of staff who will be trained and proficient in the identification of wastes and the role they undertake. All responsible staff undertake waste awareness training to ensure they are proficient in identifying waste types and in recording the necessary information under the duty of care provisions and other requirements as described in the Environmental Permit. In addition, further support, i

needed, is provided by the site's Technically Competent Person.

Hazardous wastes delivered to the site must be accompanied by a Hazardous Waste Consignment Note (HWCN). Non-hazardous waste will be transferred under a Waste Transfer Note.

Wastes will only be accepted if it is delivered to the site by registered waste carriers.

Wastes will only be accepted onto the site when there is sufficient storage capacity for that waste and the site is adequately staffed to receive it.

The Site Manager (or other competent person on-site) will carry out visual checks on the waste to confirm that it is described adequately, conforms to any pre-acceptance checks and that the waste is permitted for acceptance at the site. At this stage the load is also checked for odour in line with our odour management plan (**MP3**). Skips observed to be leaking any liquids should be immediately moved inside the waste transfer station building and a more detailed inspection carried out to establish the nature of the leaked liquid. Under no circumstances should skips leaking liquid be sent to the skip waiting area prior to inspection and tipping.

Containers should be checked to confirm quantities against accompanying paperwork. All containers should be clearly labelled and should be equipped with well-fitting lids, caps and valves secure and in place. Any damaged, corroded or unlabelled drums should be put into a quarantine area and dealt with appropriately.

Particular attention should be paid to identifying the presence of lithium-ion batteries either as separate items of waste, or where they may have been discarded in items such as Waste Electrical and Electronic Equipment (WEEE). Where these are identified during an initial inspection additional precautions, including initially tipping the load in the (impermeably surfaced area of the) open yard area to enable any lithium-ion battery to be recovered prior to moving the load into the WTS building for sorting, and ensuring appropriate firefighting materials are on hand, should be taken. Damaged lithium-ion batteries may generate sparks, catch fire or explode releasing combustible, carcinogenic, toxic, and corrosive substances. Any lithium-ion batteries displaying damage to their casing or terminals should not be stored with other undamaged batteries.

Only specified hazardous wastes are accepted on site. Should any contrary hazardous wastes be inadvertently accepted in mixed loads, then, these will be quarantined in secure containers for controlled disposal or recovery elsewhere.

Asbestos waste deliveries should be managed in accordance with the Asbestos Management Plan (**MP6**). Should waste be found to contain loose fibrous asbestos it will not be processed further by any of the site personnel but will be dealt with through an asbestos specialist. A record of such occurrences will be made in the Site Diary.

If any of the wastes are identified as containing leather, synthetic leather, other fabric, or foam (potentially containing persistent Organic Pollutants (POPs)) , the items will be stored in the quarantine area and sent to a suitably permitted site for destruction. If there is a risk of contamination from the identified POPs waste i.e. if pieces of foam, cover, lining or wadding material are released from the item the whole load will be classified as POPs waste and quarantined.

In the event of any delay in the examination of the waste consignment documentation or doubt in respect of the consignment, the vehicle is directed to a holding area until the Technically Competent Person is satisfied that the documents are in order and the waste conforms with the terms of the site permit.

Following inspection, vehicles should be directed to the appropriate tipping area. Following unloading and a further inspection made to ensure that the waste complies with the acceptance criteria, a second olfactory check should be carried out for odour in line with the odour management plan (**MP3**).

For hazardous waste deliveries (other than asbestos) the vehicle driver will be directed to the unloading area within the building. On arrival, a competent person will inspect the delivery during unloading for broken/damaged items. In the event of such damage being observed, the Site Manager is to be informed and appropriate steps taken to manage the delivery based on the nature of the waste and appropriate management of any risks to staff and/or the environment.

Following inspection, either:

- Wastes are acceptable, the company takes responsibility for the duty of care of the waste, and the driver is issued with a conveyance note confirming receipt of the waste; or
- If the Site Manager/Technically Competent Person finds any irregularities with the waste after deposit then the waste will be either re-loaded back into the vehicle and rejected from the site, or will be quarantined within a secure quarantine area pending further enquiries and agreement with or instructions received from Natural Resources Wales (as required). Procedure **PR8** must be followed if any suspicious items are discovered within the load. The Best Practicable Environmental Option for recovery/disposal of the non-conforming material will be used. Arrangements for the offsite transfer/disposal of non-conforming wastes will be made as soon as arrangements can be finalised taking due account of their potential to cause environmental impact/nuisance e.g. odour etc.

Once accepted wastes will be transferred to storage to await treatment (non-hazardous/inert wastes only) or dispatch to a suitably licensed waste facility to recovery or disposal. Appropriate PPE should be worn at all times when handling wastes. Non-hazardous/inert wastes may be subject to manual or mechanical sorting within the tipping area.

On receipt of hazardous wastes the Site Manager will unlock the appropriate storage container(s). Hazardous wastes should be transferred to the storage container in a manner that reduces the likelihood of damage and spills (e.g. in a pallet box using a fork lift truck of telehandler). Hazardous wastes should be placed in segregated storage containers/bays to prevent incidents from incompatible substances and as a means of preventing escalation should an incident occur.

Containers and bays used for storing waste should be labelled to clearly indicate their contents and any hazardous characteristics of the wastes stored therein.

Remedial measures (via a CAR Form **FR11** raised in accordance with **PR15**) will be taken in order to reduce the potential for recurrence.

Any minor leaks or spills during unloading are handled in accordance with the site Spill Procedure (**PR3**).

All records of waste received will be securely filed in the weighbridge office.

All waste movements will conform with the requirements of the Environmental Permitting Regulations.

PR10 Procedure for Assessment and Implementation of Training Needs, Competence and Awareness

PR10 - Procedure for Assessment and Implementation of Training Needs, Competence and Awareness

1. Methodology

Each person (employee, temporary or contract staff) performing tasks for or on behalf of the company, who could have a significant impact on the environment, will be assessed for their suitability, competence (training or on the job experience) and environmental awareness (e.g. in relation to company policies and procedures, and in relation to prevention of pollution).

The responsibility for this assessment lies with the Site Manager.

If there appear to be deficiencies, the responsible person will arrange the relevant training/mentoring at the earliest possible time. The responsible person should ensure that there is no risk to the environment, or any health and safety risk to employees or the public during the interim period prior to training.

2. Provision of training

Any training provided should be by a competent person or body, as defined by knowledge, qualifications or experience. The competency of the training person or body should be assessed by the responsible person as defined above.

3. Verification of training effectiveness

The verification of the effectiveness of training and awareness will be performed during the internal audit process of operational activities, or at a separate inspection if deemed necessary (i.e. for a new employee). Any random checks or inspections of employee awareness should be noted on the individual member of staff's training record (**FR8**), and any corrective actions taken if required.

4. Training Records

The responsible person defined above will ensure that the Training Checklist (**FR7**) and Training Records (**FR8**) which define needs, status of training etc. are updated and readily available for inspection. Copies of all relevant training certificates and each member of staff's Training Record (**FR8**) will be held on site within the member of staff's personnel file.

PR11 Maintenance Procedure

PR11 - Maintenance Procedure

1. Methodology

The integrity of the site's infrastructure shall be inspected daily by an appropriate member of staff. Concerns should be discussed with the Site Manager and any issues documented as a corrective action (**FR11** raised in accordance with **PR15**).

A Maintenance Checklist (**FR5A** and **FR5B**) identifying items of plant, location of maintenance instructions and responsibilities will be kept and maintained.

A separate Maintenance Record (**FR6**) will be kept for each item of plant identified in the Maintenance Checklist. Maintenance undertaken on any plant will be recorded in the relevant Maintenance Record (**FR6**) which will be filed in the Maintenance Log on completion of the work.

PR12 Procedure for Recording of Staff Responsibilities

PR12 - Procedure for Recording of Staff Responsibilities

A record of staff roles and responsibilities will be maintained (**FR9**) clearly defining roles and responsibilities (e.g. technically competent person). This document will state who is in charge of ensuring compliance with each part of the permit and other relevant legislation and guidance. This document will be kept and updated at least every 12 months, or if staff change roles or leave the organisation.

PR13 Procedure for Recording and Reporting of Environmental Incidents

PR13 - Procedure for Recording and Reporting of Environmental Incidents

All employees are responsible for reporting environmental incidents to the site operator or nominated manager. Where procedures or Permit Conditions require additional, specific records to be maintained, a written incident report must be provided to the site manager on the attached Accident and Incident Report template (**FR10**) as soon as possible after the verbal report has been made.

Where an incident is serious, Natural Resources Wales must be informed immediately by telephone or other agreed mechanism. A serious incident would include:

- Actual or imminent risk of significant environmental pollution.
- Breach of statutory limits or Site Licence Conditions.
- Any incident that must be reported to the enforcing authorities.
- Deposit of significant amounts of a non-permitted waste in skips or directly at the site.
- Any incident that could foreseeably lead to serious public complaint or media enquiries.
- Major damage to plant, equipment, premises including fires on-site.
- Serious injury of the public.
- Serious near-misses which could have foreseeably lead to any of the above.

A central file containing all Incident Reports will be maintained and will be reviewed at regular intervals to identify whether any trends or patterns can be discerned.

Where an incident is required to be reported to the enforcing authorities, the site operator must ensure that this report has been made within the required time period and in the specified format.

PR14 Complaints Procedure

PR14 - Complaints Procedure

On receipt of a customer complaint, the recipient shall enter pertinent details onto a Complaint Record (**FR2**). The Site Manager should be informed immediately and will be responsible for determining measures to be taken to address any issues.

The Site Manager in discussion with other personnel shall establish the responsibility for actioning the complaint. The nominated person will be responsible for communications with the customer to resolve the situation, including action by, and completion date.

If complaints are recent/current, a site inspection (and for odour sniff test) will be conducted by the nominated person in the area from which the complaint is received in order to assess the presence/absence of any ongoing issue. Where possible t

he likely cause of the complaint will be confirmed.

Emergency procedures within the Environmental Management System Plan or relevant procedure shall be initiated immediately if a verified event is in progress and that it is determined to be arising as a result of the company's operations.

For all complaints, reference will be made to the site activities at the time of the complaint and further onsite investigations conducted to determine whether any abnormal operations are/were occurring. Data from any onsite weather station from the time of the complaint w

ill be logged.

Remedial actions to prevent a recurrence of the incident shall be determined by the nominated person in agreement with the Site Manager and if necessary, a Corrective Action Request (**FR11**) raised in accordance with **PR15**, copies of which shall be distributed as necessary for information purposes.

Feedback will be given to complainants on the findings of these investigations if they are known, and a summary will be provided of any remedial measures taken to rectify problems and ensure that the problem has been suitably resolved. The complainant will be asked if the perceived problem is still occurring to measure any improvement achieved. In the event that a significant verified event has occurred, an apology will be issued as appropriate and a commitment given to try and prevent further occurrences

.Within 28 days of the complaint a short factual report should be submitted to Natural Resources Wales by the Site Manager or Designated Senior Manager, detailing the complaint(s) received, the investigations conducted, the findings of those investigations, whether the complaint was substantiated, any remedial measures implemented and any ongoing improvement actions to be implemented.

All stages of the progression of the complaint will be recorded. All complaints will be filed in a Complaint Log held by the Site Manager.

On completion of the remedial action, the Complaint Form, together with copies of any associated correspondence shall be forwarded to the Company Secretary for filing purposes. Records of all complaints, subsequent investigations, and remedial actions will be kept for at least five years. The Company Secretary shall ensure they are readily retrievable, and maintained as fit for retention. As applicable, records will be stored in accordance with the Data Protection Act 1998 (DPA 2018) and General Data Protection Regulation (GDPR).

Customer complaints will be reviewed at the scheduled management review meetings. Complaint trend analysis will be conducted to identify any trends and patterns in complaints to assist in identification of possible causes and solutions.

PR15 Corrective and Preventative Action Procedure

PR15 - Corrective and Preventative Action Procedure

The purpose of this procedure is to ensure that any non-conformance is identified and addressed as soon as possible. It defines who has responsibility and authority for ensuring that any incidence of non-conformance is addressed and that appropriate corrective and preventive action is taken in line with the company's quality management system.

The procedure explains how non-conformance should be addressed or, if it is not addressed or the response is inadequate, how the escalation of responsibility through senior management is effected to ensure that corrective and preventive action is undertaken appropriately. The procedure applies to all areas of the company's activities.

Examples and definitions of what might constitute an observation, non-conformance or major non-conformance are given below. Each case will be assessed on the basic of level of risk and significance of the breach. It will be for the initiator to assess the actual classification based on their personal judgement.

- **Observation** - Evidence of non-conformance which is deemed not to be a systemic failure of the management system as evidenced by the general level of conformance but which needs to be addressed. For example, the presence of a waste stockpile on the incorrect surfacing, etc..
- **Minor Non-conformance** - A significant deviation from work standards, practices, procedures, regulations, management system performance, etc., either in number of occurrences or in seriousness. Individual observations that are not addressed within a given timescale. A significant number of single observations can lead to a formal non-conformance. For example, the repeated presence of a waste stockpile on the incorrect surfacing could indicate a need for additional site infrastructure, temporary reductions in waste receipts, o
- r staff training being required.
- **Major Non-conformance** - A situation that requires immediate corrective action due to a situation which poses imminent danger, a significant breach in legislation or a previously identified significant non-conformance(s) that has not been addressed or has been inadequately addressed. For example, a damaged bund wall in danger of collapse, an unstable stockpile, etc..
- **Initiator** - The person who identifies the incidence of non-conformance and initiates a CAR form.
- **Corrective & Preventive Action** - Action taken to eliminate the cause of an identified non-conformance or other undesired situation.

Identification of Non-conformances

Reports of non-conformance may result from the following activities:

- Daily Inspections
- Internal or third-party audit findings.
- Complaints (internal or external).
- Observations.
- Accidents/Incidents.
- Housekeeping inspections.
- Checklist findings.
- Near-misses.

Responsibilities

It is the responsibility of all employees to bring suspected non-conformances to the attention of the Site Manager (or other nominated representative).

It is the responsibility of the Site Manager (or other nominated representative), to prepare and issue a Corrective Action Request (**FR11** raised in accordance with **PR15**) on detection of a non-conformance.

Site Manager

Responsible for:

- The coordination of the response to an identified non-conformance.
- Ensuring a robust monitoring system is developed to effectively address quality corrective and preventive actions and ensure that this Corrective and Preventive Action Procedure is complied with.
- Ensuring all staff are suitably trained and competent and follow the conditions set within the site's Environmental Permitting regime and as required by the environmental management system and company quality expectations (or systems where in place).

Site Staff

Responsible for:

- Identifying and reporting non-conformances.
- Ensuring compliance with the site's Environmental Permitting regime and as required by the environmental management system and company quality expectations (or systems where in place).

Procedure

Upon identifying a non-conformance, a Corrective Action Request (**FR11**) should be raised by the Initiator in accordance with this Procedure and submitted to the Site Manager detailing:

- Detailed description of he non-conformance.
- Root cause of the non-conformance.
- Corrective actions to be taken including name of the person responsible and a timescale for completion.
- Preventive measures to be taken to avoid recurrence and measure of effectiveness.
- Action completion date.

Upon receiving the Corrective Action Request (CAR) the Site Manager will assess the findings and determine the corrective and preventive actions to be undertaken. These will be communicated to the relevant parties for implementation. Once the actions are completed the Site Manager will carry out a follow-up where they will check that the actions have been correctly undertaken and a recurrence is unlikely. If they are happy with the actions they will close out the CAR. If they are unhappy they will raise the issue with a Company Director and a resolution and more sufficient corrective and preventive actions will be suggested and undertaken.

Management Review

Outstanding CARs will be tabled as a discussion topic and reviewed at weekly Site Management Meetings. The Site Manager will be responsible for updating the Corrective Action Request (**FR11**) with any actions from the meeting.

PR16 - Maintenance of Surface Water Drainage System

PR16 - Maintenance of Surface Water Drainage System

The company's safety policy will be adhered to at all times and the following particular procedure will be the subject of training in order to ensure that all employees are familiar with and practised in the execution of this procedure.

Possible pollution may result from the surface water drainage system not being maintained adequately.

Inspections

- Inspections of the drainage system shall be undertaken on a daily, weekly, monthly or annual basis in accordance with the inspection schedule shown on the Site Inspection Records (**FR1**).

Alarms and Incidents

- The interceptors are fitted with sensors to monitor High Oil, High Liquid and Silt levels and is connected to an alarm systemin the Weighbridge Office.
- In the event of the alarm being triggered the Site Manager shall be notified and action taken to investigate and undertake the necessary actions to remove the source of the alarm being activated. This may include the removal of oil or silt, or other actions.

Maintenance

Full Retention Interceptors

- The interceptor and associated equipment shall be operated and maintained in accordance with the manufacturer's instructions. A copy of the Operator's Manual is held in the site office.
- The oil level will determine how often the system needs to have excess oils removed. The oil level shall be monitored weekly and checked immediately after any significant spillage on site.
- Following installation, monthly inspections should be made so as to be able to assess the volumes of silt accumulated. The inspection and emptying programme can then be defined following the first 6 month's site experience. A maximum interval between inspections of 6 months should be defined.
- Alarm probes should be removed and cleaned with water whenever waste material is removed from the separator. Note: the alarm may alert until the liquid level is replaced.

Pumping System

- The pumping system shall be operated and maintained in accordance with the manufacturer's instructions. A copy of the Operator's Manual is held in the site office.

Drainage System

- The complete drainage system (pipework, attenuation storage and interceptor system) should be drained and its integrity inspected at least every 5 years.

Removal of Sludge, Waste Oils and Silts

- All waste removed from the drainage systems shall only be transferred off-site for treatment or disposal at licensed waste management facilities in compliance with the Duty of Care Regulations and Hazardous Waste Regulations.

Records

All significant discharges of effluent outside of the consented limits should be recorded on an Environmental Accident/Incident Record (Form **FR10**) and a Corrective Action Request (**FR11**) raised in accordance with procedure **PR15**.

Section Contents

Forms and Records
FR1 Site Inspection Records
FR2 Complaints Record
FR3 External Odour Complaint Investigation Record
FR4 Internal Odour Investigation Record
FR5A Maintenance Checklist - Infrastructure & Equipment
FR5B Maintenance Checklist - Plant and Vehicles
FR6 Maintenance Record
FR7 Training Checklist(Employee Competency Matrix)
FR8 Training Record
FR9 Roles and Responsibilities
FR10 Environmental Accident (and Incident) Record
FR11 Corrective Action Request

FR1 Site Inspection Records

Daily Inspection Record

Inspection 1 - During Operating Hours			
Inspected by			
Date		**Time**	
Checklist	**What to check for**	**Issues identified?**	**CAR Raised?**
Drainage	Obstructions, visible pooling, slow draining during rainfall.	Yes/No	
Waste Stockpiles	On correct surfaces/drainage, not exceeding max. size in FPMP, stability, fire breaks.	Yes/No	
Leaks and spills	On yard/buildings surfaces. Fuel/oil/chemical tanks.	Yes/No	
Noise	No abnormal noise on-site (if identified, check at receptors).	Yes/No	
Dust	No abnormal dust levels on-site/escaping site boundary.	Yes/No	
Mud and Debris	Deposits of mud outside of entrances/on highway, internal roads and in storage areas.	Yes/No	
Odour Monitoring	Olfactory (sniff) test at site boundary.	Yes/No	
Litter	No litter or spilled waste outside of site boundary.	Yes/No	

Inspection 2 - Evening Before Leaving Site			
Inspected by			
Time			
Checklist	**What to check for**	**Issues identified?**	**CAR Raised?**
Skips and Stockpiles	“Lights” covered/lids closed. Batteries in containers.	Yes/No	
Leaks and spills	Surfaces in yard/buildings, Fuel/Oil/Chemical Storage.	Yes/No	
Spill Kits	Spill kits replenished.	Yes/No	
Drainage	Obstructions, visible pooling, slow draining during rainfall.	Yes/No	
Site housekeeping	Site tidy, yards/floors swept.	Yes/No	
Hazards	Quarantine areas secure. Cylinders stowed and secured.	Yes/No	
Litter	No litter or spilled waste outside of site boundary.	Yes/No	
Mud and Debris	Deposits of mud outside of entrances/on highway, internal roads and in storage areas.	Yes/No	
Work equipment	Collected and stored.	Yes/No	
Firefighting Equipment	Fire extinguishers in correct locations/affixed to wall mounts. Fire hoses in place and correctly stowed.	Yes/No	
Fire Watch	Fire Prevention Checks – no evidence of heating, vehicle parking/no exhausts in contact with waste, ignition sources. Fire quarantine area available and clear.	Yes/No	
Security	Boundary fencing/gates integrity and locked, cameras functioning, floodlighting operational.	Yes/No	
Paperwork	Completed and CAR’s raised.	Yes/No	
Buildings	Personnel doors, roller shutter doors and fire exits clear of obstacles, secured and locked.	Yes/No	

Comments/ Observations (continue overleaf)	

Note: At the end of each day, please return completed forms to the main office, together with details of any CAR’s to be raised.

Weekly Inspection Record

Weekly Checks (Mondays)			
Inspected by			
Time			
Checklist	**What to check for**	**Issues identified?**	**CAR Raised?**
Drainage	Sealed sump levels.	Yes/No	
Oil Interceptors	Oil levels (irrespective of warning alarm).	Yes/No	
Site Surfacing	Damage to impermeable surfaces that could allow water to reach the ground below.	Yes/No	
Push/Bay Walls	Damage, misaligned/unstable walls.	Yes/No	
Oil/Fuel Bunds	Leaks, rainwater levels.	Yes/No	
Battery storage boxes	Damage, lids available.	Yes/No	
Mobile Plant	No damage or operating issues that could lead to environmental pollution or H&S risks to operators.	Yes/No	
Firefighting Equipment	Water levels in firewater storage tanks have not dropped below the minimum level marker.	Yes/No	
Sand bags/drain covers	Stock intact.	Yes/No	
Fire Prevention	Build-up of loose combustible wastes, dust and fluff. Damage to electrical installations. Build-up of debris in equipment.	Yes/No	

Comments/ Observations	

Note: At the end of each day, please return completed forms to the main office, together with details of any CAR's to be raised.

Monthly Inspection Record

Monthly Checks (First Week of Month)			
Inspected by			
Time			
Checklist	**What to check for**	**Issues identified?**	**CAR Raised?**
Drainage	Debris in drains, gully silting, lift inspection covers and check for flow restrictions/potential blockages.	Yes/No	
Oil Interceptors	Silt levels.		
Site Surfacing	Uneven surfacing/rutting of hardstand.	Yes/No	
Containers	Free from cracks that cold result in a loss of containment.	Yes/No	
Electricals	Inspect wiring and panels for damage.	Yes/No	
Fuel Tanks	No cracks or leaks.	Yes/No	
Fire Alarm	Test fire alarm equipment.	Yes/No	
Fire Extinguishers	Visual checks for damage to hose or nozzle, missing/broken lock pins, loose handle, service label date, pressure dial in green, corrosion or leaks.	Yes/No	
Fire Hoses	Fire hoses in good condition and free from damage. Test hose operation.	Yes/No	

Comments/ Observations	

Note: At the end of each day, please return completed forms to the main office, together with details of any CAR's to be raised.

Annual Inspection Record

Annual Checks (January)			
Inspected by			
Time			
Checklist	**What to check for**	**Issues identified?**	**CAR Raised?**
Electrics	Inspection and certification by a qualified electrician.	Yes/No	
Fire Extinguishers (inc. in vehicles and fitted to-plant)	Annual maintenance and inspection.	Yes/No	
Fire Alarms	Annual maintenance and inspection.	Yes/No	
Site Surfacing	Phased clearance and inspection for damage that could allow water to reach the ground below.	Yes/No	

Comments/ Observations	

Note: At the end of each day, please return completed forms to the main office, together with details of any CAR's to be raised.

FR2 Complaint Record

FR2 Complaint Record

If the complaint is odour related, please complete the separate odour complaint form.

Who made the complaint?	
Name:	
Address	
Phone No.	
Date and time they made the complaint	

Details	
What happened, what was it about?	
Was anyone else aware of this - other neighbours or staff? If so who?	
Did the complaint relate to the site? If so, what happened? What went wrong?	
What have you done to make sure that it does not happen again?	
Was there any **significant pollution** or **environmental damage** to land, water or protected areas - for example: dust, odour or noise pollution outside the site or spillage of polluting liquids onto the ground, or at a site of special scientific interest, or into a drain or a watercourse? (If so, then complete an incident FR6)	
If there was, then you must take steps to prevent further damage and notify Natural Resources Wales on 0800 807060 and any other relevant regulators ASAP.	Have you done so? Yes / No Who did you phone? At what time did you phone?
You must also write or send an email to confirm this to the local office (see your accident management plan for the address) Have you done so?	Yes/No What date did you contact?
Please print your name and sign:	

Continue overleaf or on a separate sheet if you do not have enough room. Keep the completed form in the file to discuss with Natural Resources Wales when they visit.

FR3 External Odour Complaint Investigation Record

FR3 External Odour Complaint Investigation Record

Odour Complaint Report Form	
Time and date of complaint:	Name and address of complainant:
Telephone number of complainant:	

Date of odour:	
Time of odour:	
Location of odour, if not at above address:	
Weather conditions (i.e., dry, rain, fog, snow):	
Temperature (very warm, warm, mild, cold or degrees if known):	
Wind strength (none, light, steady, strong, gusting):	
Wind direction (e.g. from NE):	
Complainant's description of odour: o What does it smell like?	
o Intensity (see below):	
o Duration (time):	
o Constant or intermittent in this period:	
o Does the complainant have any other comments about the odour?	
Are there any other complaints relating to the installation, or to that location? (either previously or relating to the same exposure):	
Any other relevant information:	
Do you accept that odour likely to be from your activities?	
What was happening on site at the time the odour occurred?	
Operating conditions at time the odour occurred (e.g. flow rate, pressure at inlet and pressure at outlet):	
Actions taken:	

Form completed by:	Date	Signed

Intensity (Detectability)

1 No detectable odour
2 Faint odour (barely detectable, need to stand still and inhale facing into the wind)
3 Moderate odour (odour easily detected while walking & breathing normally)
4 Strong odour
5 Very strong odour (possibly causing nausea depending on the type of odour)

FR4 Internal Odour Investigation Record

FR4 Internal Odour Investigation Record

Test Undertaken by:			**Date:**		
Time of test					
Location of test e.g. street name etc.					
Weather conditions (dry, rain, fog, snow etc.):					
Temperature (very warm, warm, mild, cold, or degrees if known)					
Wind strength (none, light, steady, strong, gusting)					
Wind direction (e.g. from NE)					
Intensity (see below)					
Duration (of test)					
Constant or intermittent in this period					
What does it smell like?					
Location sensitivity (see below)					
Is the source evident?					
Any other comments or observations					

Sketch a plan of where the tests were taken, the potential source(s).

North

Intensity (Detectability)	Location sensitivity where odour detected
1 No detectable odour 2 Faint odour (barely detectable, need to stand still and inhale facing into the wind) 3 Moderate odour (odour easily detected while walking & breathing normally) 4 Strong odour 5 Very strong odour (possibly causing nausea depending on the type of odour	0 not detectable 1 Remote (no housing, commercial/industrial premises or public area within 500m) 2 Low sensitivity (no housing, etc. within 100m of area affected by odour) 3 Moderate sensitivity (housing, etc. within 100m of area affected by odour) 4 High sensitivity (housing, etc. within area affected by odour) 5 Extra sensitive (complaints arising from residents within area affected

FR5A Maintenance Checklist - Infrastructure & Equipment

FR5A Maintenance Checklist - Infrastructure & Equipment

Item requiring maintenance	How often? (tick the appropriate box)						Where are maintenance instructions?	Who is responsible?
	Day	Week	Month	Year	2 years	5 years		
Drainage								
Operation of penstock valves and/or effectiveness of drain closure devices			✔				Site Office	NB
Integrity testing of underground pipes, sumps, tanks, silt traps and interceptors						✔	Site Office	NB
Integrity testing of surface water containment systems (bunds, kerbing, etc.)					✔		Site Office	NB
Containment								
Integrity testing of oil/fuel bunds.				✔			Site Office	NB
Integrity of hazardous waste storage areas and equipment (covered bays/skips, stillages, containers, tanks, etc.)			✔				Site Office	NB
Check Spill Kits for missing items			✔				Site Office	NB
Surfacing								
Integrity of impermeable surfaces. Inspection by Civil Engineer.				✔			Site Office	NB
Integrity of hardstand surfaces			✔				Site Office	NB
Safety								
Inspection and testing of electrical systems by Qualified Electrician.				✔			Site Office	NB
Check First Aid Box and PPE, replace missing/out of date items			✔				Site Office	NB
Security								
Integrity/continuity of fences and gates.		✔					Site Office	NB
Maintenance of CCTV system				✔			Site Office	NB
Fire Safety								
Integrity of fire walls.			✔				Site Office	NB
Servicing of firefighting equipment				✔			Site Office	NB
Equipment								

Maintenance of fuel storage system. (As advised by the supplier.)				✔			Site Office	NB
Weighbridge inspection and calibration				✔			Site Office	NB

Details of work carried out to be recorded in the Site Diary.

FR5B Maintenance Checklist - Plant and Vehicles

FR5B Maintenance Checklist - Plant and Vehicles

Item requiring maintenance	How often? (tick the appropriate box)						Where are maintenance instructions?	Who is responsible?
	Day	Week	Month	500 Hours	Year	Other		
Baler (as advised by the supplier)					✔		Site Office	NB
Excavators (as advised by the supplier)				✔			Site Office	NB
Crusher (as advised by the supplier)				✔			Site Office	NB
Screen (as advised by the supplier)				✔			Site Office	NB
Shredder (as advised by the supplier)				✔			Site Office	NB
FLS/Telehandler (as advised by the supplier)				✔			Site Office	NB
Fuel Bowser (as advised by the supplier)`					✔		Site Office	NB
Weighbridge (as advised by the supplier)					✔		Site Office	NB

Details of work carried out to be recorded in the Maintenance Record (FR6)

FR6 Maintenance Record

FR6 Maintenance Record

Type of Vehicle/Plant:……

Serial/Registration/Chassis Number:……..

Item:		**Frequency:**
Completed on	**Completed by**	**Comments**

FR7 Training Checklist

FR7 Training Checklist

JOB ROLE	TRAINING REQUIRED (check boxes to show who needs which training)																		COMMENTS
	Environmental/H&S							Maintenance/operations						Accidents and emergency					
	Induction Training	CoTC/WAMITAB Level 4	Environmental and permit awareness	Waste receipt inc Duty of Care	Waste separation and storage			Maintenance of equipment	Maintenance of Petrol storage	Maintenance of drainage				Fire procedure	Spill response procedure	Failure of services	First Aid	Fire response	
TCM	X	X	X	X	X									X	X				
Site Manager	X		X	X	X									X	X				
Weighbridge Operator	X		X	X	X									X					
Skip Lorry Drivers	X		X		X									X	X				
Yard Operatives	X		X		X									X	X				
Plant Operators	X		X											X	X				
Transport Manager	X							X	X	X				X	X				
Fitter	X							X	X	X				X	X				
First Aiders	X													X			X		
Fire Wardens	X													X				X	

Administrative Staff	X													X		X			

FR8 Training Record

FR8 Training Record

Employee Name	Job Title

Training Required	Date due	Date done	Passed as competent? yes/no	Reviewers Signature	Date for Refresher	Comments

FR9 Staff Roles and Responsibilities

FR9 Staff Roles and Responsibilities

Name	Role	Part of permit responsible for	Any other legislative responsibilities?	Required training received?
Nicholas Brannan	Managing Director	All	Corporate Governance, Finance, H&S, Transport	Yes
Nicholas Brannan	TCM	Compliance Duty of Care Waste Acceptance/ Processing/ Distpatch	H&S Compliance	Yes
Cian	Weighbridge	Waste Acceptance/Duty of Care		Yes
	Transport Manager	N/A	Transport (DVSA)	Yes

FR10 Accident (and Incident) Record

FR10 Accident (and Incident) Record

Record of accidents, incidents or near misses

Details	
Date and time of the incident	
What happened, what was it about?	
Was anyone else aware of this - other witnesses? If so who?	
What caused it?	
What have you done to make sure that it does not happen again?	
Was there any **significant pollution** or **environmental damage** to land, water or protected areas - for example: dust, odour or noise pollution outside the site or spillage of polluting liquids onto the ground, or at a site of special scientific interest, or into a drain or a watercourse? If so what?	Is there a continuing threat? Yes / No
If there was (or still is), then you must take steps to prevent further damage and notify Natural Resources Wales on 0800 807060 and any other relevant regulators ASAP.	Have you done so? Yes / No Who did you phone? At what time did you phone?
You must also write or send an email to confirm this to the local office (see your accident management plan for the address) Have you done so?	Yes/No What date did you contact?
Please print your name and sign:	

Continue overleaf or on a separate sheet if you do not have enough room.

Keep the completed form in the file to discuss with Natural Resources Wales when they visit.

FR11 Corrective Action Request

FR11 Corrective Action Request

Corrective Action Request No.	
Date CAR raised	
Response to e.g. audit, observation, complaint, improvement suggestion, near miss, accident, non-conforming product etc.	
Person(s) Responsible for CAR	
CAR Origin e.g. Area number (1-office, 2- transfer station building, 3- yard, 4-external, 5-other)	

Details of Non-Conformance

Root cause analysis

Action(s) to be taken	Person Responsible	Timescale	Completed

Preventive Measures taken to avoid recurrence and controls applied to ensure effectiveness

Procedures Modified? (If Yes, Reference No.)			
Action Complete (Signed):		**Follow-Up Date:**	
		Close-Out Date:	

Section Contents

Site Rules
SR1 Site Rules

SR1 Site Rules

Site Rules

SITE SAFETY RULES AND REGULATIONS FOR VISITORS AND SUPPLIERS



Always adhere to the speed limit for the site.



Follow the directional signs at all times except when reversing into unloading bay. Hazard warning lights are to be used when reversing.



Always give way to reversing vehicles and pedestrians.



Park vehicles in designated parking bays only.



No unauthorised passengers, children (under 16 years of age) or animals are allowed on site.



Smoking is strictly prohibited on the site.



High visibility jackets and safety footwear **must** be worn at all times whilst out of vehicle on site.



Always STOP at Weighbridge to weigh in and out of site.

All drivers must strictly comply with these rules.
Any driver found not complying will be refused access to the site in future.

1. Always adhere to the speed limit for the site. Be observant of pedestrians and other vehicles.
2. Follow the direction signs at all times. Be aware that machines may travel in all directions whilst carrying out their duties.
3. High Visibility vests and safety footwear must be worn at all times on site.
4. Upon arrival, report to weighbridge. Await instructions to proceed to loading/unloading destination.
5. You may only reverse into loading/unloading bays under supervision from an Agresol employee.
6. After loading/unloading, return to weighbridge to be weighed out.
7. It is the driver's responsibility to adhere to vehicle maximum weight. Agresol will accept no liability for cases of overload.
8. Adhere to site speed limit until you rejoin the public road.

Fire / Emergency Evacuation Procedures - On hearing the continuous siren/bell, evacuate the building by using the nearest marked fire exit. DO NOT move your vehicle unless instructed to do so by site personnel. If you do not need to move your vehicle, proceed to the fire assembly point which is near the weighbridge. If requested to move your vehicle, do so ensuring it is parked in a safe manner and not causing an obstruction - then return to the assembly point.
Smoking on Site - There is strictly no smoking on site.
Accidents - If you have an accident on site, report it immediately to a member of staff who will contact a First Aider and a Supervisor. An investigation will be carried out and you are obliged to assist.
Toilet Facilities - These are available as unisex facilities. If you need to access these areas, please beware of moving traffic and the movement of Mechanical Handling Equipment within the site.
Children (Under 16 years of age) - Children are not allowed on site.
Permits to Work - If you are carrying out any work on site please report to the respective Manager before carrying out any work. If a Permit to Work is required it will be issued and you will be reequired to adhere rigidly to its requirements.

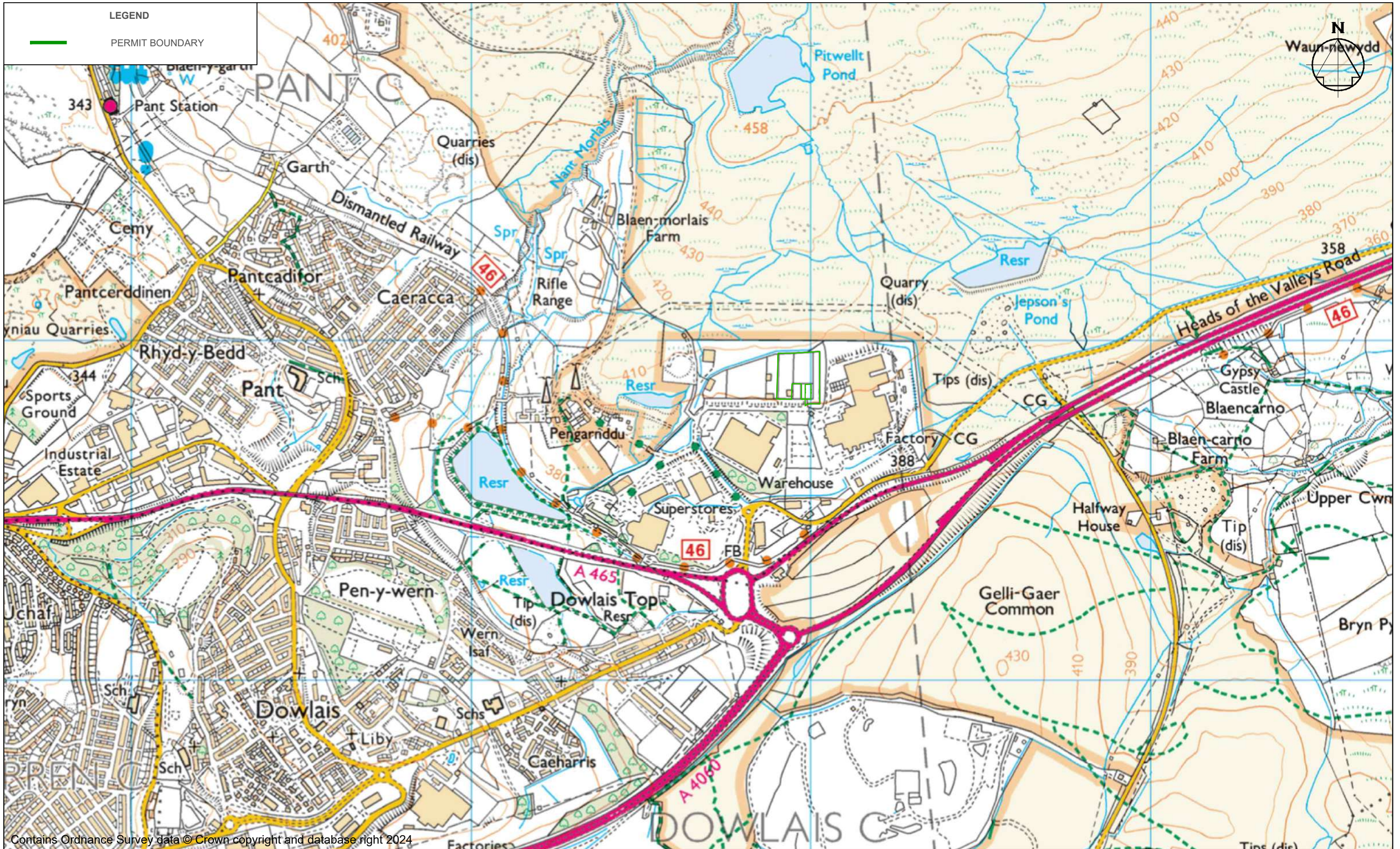
By entering site you have agreed to these rules and regulations.

Section Contents

Drawings
10915 – 000 - A Permitted Area Plan
10915 – 000 - B Location Plan
10915 – 000 - C Site (Block) Plan
10915 – 000 - D Drainage Plan
10915 – 000 - E Storage Plan
10915 – 000 - F Satellite Image
10915 – 000 - G Receptor Plan
10915 – 000 - H Process Flowchart
10915 – 000 - I Emergency Access Plan
10915 – 000 - J Emergency Plan
10915 – 000 - K Receptor Plan (Fire Response)

Drawings

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AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	UPDATE BASE MAP	04/07/22	SCW	NB
B	UPDATE BASE MAP	24/04/23	SCW	NB
C	UPDATE BASE MAP	25/07/25	SCW	NB

TECHNIA ENVIRONMENT AND PLANNING LTD
UNIT 1 FOXES LANE, OAKDALE BUSINESS PARK
BLACKWOOD, NP12 4AB
TEL: 02921 900400
EMAIL: PLANNING@TEPL.EU

MERTHYR BOROUGH RECYCLING COMPANY LTD

LOCATION PLAN

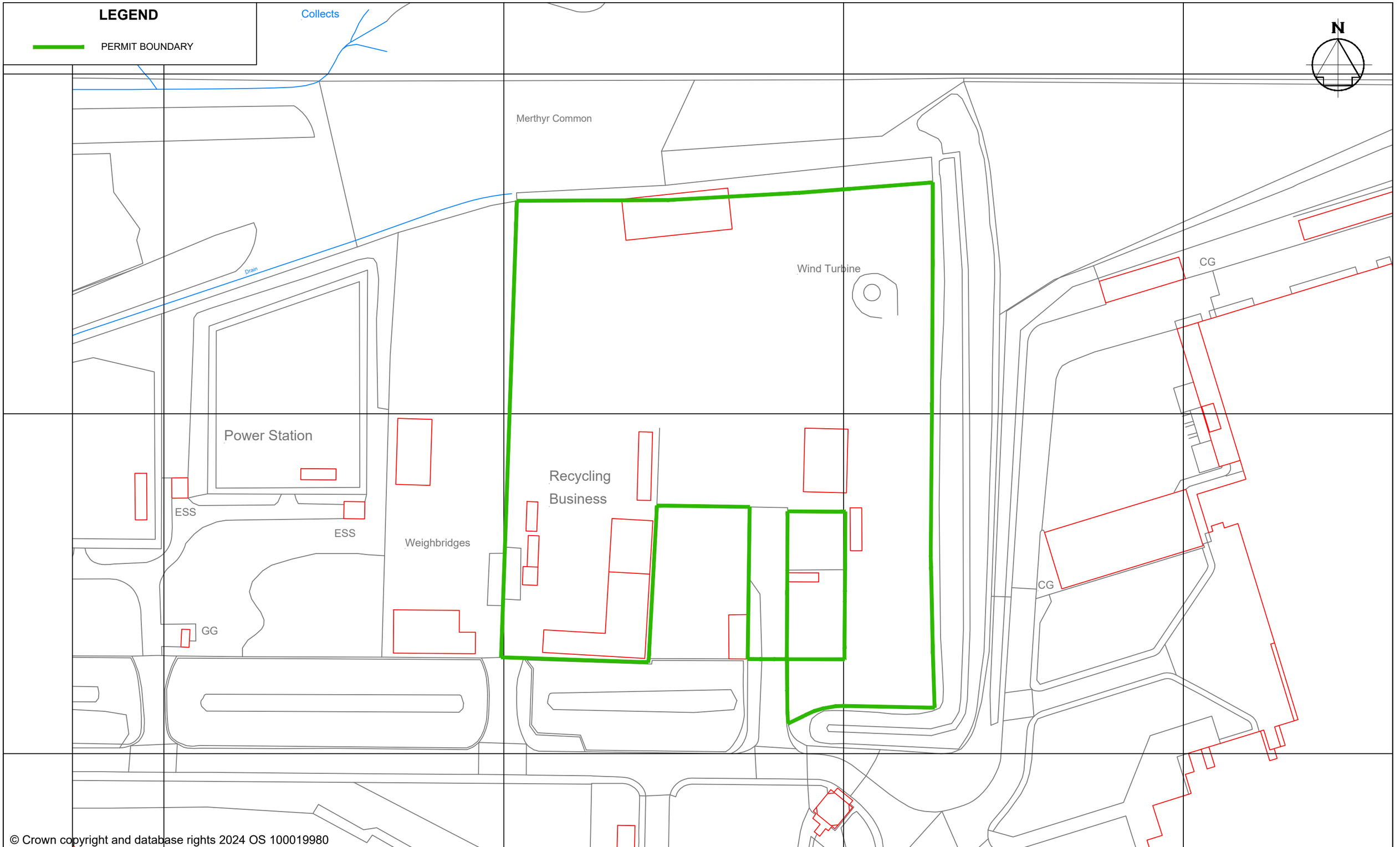
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Drawn	SCW	1:10,000
Ch'kd	NB	
Appr'd	NB	@A3
Date	25/07/25	

Job No. MBRC Drg No. 10915 - 000 - A

Contents Page

LEGEND

PERMIT BOUNDARY



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AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	UPDATE BASE MAP	24/04/23	SCW	NB
B	UPDATE BASE MAP	25/07/25	SCW	NB

TECHNIA ENVIRONMENT AND PLANNING LTD
UNIT 1 FOXES LANE, OAKDALE BUSINESS PARK
BLACKWOOD, NP12 4AB
TEL: 02921 900400
EMAIL: PLANNING@TEPL.EU

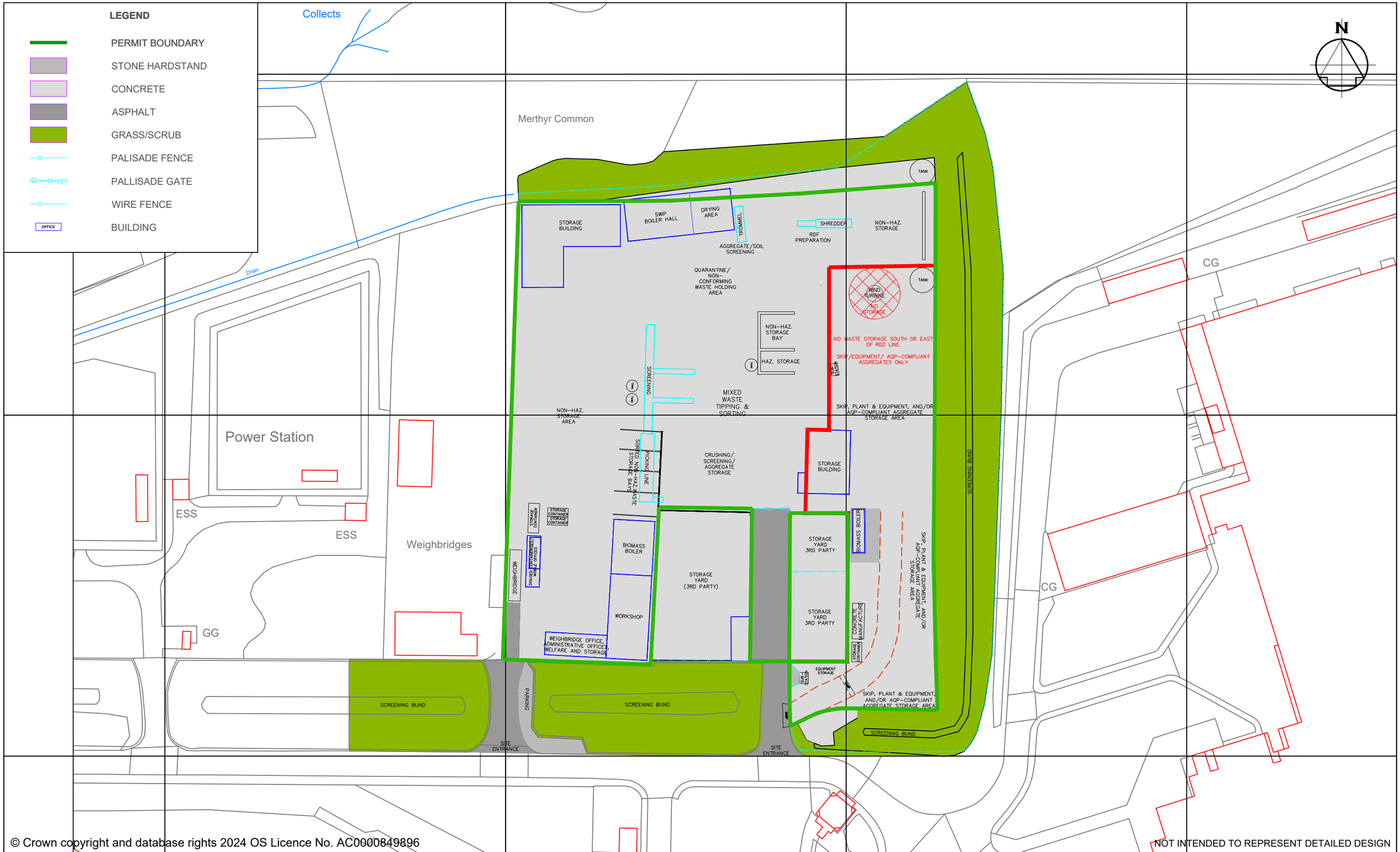
MERTHYR BOROUGH RECYCLING COMPANY LTD

SITE PLAN

Drawn	SCW	Scale	1:1,000
Ch'kd	NB		
Appr'd	NB	@A3	
Date	25/07/25		

Job No.	MBRC	Drg No.	10915 - 000 - B

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NOT INTENDED TO REPRESENT DETAILED DESIGN

AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	UPDATE LAYOUT	19/12/21	SCW	NB
B	UPDATE LAYOUT	24/04/23	SCW	NB
C	UPDATE BASE MAP, UPDATE LAYOUT	25/07/25	SCW	NB

TECHNIA ENVIRONMENT AND PLANNING LTD
UNIT 1 FOXES LANE, OAKDALE BUSINESS PARK
BLACKWOOD, NP12 4AB
TEL: 02921 900400
EMAIL: PLANNING@TEPL.EU

MERTHYR BOROUGH RECYCLING COMPANY LTD

SITE LAYOUT

Drawn	SCW	Scale	1:1,000
Ch'kd	NB		
Appr'd	NB	@A3	
Date	25/07/25		

Job No.	MBRC	Drg No.	10915 - 000 - C

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LEGEND

- PERMIT BOUNDARY
- STONE HARDSTAND
- CONCRETE
- ASPHALT
- GRASS/SCRUB
- BUILDING (OFFICE)

SURFACE WATER DRAINAGE (COLOUR MATCHES CATCHMENT AREA)

- DRAINED AREAS
- FALL
- GULLEY
- BELOW GROUND PIPEWORK (TO SEWER)
- CUT-OFF DRAIN
- SILT TRAP/STORAGE TANK/ INTERCEPTOR
- SILT TRAP
- INTERCEPTOR

Collects
Merthyr Common
Power Station
ESS
ESS
Weighbridges
GG
CG
CG
N
STORAGE BUILDING
SWIP BOILER HALL
DRYING AREA
TROMMEL
SHREDDER
RDF PREPARATION
NON-HAZ. STORAGE
AGGREGATE/SOIL SCREENING
TANK
TANK
WATER
QUARANTINE/ NON-CONFORMING WASTE HOLDING AREA
WIND TURBINE
NO STORAGE
NON-HAZ. STORAGE BAY
NO WASTE STORAGE SOUTH OR EAST OF RED LINE.
SKIP EQUIPMENT/ AQP-COMPLIANT AGGREGATES ONLY
SURFACE WATER DRAINED ACROSS IMPERMEABLE SURFACE TO SILT TRAP /INTERCEPTOR TO SEWER
NON-HAZ. STORAGE BAY
SURFACE WATER DRAINED ACROSS IMPERMEABLE SURFACE TO SILT TRAP /INTERCEPTOR TO SEWER
SCREENING
MIXED WASTE TIPPING & SORTING
SKIP, PLANT & EQUIPMENT, AND/OR AQP-COMPLIANT AGGREGATE STORAGE AREA
SORTED NON-HAZ STORAGE BAYS
PICKING LINE
CRUSHING/ SCREENING/ AGGREGATE STORAGE
INTERCEPTOR OUTLET TO SEWER BLOCKED OFF
STORAGE BUILDING
PUMP DISCHARGE TO FOUL SEWER
PUMP
SILT TRAP/ HOLDING TANK
CLASS 1 FULL-RETENTION INTERCEPTOR
CLASS 1 FULL-RETENTION INTERCEPTOR
KERB
SILT TRAP/ HOLDING TANK
CUT-OFF DRAIN
BIOMASS BOILER
STORAGE YARD 3RD PARTY
BIOMASS BOILER
SURFACE WATER DRAINED ACROSS IMPERMEABLE SURFACE TO SILT TRAP/INTERCEPTOR TO SEWER
SKIP, PLANT & EQUIPMENT, AND/OR AQP-COMPLIANT AGGREGATE STORAGE AREA
STORAGE CONTAINER
STORAGE CONTAINER
STORAGE CONTAINER
CLASS 1 FULL-RETENTION INTERCEPTOR
WEIGHBRIDGE
STORAGE YARD (3RD PARTY)
STORAGE YARD 3RD PARTY
RAISED KERB
WORKSHOP
CONCRETE MANUFACTURE
WEIGHBRIDGE OFFICE, ADMINISTRATIVE OFFICES, WELFARE AND STORAGE
EQUIPMENT STORAGE
PUMP STATION
CHANNEL
SCREENING BUND
SCREENING BUND
SCREENING BUND
PARKING
SITE ENTRANCE
SITE ENTRANCE
SILT TRAP/ HOLDING TANK
EXISTING DISCHARGE TO FOUL SEWER
EXISTING DISCHARGE TO SURFACE WATER SEWER

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AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	UPDATE LAYOUT AND DRAINAGE DETAILS	19/12/21	SCW	NB
B	ADD SILT TRAP PROPOSAL	04/07/22	SCW	NB
C	UPDATE LAYOUT	24/04/23	SCW	NB
D	UPDATE SURFACING AND INTERCEPTOR DETAILS	02/11/23	SCW	NB
E	UPDATE BASE MAP, UPDATE DRAINAGE FOLLOWING DCWW SURVEY	25/07/25	SCW	NB

TECHNIA ENVIRONMENT AND PLANNING LTD
UNIT 1 FOXES LANE, OAKDALE BUSINESS PARK
BLACKWOOD, NP12 4AB
TEL: 02921 900400
EMAIL: PLANNING@TEPL.EU

MERTHYR BOROUGH RECYCLING COMPANY LTD

DRAINAGE PLAN

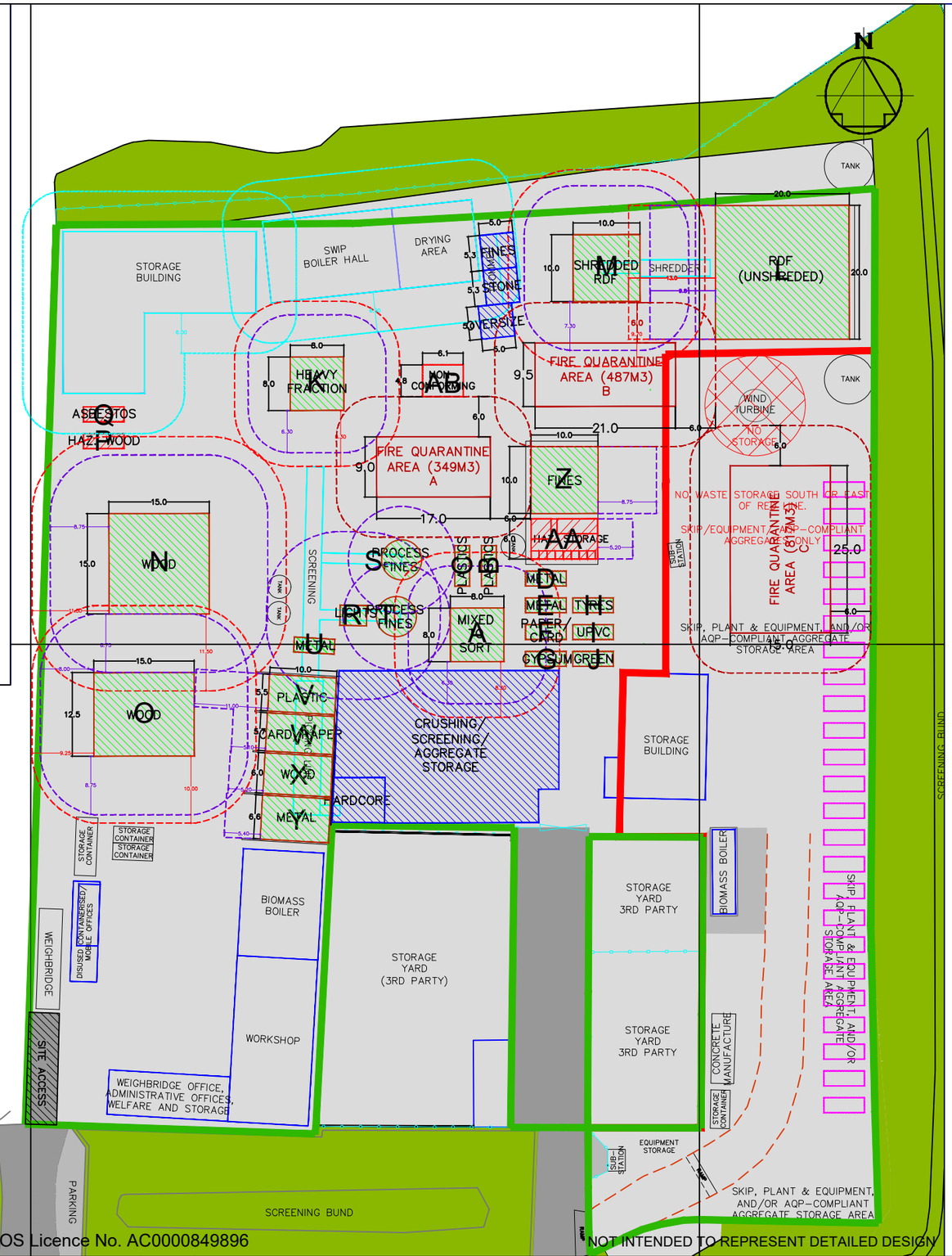
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Ch'kd	NB		
Appr'd	NB		@A3
Date	25/07/25		

Job No. MBRC Drg No. 10915 - 000 - D

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LEGEND

- PERMIT BOUNDARY
- STONE HARDSTAND
- CONCRETE
- ASPHALT
- GRASS/SCRUB
- PALISADE FENCE
- PALLISADE GATE
- WIRE FENCE
- BUILDING
- HAZARDOUS WASTE STORAGE
- NON-HAZARDOUS (COMBUSTIBLE) WASTE STORAGE
- NON-HAZARDOUS (INERT) WASTE STORAGE
- STOCKPILE TO STOCKPILE FIRE BREAK
- STOCKPILE TO BUILDING FIRE BREAK
- FIRE QUARANTINE



A	Incoming Waste (mixed and source segregated)	Central storage yard	Stockpile	No	Yes	8m x 8m x 4m	256.0	1	55.8	7 days
B	Rigid Plastics	Central storage yard	RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	3.1	3 months
C	Plastic Film		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	3.8	3 months
D	Metals		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	11.3	3 months
E			RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	3.8	3 months
F	Paper & Cardboard		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	2.6	3 months
G	Gypsum		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	7.7	3 months
H	Tyres		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	5.8	3 months
I	uPVC		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	3.1	3 months
J	Green		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	4.4	1 month
K	Mixed (Sorted Heavy Fraction)	Central storage yard	Stockpile	No	Yes	8m x 8m x 4m	256.0	1	55.8	3 months
L	Mixed (Sorted Light Fraction)	North eastern storage yard	Stockpile	No	Yes	20m x 20m x 4m	1600.0	1	195.4	3 months
M	Refuse Derived Fuel (RDF)		Stockpile	No	Yes	10m x 10m x 4m	400.0	1	48.8	3 months
N	Unprocessed Wood	Western storage yard	Stockpile	No	Yes	15m x 15m x 4m	900.0	1	98.6	1 months
O	Woodchip		Stockpile	No	Yes	15m x 12.5m x 4m	750.0	1	123.8	3 months
P	Wood		RoRo Skip	Yes	Yes	6.1m x 2.4m x 2.6m	38.1	1	4.1	3 months
Q	Asbestos		Enclosed Container	Yes	No	6.1m x 2.4m x 2.6m	38.1	1	3.9	3 months
R	Mixed (Sorted Light Fraction)	Centre of site below screen and picking line	Cage	No	Yes	4m x 3m x 3m	36.0	1	4.4	3 months
S	Process Fines		Stockpile	No	Yes	10m x 4.55m x 4m	182.0	1	22.2	1 month
T	Process Fines		Stockpile	No	Yes	10m x 4.55m x 4m	182.0	1	22.2	1 month
U	Ferrous Metal		RoRo Skip	No	Yes	6.1m x 2.4m x 2.6m	38.1	1	11.3	3 months
V	Plastics		Bay	No	Yes	10m x 5.5m x 4m	220.0	1	38.2	3 months
W	Paper & Cardboard		Bay	No	Yes	10m x 5.7m x 4m	228.0	1	15.8	3 months
X	Wood		Bay	No	Yes	10m x 6.0m x 4m	240.0	1	26.1	3 months
Y	Non-Ferrous Metal		Bay	No	Yes	10m x 6.6m x 4m	264.0	1	28.5	3 months
Z	Process Fines	Central storage yard	Bay	No	Yes	10m x 10m x 4m	400.0	1	48.8	1 month
AA	Waste Quarantine		Covered Bay	Yes	Yes	10m x 6m x 4m	240.0	1	26.1	1 months
AB	Non-Conforming Waste		RoRo Skips	No	Yes	6.1m x 2.4m x 2.6m	38.1	2	8.3	7 days

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AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	UPDATE LAYOUT	19/12/21	SCW	NB
B	UPDATE LAYOUT	24/04/23	SCW	NB
C	UPDATE BASE MAP, UPDATE STORAGE ARRANGEMENTS	25/07/25	SCW	NB

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TEL: 02921 900400
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MERTHYR BOROUGH RECYCLING COMPANY LTD

STORAGE PLAN

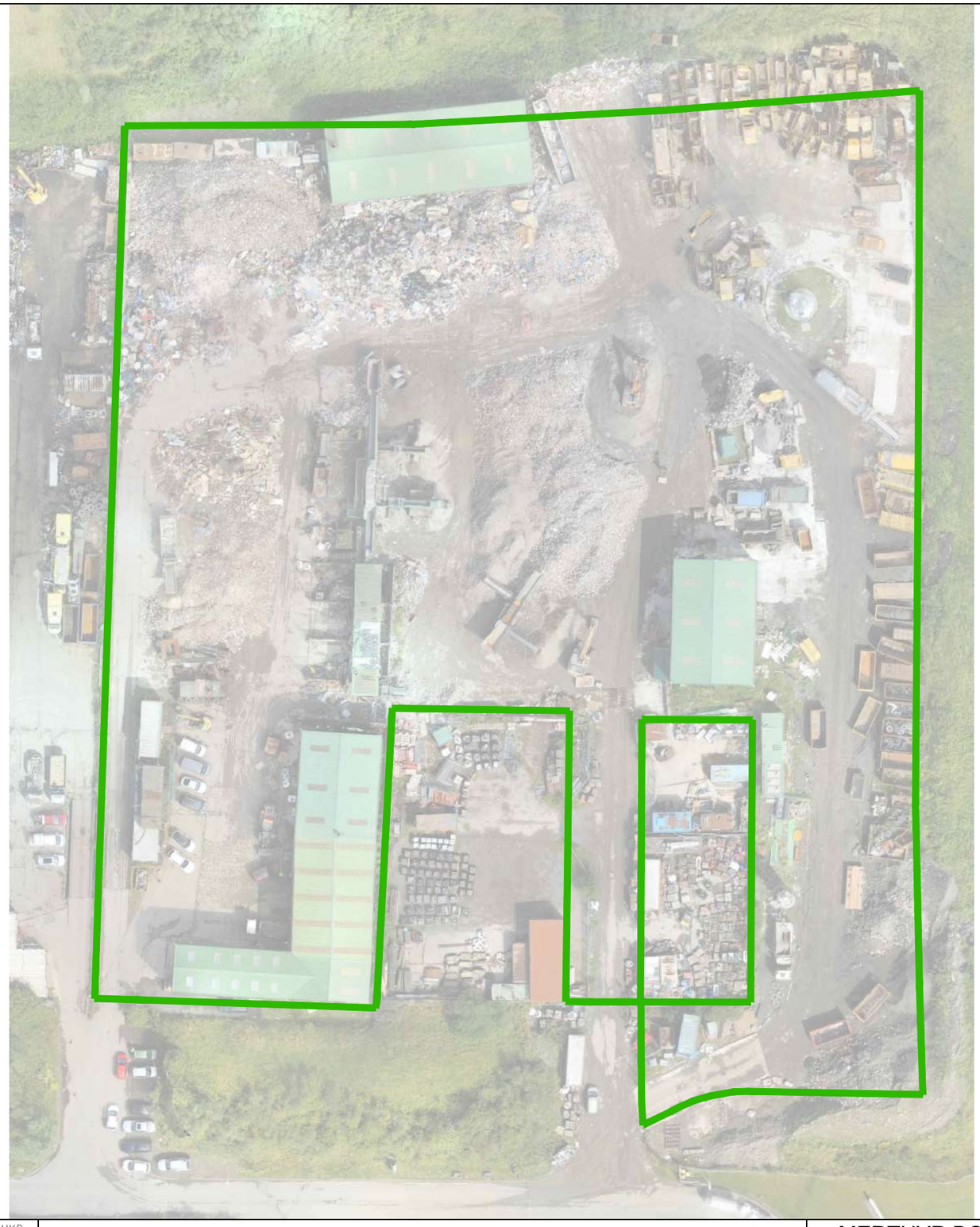
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Ch'kd	NB		
Appr'd	NB	@A3	
Date	25/07/25		

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LEGEND

PERMIT BOUNDARY



N

AMENDMENTS	REV REF	DETAILS	DATE	MADE BY	CHKD BY
	A	UPDATE SATELLITE PHOTOGRAPH	19/12/21	SCW	NB
	B	UPDATE SATELLITE PHOTOGRAPH	25/07/25	SCW	NB

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SATELLITE IMAGE 16/08/24

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Ch'kd	NB	1:750	
Appr'd	NB	@A3	
Date	25/07/25		

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LEGEND

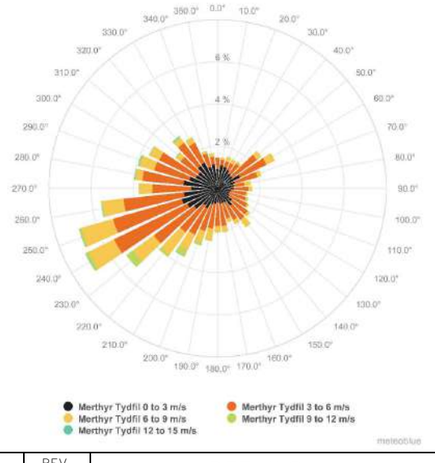
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- 1000M/2000M SCREENING BOUNDARIES

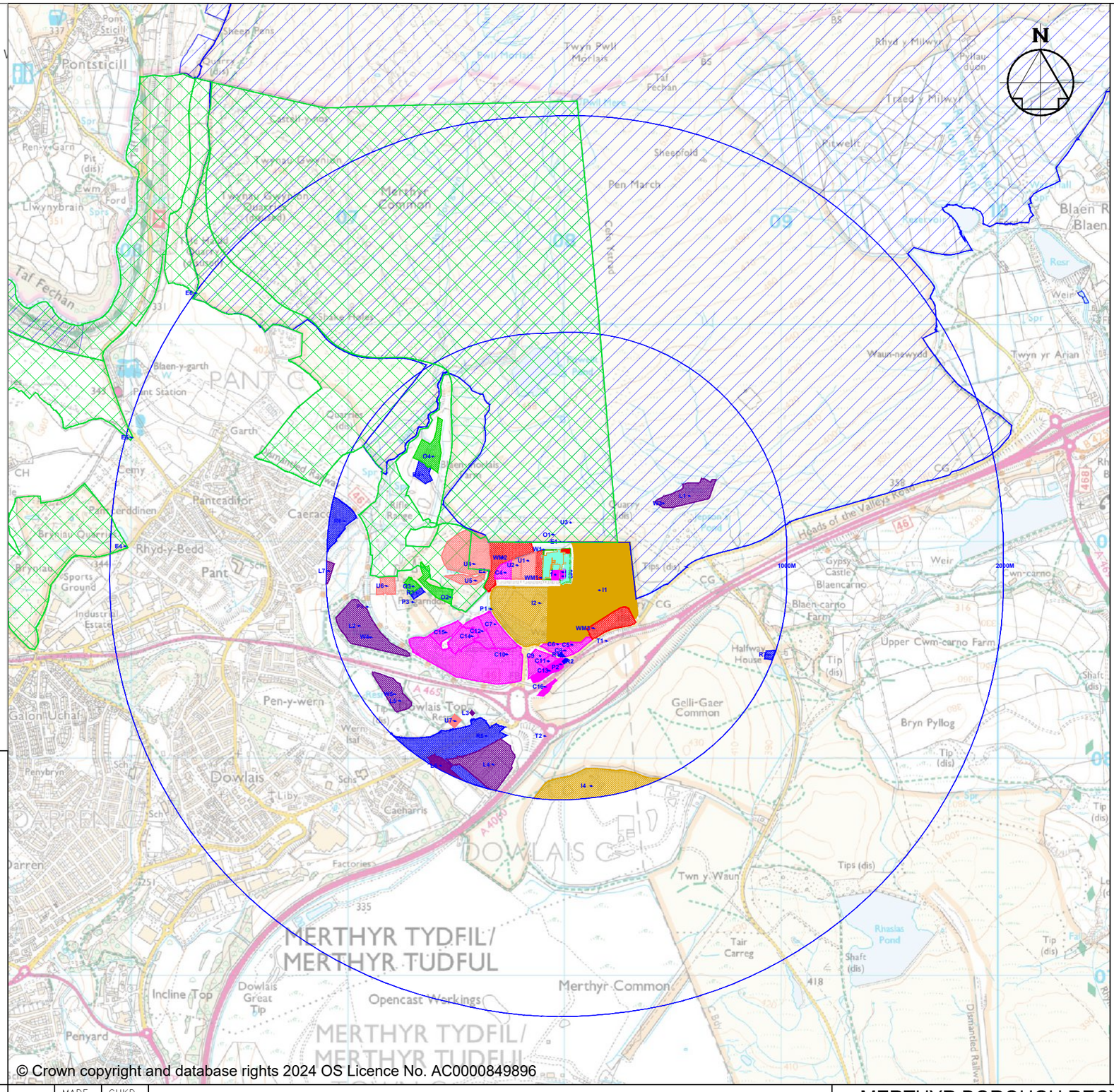
HUMAN RECEPTORS

- R3 RESIDENTIAL
- C3 COMMERCIAL
- I3 INDUSTRIAL
- O3 OTHER
- U3 UTILITY
- L3 LEISURE/RECREATION
- W3 WASTE MANAGEMENT
- T3 KEY TRANSPORT ROUTE
- P3 PUBLIC RIGHT OF WAY
- OPEN ACCESS LAND

ECOLOGICAL RECEPTORS

- E3 SSSI
- E3 SAC
- E3 RAMSAR
- E3 SPA
- E3 NNR
- E3 LNR
- E3 SINC
- W1





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RECEPTOR TYPE

G	0M	GROUNDWATER
C1	0M	STORAGE YARD
C2	0M	STORAGE YARD
C3	0M	SALVAGE YARD
WM1	0M	ELV ATF
W1	2M	WATERCOURSE
I1	8M	ABATTOIR
E1	29M	SSSI
E2	29M	SINC
O1	31M	OPEN ACCESS LAND
U1	34M	STOR ENERGY
I2	36M	AUTOMOTIVE PARTS MANUFACTURER
WM2	45M	WASTE TRANSFER STATION
U2	100M	STOR ENERGY
U3	121M	33KV OVERHEAD POWER LINES
C4	146M	SALVAGE YARD
WM3	221M	ELV ATF
U4	241M	RESERVOIR (UNDERGROUND)
E3	248M	SINC
U5	264M	RESERVOIR (ABOVE GROUND)
C5	264M	CARAVAN STORAGE
P1	276M	PUBLIC RIGHT OF WAY
C6	277M	FURNITURE RETAILER
C7	286M	FURNISHINGS RETAILER
C8	295M	MOT CENTRE
T1	309M	A465 HEADS OF THE VALLEYS ROAD
R1	320M	RESIDENTIAL PROPERTY
C9	326M	GROCERIES RETAILER
C10	326M	GROCERIES RETAILER/PETROL STATION
C11	334M	STORAGE YARD
C12	343M	CARPET RETAILER
C13	357M	OFFICE/STORAGE YARD
R2	348M	RESIDENTIAL PROPERTY
P2	374M	NATIONAL CYCLE ROUTE 46
C14	391M	HOMEWARES RETAILER
O2	416M	STABLES/STORAGE/ALLOTMENTS
C15	428M	FLOORING/FURNITURE RETAILERS
C16	442M	PETROL STATION
W3/L1	445M	POND
R3	549M	RESIDENTIAL PROPERTY
O3	565M	STABLES/STORAGE YARDS
O4	606M	FARM
R4	608M	RESIDENTIAL PROPERTIES
P3	609M	PUBLIC RIGHT OF WAY
U6	682M	ELECTRICITY SUBSTATION
L3	688M	PARK/RECREATION AREA
R5	700M	RESIDENTIAL PROPERTIES
W4/L2	705M	RESERVOIR (ANGLING)
U7	745M	RESERVOIR (UNDERGROUND)
L4	762M	PLAYING FIELDS
W5/L5	816M	RESERVOIR (ANGLING)
P4	820M	PUBLIC RIGHT OF WAY
I5	862M	LANDFILL
R6	878M	RESIDENTIAL PROPERTIES
L6	948M	PLAYING FIELDS
R7	958M	RESIDENTIAL PROPERTY
L7	964M	PLAYING FIELD
E4	1920M	SINC
E5	1967M	SINC
E6	1993M	SINC

AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	REPLACE PREVIOUS RECEPTOR PLAN (FPMP V5 REV 1 – 19/017D 001)	25/07/25	SCW	NB

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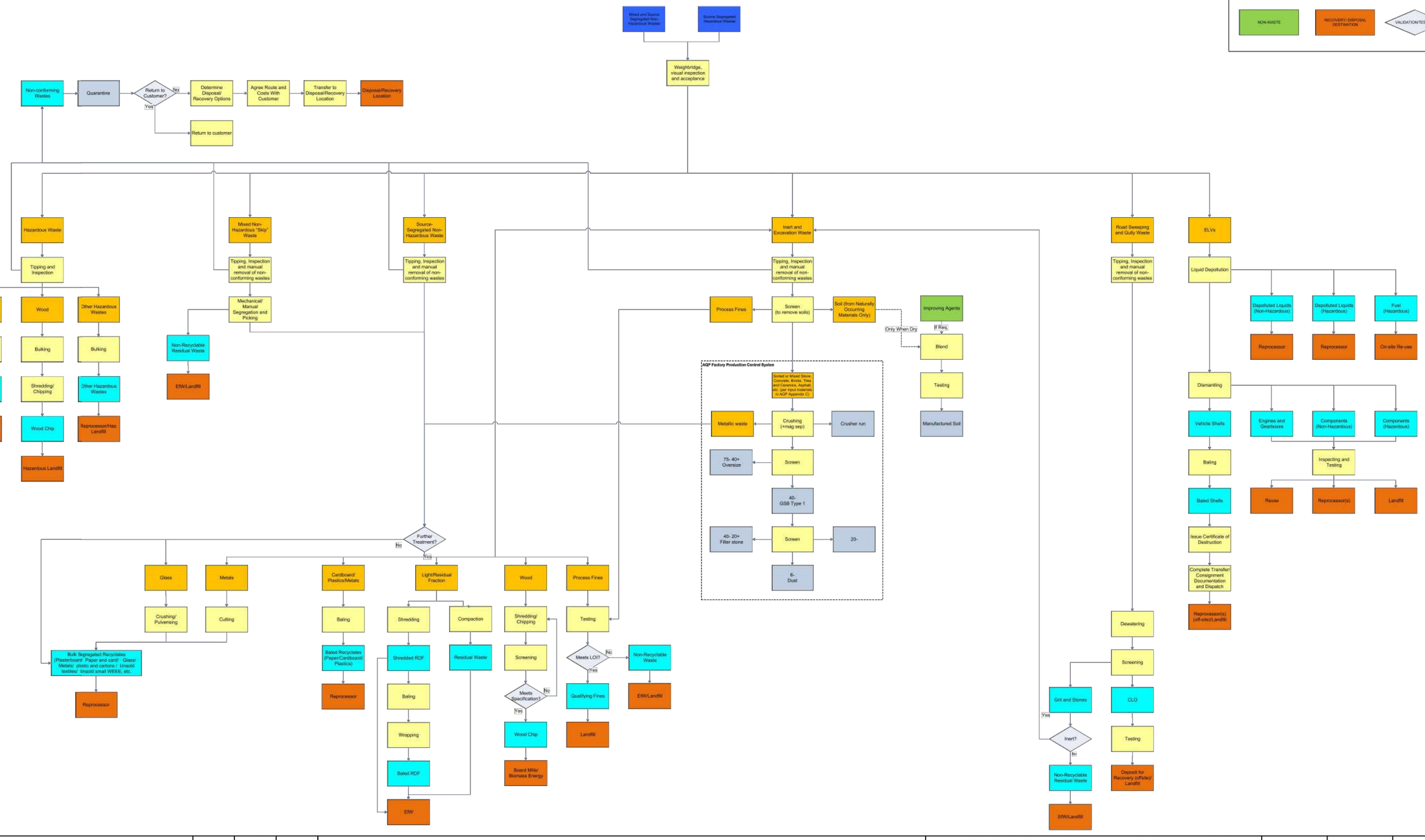
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RECEPTOR PLAN

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Ch'kd	NB		
Appr'd	NB		@A3
Date	25/07/25		

Job No. MBRC Drg No. 10915 - 000 - G

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AMENDMENTS	REV REF	DETAILS	DATE	MADE BY	CHKD BY
	A	REVISE LAYOUT TO IMPROVE READABILITY	25/07/25	SCW	NB

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PROCESS FLOWCHART

Drawn	SCW	Scale
Ch'kd	NB	NTS
Appr'd	NB	@A3
Date	25/07/25	

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LEGEND

- PERMIT BOUNDARY
- HAZARDOUS WASTE/ CHEMICALS/ COMPRESSED GASES
- COMBUSTIBLE WASTES
- NON-COMBUSTIBLE WASTE
- EMERGENCY VEHICLE ACCESS/EGRESS
- REFER TO STORAGE PLAN FOR DETAILS OF WASTES

N

STORAGE BUILDING
SWIP BOILER HALL
DRYING AREA
FINES
SCREENING
SHREDDED RDF
SHREDDER
RDF PREPARATION
RDF (UNSTORED)
NON-HAZ. (UNSTORED)
AGGREGATE/SOIL SCREENING
HEAVY FRACTION
QUARANTINE/ NON-CONFORMING WASTE HOLDING AREA
Wind Turbine
WIND TURBINE
NO STORAGE
TANK
ASBESTOS
HAZ. WOOD
NON-HAZ. STORAGE BAY
NO WASTE STORAGE SOUTH OR EAST OF RED LINE.
SKIP/EQUIPMENT/ AQP-COMPLIANT AGGREGATES ONLY
WOOD
SCREENING
PLASTICS
LIGHTS
METALS
MIXED WASTE TIPPING & SORTING
METAL
METAL
TYRES
PAPER/ CARD
UPVC
GYPSUM
GREEN
SUB-STATION
NON-HAZ. STORAGE AREA
SKIP, PLANT & EQUIPMENT, AND/OR AQP-COMPLIANT AGGREGATE STORAGE AREA
Power Station
WOOD
PLASTIC
CARD/PAPER
SORTED NON-HAZ WASTE STORAGE BAYS
TIPPING FLOOR
FUEL
CRUSHING/ SCREENING/ AGGREGATE STORAGE
Recycling Business
STORAGE BUILDING
SCREENING BUND
STORAGE CONTAINER
STORAGE CONTAINER
STORAGE CONTAINER
DISUSED CONTAINERISED/ MOBILE OFFICES
WEIGHBRIDGE
BIOMASS BOILER
STORAGE YARD (3RD PARTY)
WORKSHOP
STORAGE YARD 3RD PARTY
BIOMASS BOILER
SKIP, PLANT & EQUIPMENT, AND/OR AQP-COMPLIANT AGGREGATE STORAGE AREA
ESS
ESS
Weighbridges
CG
GG
EMERGENCY GRAB PACK FIXED TO OUTSIDE WALL
WEIGHBRIDGE OFFICE, ADMINISTRATIVE OFFICES, WELFARE AND STORAGE
ACCESS MAY BE RESTRICTED
CONCRETE MANUFACTURE
STORAGE CONTAINER
EQUIPMENT STORAGE
SUB-STATION
SKIP, PLANT & EQUIPMENT, AND/OR AQP-COMPLIANT AGGREGATE STORAGE AREA
SCREENING BUND
SCREENING BUND
PARKING
SCREENING BUND
SCREENING BUND
SITE ENTRANCE
SITE ENTRANCE
SITE ENTRANCE FROM PENGARNDDU IND. EST. (GRID REF. SO 07900 08803)
SITE ENTRANCE FROM PENGARNDDU IND. EST. (GRID REF. SO 07978 08800)

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AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	UPDATE STORAGE ARRANGEMENTS	25/07/25	SCW	NB

TEPL
TECHNIA ENVIRONMENT AND PLANNING LTD
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EMERGENCY ACCESS PLAN

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Ch'kd	NB		
Appr'd	NB		@A3
Date	22/04/23		

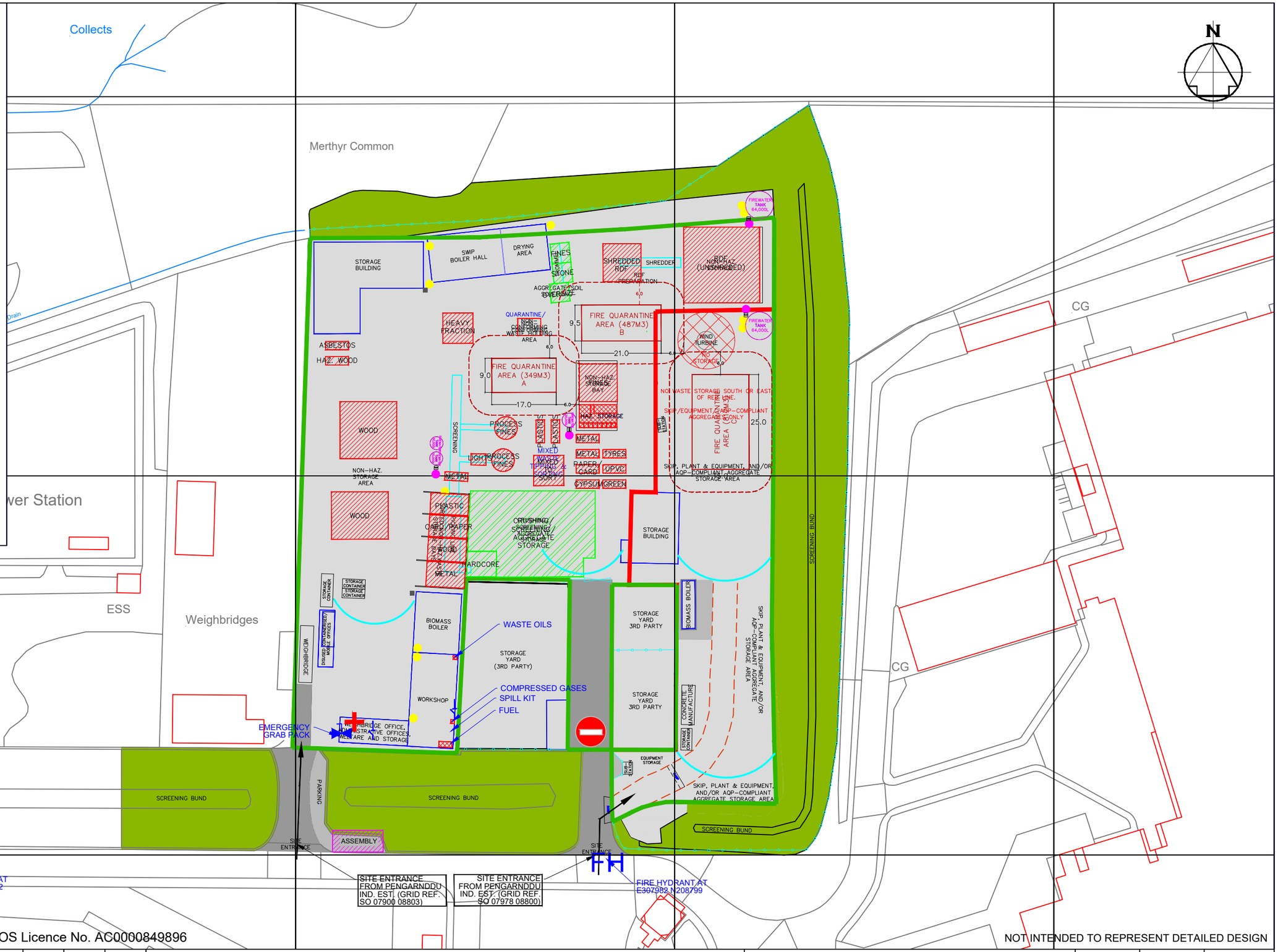
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LEGEND

- PERMIT BOUNDARY
- HAZARDOUS WASTE/ CHEMICALS/ COMPRESSED GASES
- COMBUSTIBLE WASTES
- NON-COMBUSTIBLE WASTE
- FH — FIRE HYDRANT
- FE — FIRE ESCAPE
- ASSEMBLY — FIRE ASSEMBLY POINT
- FIRE EXTINGUISHER
- FIRE HOSE
- TANK — FIREWATER TANK
- IBC WATER TANK
- FIRST AID KIT
- MAIN ELECTRICAL BREAKER
- MAINS WATER STOPCOCK
- FIRE QUARANTINE AREA
- FIREWATER CONTAINMENT BOOM

REFER TO STORAGE PLAN FOR DETAILS OF WASTES



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AMENDMENTS

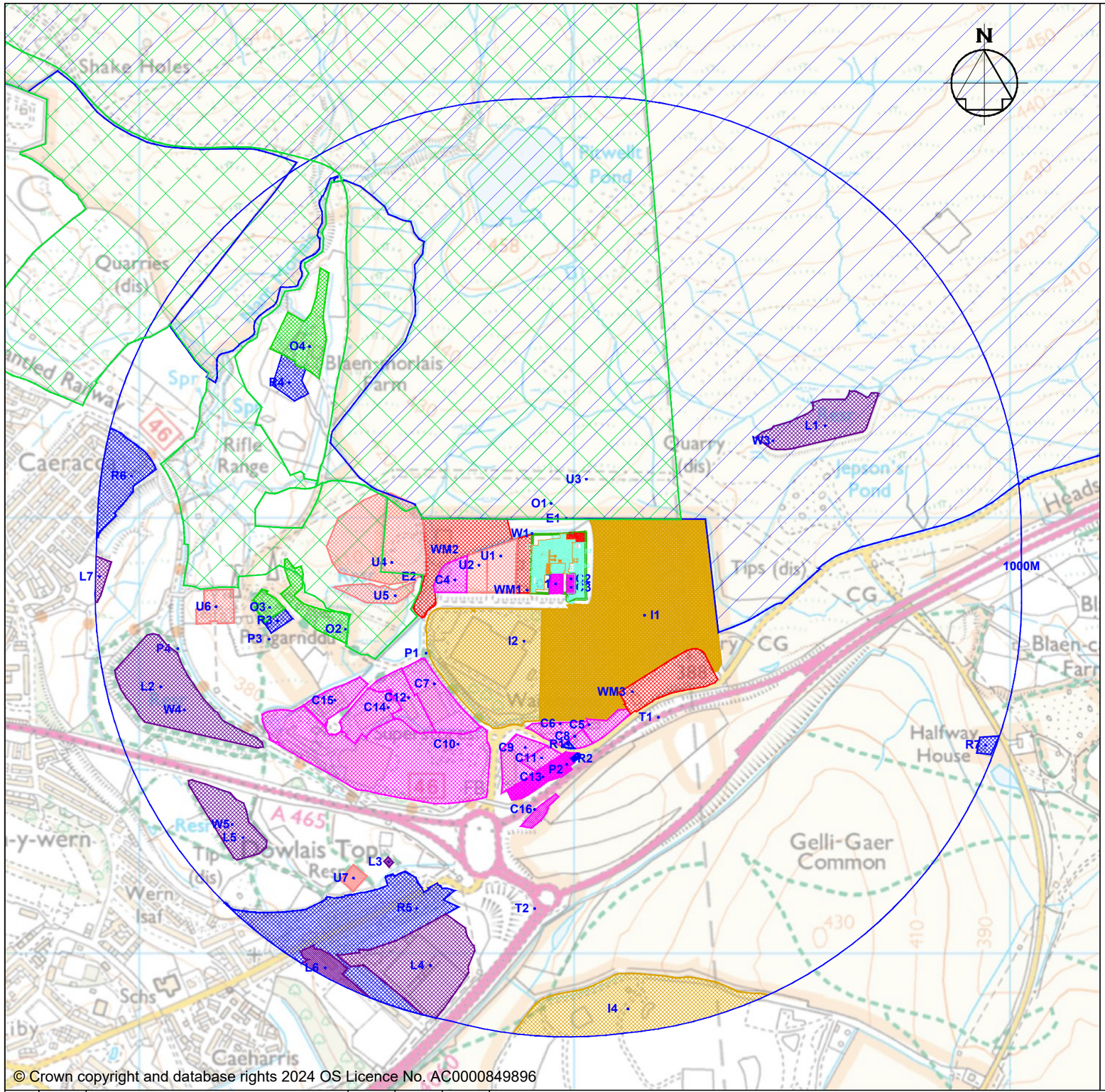
REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	UPDATE STORAGE ARRANGEMENTS	25/07/25	SCW	NB

TEPL

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	Ch'kd	NB	1:1,000
EMERGENCY PLAN	Appr'd	NB	@A3
	Date	25/07/25	
Job No. MBRC	Drg No.	10915 - 000 - J	

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		RECEPTOR TYPE	PROPERTY/ORGANISATION	CONTACT NUMBER
G	0M	GROUNDWATER	GROUNDWATER	NO CONTACT NUMBER
C1	0M	STORAGE YARD	PAUL BROGDAN	NO CONTACT NUMBER
C2	0M	STORAGE YARD	UNKNOWN	NO CONTACT NUMBER
C3	0M	SALVAGE YARD	MERTHYR RECLAMATION	07702 399711
WM1	0M	ELV ATF	ABBA SCRAP METALS	01685 722758
W1	2M	WATERCOURSE	WATERCOURSE	NO CONTACT NUMBER
I1	8M	ABATTOIR	ST MERRYN/KEPAK	01685 354800
E1	29M	SSSI	MYNYDDOEDD LLANGYNIDR A LLANGATWG	NO CONTACT NUMBER
E2	29M	SINC	MERTHYR COMMON NORTH	NO CONTACT NUMBER
O1	31M	OPEN ACCESS LAND	GELIGAER AND MERTHYR COMMON	NO CONTACT NUMBER
U1	34M	STOR ENERGY	CONRAD ENERGY	01235 427290
I2	36M	AUTOMOTIVE PARTS MANUFACTURER	TENNECO WALKER UK	01495 711211
WM2	45M	WASTE TRANSFER STATION	HAMPSHIRE DEMOLITION AND RECYCLING	01685 725000
U2	100M	STOR ENERGY	PULSE CLEAN ENERGY	01675 437777
U3	121M	33KV OVERHEAD POWER LINES	NATIONAL GRID	0800 096 3080
C4	146M	SALVAGE YARD	MERTHYR SALVAGE	01685 375406
WM3	221M	ELV ATF	HEADS OF THE VALLEYS SALVAGE	01685 386649
U4	241M	RESERVOIR (UNDERGROUND)	DWR CYMRU WELSH WATER	0800 052 0145
E3	248M	SINC	BLAENMORLAIS	NO CONTACT NUMBER
U5	264M	RESERVOIR (ABOVE GROUND)	DWR CYMRU WELSH WATER	0800 052 0145
C5	264M	CARAVAN STORAGE	ROBINS CARAVAN STORAGE	01685 384264
P1	276M	PUBLIC RIGHT OF WAY	PUBLIC ACCESS ROUTE	NO CONTACT NUMBER
C6	277M	FURNITURE RETAILER	COMFORTZONE	01685 377880
C7	286M	FURNISHINGS RETAILER	DUNELM	01685 490043
C8	295M	MOT CENTRE	BLAKEY'S MOT CENTRE	01685 384264
T1	309M	A465 HEADS OF THE VALLEYS ROAD	SOUTH WALES TRUNK ROAD AGENT (SWTRA)	0300 123 1213
R1	320M	RESIDENTIAL PROPERTY	BLAKEY'S MOT CENTRE	01685 384264
C9	326M	GROCERIES RETAILER	LIDL	020 3966 5566
C10	326M	GROCERIES RETAILER/PETROL STATION	ASDA	01685 379981
C11	334M	STORAGE YARD	PINNACLE CONSTRUCTION	07494 446260
C12	343M	CARPET RETAILER	CARPETRIGHT	01685 707080
C13	357M	OFFICE/STORAGE YARD	PENGARNDDU HIGHWAYS	NO CONTACT NUMBER
R2	348M	RESIDENTIAL PROPERTY	STATION HOUSE	NO CONTACT NUMBER
P2	374M	NATIONAL CYCLE ROUTE 46	WALK WHEEL CYCLE TRUST	0117 926 8893
C14	391M	HOMEWARES RETAILER	B&M HOME STORE	0330 838 9521
O2	416M	STABLES/STORAGE/ALLOTMENTS	CASTLE ROW, PENGARNDDU	NO CONTACT NUMBERS
C15	428M	FLOORING/FURNITURE RETAILERS	CARPET & BED CO, TRADE PRICE SOFAS, FLOOR GIANTS	01685 388340
C16	442M	PETROL STATION	TEXACO, VALLEY HEIGHTS	01685 374792
W3/L1	445M	POND	JEPSON'S POND (MERTHYR TYDFIL ANGLING ASSOCIATION)	01685 723520
R3	549M	RESIDENTIAL PROPERTY	CASTLE ROW, PENGARNDDU	NO CONTACT NUMBER
O3	565M	STABLES/STORAGE YARDS	CASTLE ROW, PENGARNDDU	NO CONTACT NUMBERS
O4	606M	FARM	BLAEN-MORLAIS FARM	NO CONTACT NUMBER
R4	608M	RESIDENTIAL PROPERTIES	BLAEN-MORLAIS FARM	NO CONTACT NUMBER
P3	609M	PUBLIC RIGHT OF WAY	FOOTPATH	NO CONTACT NUMBER
U6	682M	ELECTRICITY SUBSTATION	DOWLAIS GRID STATION (NATIONAL GRID)	NO CONTACT NUMBER
L3	688M	PARK/RECREATION AREA	PLAYGROUND	NO CONTACT NUMBER
R5	700M	RESIDENTIAL PROPERTIES	DOWLAIS TOP	NO CONTACT NUMBERS
W4/L2	705M	RESERVOIR (ANGLING)	PENYWERN POND - TOP POND (MTAA)	07931 512483
U7	745M	RESERVOIR (UNDERGROUND)	DOWLAIS TOP RESERVOIR (DCWW)	0800 052 0145
L4	762M	PLAYING FIELDS	DOWLAIS RFC AND PLAYGROUND	01685 382322
W5/L5	816M	RESERVOIR (ANGLING)	PENYWERN POND - MIDDLE POND (MTAA)	07931 512483
P4	820M	PUBLIC RIGHT OF WAY	FOOTPATH	NO CONTACT NUMBER
I5	862M	LANDFILL	BIFFA, TRECATTI LANDFILL	0800 307307
R6	878M	RESIDENTIAL PROPERTIES	CAERACCA, PANT	NO CONTACT NUMBERS
L6	948M	PLAYING FIELDS	DOWLAIS RFC	01685 382322
R7	958M	RESIDENTIAL PROPERTY	HALFWAY HOUSE	NO CONTACT NUMBER
L7	964M	PLAYING FIELD	CAERACCA PLAYING FIELDS	NO CONTACT NUMBER
E4	1920M	SINC	BLAENMORLAIS	NO CONTACT NUMBER
E5	1967M	SINC	BRYNIAU	NO CONTACT NUMBER
E6	1993M	SINC	TYLE HAIDD	NO CONTACT NUMBER

AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY

TECHNIA ENVIRONMENT AND PLANNING LTD
UNIT 1 FOXES LANE, OAKDALE BUSINESS PARK
BLACKWOOD, NP12 4AB
TEL: 02921 900400
EMAIL: PLANNING@TEPL.EU

MERTHYR BOROUGH RECYCLING COMPANY LTD

RECEPTOR PLAN (FIRE RESPONSE)

Drawn	SCW	Scale	1:10,000
Ch'kd	NB		
Appr'd	NB		@A3
Date	25/07/25		

Job No.	MBRC	Drg No.	10915 - 000 - K

Section Contents

Help and Guidance
HG1 Further Help
HG2 Protecting the Environment

HG1 Further Help

HG1 Further Help

How to Comply with Your Environmental Permit

(https://naturalresourceswales.gov.uk/permits-and-permissions/environmental-permits/guidance-to-help-you-comply-with-your-environmental-permit/?lang=en)

Natural Resources Wales Contact Information - National Customer Contact Centre

(English - http://naturalresourceswales.gov.uk/about-us/how-to-contact-us/228102/?lang=en

Welsh - http://naturalresourceswales.gov.uk/about-us/how-to-contact-us/228102/?lang=cy)

Natural Resources Wales

Ty Cambria

29 Newport Road

Cardiff

CF24 0TP

Telephone: 0800 807060 (24 hour service)

Regulatory Guidance Notes (RGN's) - A series of documents to help permit holders understand definitions and terms for the environmental permitting regulations

(https://naturalresourceswales.gov.uk/permits-and-permissions/environmental-permits/regulatory-guidance-notes-rgns/?lang=en)

Guidance and Advice

How to classify and assess waste: https://naturalresourceswales.gov.uk/guidance-and-advice/environmental-topics/waste-management/how-to-classify-and-assess-waste/?lang=en

Separate collection requirement for waste: https://naturalresourceswales.gov.uk/guidance-and-advice/environmental-topics/waste-management/separate-collection-requirement-for-waste/?lang=en

Storing oil at your home or business: https://www.gov.uk/oil-storage-regulations-and-safety

Oil storage regulations for businesses: https://www.gov.uk/guidance/storing-oil-at-a-home-or-business

How you'll be regulated: environmental permits: https://naturalresourceswales.gov.uk/about-us/what-we-do/how-we-regulate-you/?lang=en

Moving hazardous waste: https://naturalresourceswales.gov.uk/guidance-and-advice/environmental-topics/waste-management/moving-hazardous-waste/?lang=en

Hazardous waste returns: https://naturalresourceswales.gov.uk/guidance-and-advice/environmental-topics/waste-management/hazardous-waste-returns-1/?lang=en

International Waste Shipments: https://naturalresourceswales.gov.uk/permits-and-permissions/waste/international-waste-shipments/?lang=en

End of waste: https://naturalresourceswales.gov.uk/guidance-and-advice/environmental-topics/waste-management/end-of-waste/?lang=en

HSE Waste Guidance

http://www.hse.gov.uk/waste/wish-guidance.htm

HG2 Protecting the Environment

HG2a Good Management Pays

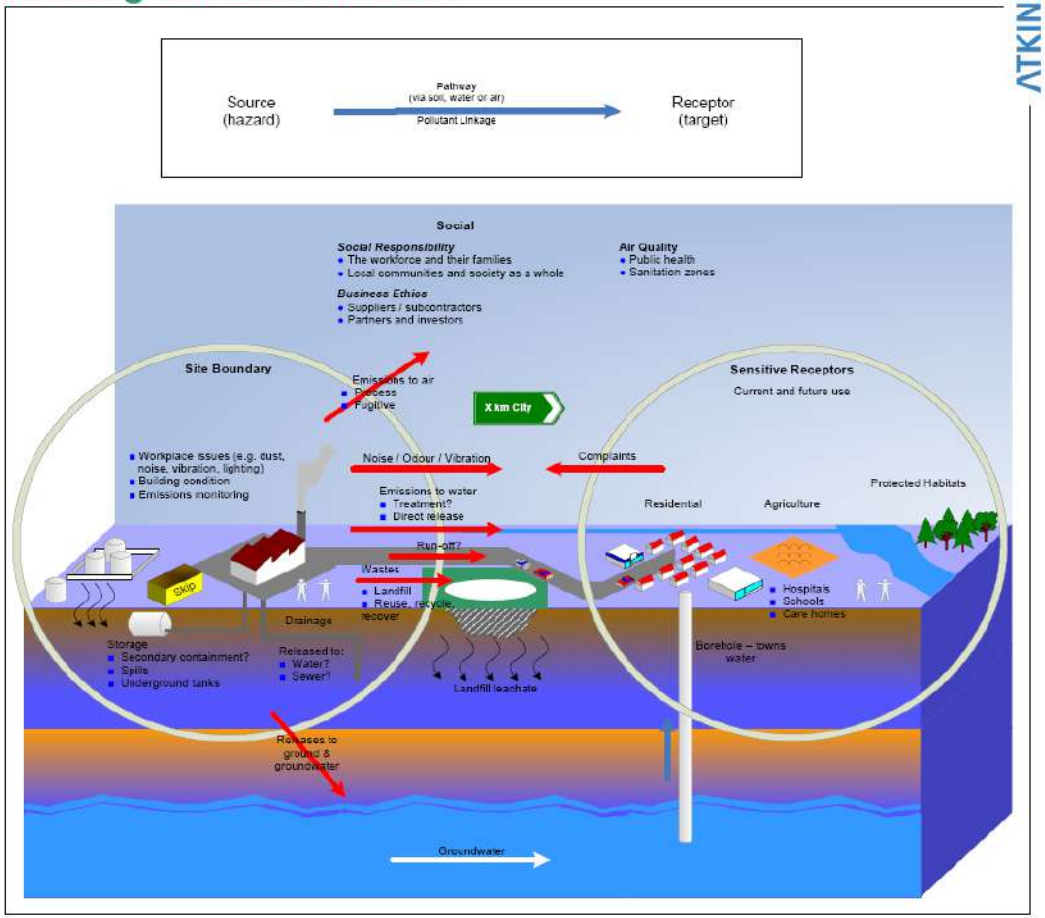


HG2b Protecting the Environment

Protecting the Environment

This site's main potential **pollution sources** are:
[e.g. Storage of waste oils in drums]
[e.g. Fibrous asbestos storage]
[e.g. Potential for dust creation if site roads are not damped down]

Sensitive **environmental receptors** at or near the site are:
[e.g. Underground aquifer used for supplying drinking water]
[e.g. Houses and gardens to the south of the site]
[Site of Special Scientific interest next to building B3]



Section Contents

Other Documents
OD1 Site Condition Report
OD2 Guidance Note 16 - Fire Prevention & Mitigation Plan Guidance –Waste Management (Version 2.0), Natural Resources Wales, August 2017
OD3 WASTE 28 - Reducing Fire Risk at Waste Management Sites (Issue 3), Waste Industry Safety and Health (WISH) Forum, March 2020

OD1 Site Condition Report

SD5a- MBRC Site Condition Report and Photographic Record

Site Condition Report and Photographic Record of Site Condition

Unit 5 Pengarnddu Industrial Estate
Dowlais, Merthyr Tydfil, CF48 2TA

Tel: 01685 370188
Email: mbrc@hotmail.com

Prepared by: Technia Environment and Planning, Suite 4, St. Margaret's Park, Pengam Road, Aberbargoed, CF81 9FW.

SITE CONDITION REPORT TEMPLATE

For full details, see H5 *SCR guide for applicants* v2.0 4 August 2008

COMPLETE SECTIONS 1-3 AND SUBMIT WITH APPLICATION

DURING THE LIFE OF THE PERMIT: MAINTAIN SECTIONS 4-7

AT SURRENDER: ADD NEW DOC REFERENCE IN 1.0; COMPLETE SECTIONS 8-10; & SUBMIT WITH YOUR SURRENDER APPLICATION.

1.0 SITE DETAILS	
Name of the applicant	Merthyr Borough Recycling Centre Ltd
Activity address	Unit 5 Penygarnddu Industrial Estate, Merthyr Tydfil, Mid Glamorgan, CF48 2TA
National grid reference	SO 07969 08908

Document reference and dates for Site Condition Report at permit application and surrender	10915 – 001 – SCR v1.0 Application – 25th October 2014

Document references for site plans (including location and boundaries)	10915 – 000 – A to 10915 – 000 – E

Note:
In Part A of the application form you must give us details of the site's location and provide us with a site plan. We need a detailed site plan (or plans) showing:

- Site location, the area covered by the site condition report, and the location and nature of the activities and/or waste facilities on the site.
- Locations of receptors, sources of emissions/releases, and monitoring points.
- Site drainage.
- Site surfacing.

If this information is not shown on the site plan required by Part A of the application form then you should submit the additional plan or plans with this site condition report.

2.0 Condition of the land at permit issue	
Environmental setting including: • geology • hydrogeology • surface waters	Refer to attached Envirocheck Report (Ref: 60917421_1_1) for additional information.
Pollution history including: • pollution incidents that may have affected land • historical land-uses and associated contaminants • any visual/olfactory evidence of existing contamination • evidence of damage to pollution prevention measures	Refer to attached Envirocheck Report (Ref: 60917421_1_1) for additional information.
Evidence of historic contamination, for example, historical site investigation, assessment, remediation and verification reports (where available)	Refer to attached Envirocheck Report (Ref: 60917421_1_1) for additional information.
Baseline soil and groundwater reference data	Refer to attached Envirocheck Report (Ref: 60917421_1_1) for additional information.

Supporting information	• Source information identifying environmental setting and pollution incidents • Historical Ordnance Survey plans • Site reconnaissance • Historical investigation / assessment / remediation / verification reports • Baseline soil and groundwater reference data

3.0 Permitted activities	
Permitted activities	A9/A11 - Waste Transfer Station with Treatment and Hazardous Storage – R&D Codes D15,R13,D9,R3,R4,R5 A16 - Inert and Excavation Processing Facility - R&D Codes D15,R13,D14,D9,R3,R4,R5 A16 - Wood Processing Facility - R&D Codes D15,R13,R3,R5 A16 - Refuse Derived Fuel Facility - R&D Codes D15,R13,R3,R5 A16 - Road Sweeping and Gully Waste Facility - R&D Codes D9/D13/D14/D15/R3/R4/R5/R9/R13 A19 - Vehicle Storage, Depollution & Dismantling (Authorised Treatment) Facility - R&D Codes R13,R4,R5,D15
Non-permitted activities undertaken	None
Document references for: • plan showing activity layout; and • environmental risk assessment.	10915 – 000 – A to 10915 – 000 – E SD7 - MBRC Site Risk Assessment

Note:

In Part B of the application form you must tell us about the activities that you will undertake at the site. You must also give us an environmental risk assessment. This risk assessment must be based on our guidance (*Environmental Risk Assessment - EPR H1*) or use an equivalent approach.

It is essential that you identify in your environmental risk assessment all the substances used and produced that could pollute the soil or groundwater if there were an accident, or if measures to protect land fail.

These include substances that would be classified as 'dangerous' under the Control of Major Accident Hazards (COMAH) regulations and also raw materials, fuels, intermediates, products, wastes and effluents.

If your submitted environmental risk assessment does not adequately address the risks to soil and groundwater we may need to request further information from you or even refuse your permit application.

4.0 Changes to the activity	
Have there been any changes to the activity boundary?	**Please refer to Drawing 10915 – 000 – A**
Have there been any changes to the permitted activities?	Merthyr Borough Recycling Centre Ltd currently operate under an EA Waste Management Licence No 30044. The licence was last modified on the 9th September 2004. Merthyr Borough Recycling Centre Ltd (MBRC) have applied to vary the current licence in order update to an Environmental Permit. The variation will include all the current activities being carried out at Pengarnddu Business Park, Merthyr Tydfil. MBRC would like to include the following activities on site, please see Table 1 below. Table 1a includes the waste activity with the appropriate recovery and disposal code for each activity. The complete EWC list for the new permit is below with each separate activity. The list captures the current use and allows the operator the ability to expand in the future. 1. <u>Waste Transfer Station with Treatment and Asbestos Storage:</u> The waste transfer station will accept non-hazardous and hazardous wastes. All storage and treatment shall be undertaken on an impermeable surface with sealed drainage. Light and residual fractions from the treatment process will pass to the refuse derived fuel (RDF) activity on site, where suitable. There will be no treatment of the hazardous wastes other than bulking up for onward transport. The annual throughput will be no more than 75,000 tons. 2. <u>Inert and Excavation Processing Facility:</u> No hazardous waste is to be accepted for storage or treatment as part of the inert

	processing activity. All storage and treatment of waste will take place on hard standing or an impermeable surface with sealed drainage. The annual throughput will be no more than 75,000 tons. 3. Wood Processing Facility: No hazardous waste is to be accepted for storage or treatment as part of the wood processing activity. All storage and treatment of waste will take place on an impermeable surface with sealed drainage. The annual throughput will be no more than 25,000 tons. 4. Refuse Derived Fuel Facility: Waste will be stored (prior to treatment) and treated within a building. Treated wrapped or bailed RDF is permitted to be stored outside on impermeable surface with sealed drainage. No hazardous waste is to be accepted for storage or treatment as part of the refuse derived fuel processing facility. The annual throughput will be no more than 25,000 tons. 5. Road Sweeping and Gully Waste Facility: Non-hazardous waste is to be accepted for storage and treatment as part of the processing activity. All storage and treatment of waste will take place on impermeable surface with sealed drainage. The annual throughput will be no more than 10,000 tons. 6. Vehicle Storage Depollution and Dismantling (Authorised Treatment) Facility will depollute and dismantle end-of-life vehicles. Uncontaminated plastic and glass arising from the treatment of end-of-life vehicles, uncontaminated ferrous metal wastes or alloys and uncontaminated non-ferrous metal wastes shall be stored on hardstanding or an impermeable surface with sealed drainage system. All other wastes shall be stored on an impermeable surface with sealed drainage system. All wastes shall be treated on an impermeable surface with sealed drainage system. Lead acid

	batteries shall be stored in containers with an impermeable, acid resistant base and a cover to prevent ingress of water. Wastes shall be stored for no longer than 1 year prior to disposal and 3 years prior to recovery. The annual throughput will be no more than 5,000 tonnes per annum of waste motor vehicles.
Have any 'dangerous substances' not identified in the Application Site Condition Report been used or produced as a result of the permitted activities?	No
Checklist of supporting information	• Plan showing any changes to the boundary (where relevant) • Description of the changes to the permitted activities (where relevant) • List of 'dangerous substances' used/produced by the permitted activities that were not identified in the Application Site Condition Report (where relevant)

5.0 Measures taken to protect land

Use records that you collected during the life of the permit to summarise whether pollution prevention measures worked. If you can't, you need to collect land and/or groundwater data to assess whether the land has deteriorated.

Checklist of supporting information	• Inspection records and summary of findings of inspections for all pollution prevention measures • Records of maintenance, repair and replacement of pollution prevention measures

6.0 Pollution incidents that may have had an impact on land, and their remediation

Summarise any pollution incidents that may have damaged the land. Describe how you investigated and remedied each one. If you can't, you need to collect land and /or groundwater reference data to assess whether the land has deteriorated while you've been there.

Checklist of supporting information	• Records of pollution incidents that may have impacted on land • Records of their investigation and remediation

7.0 Soil gas and water quality monitoring (where undertaken)

Provide details of any soil gas and/or water monitoring you did. Include a summary of the findings. Say whether it shows that the land deteriorated as a result of the permitted activities. If it did, outline how you investigated and remedied this.

Checklist of supporting information	• **Description of soil gas and/or water monitoring undertaken** • **Monitoring results (including graphs)**

8.0 Decommissioning and removal of pollution risk

Describe how the site was decommissioned. Demonstrate that all sources of pollution risk have been removed. Describe whether the decommissioning had any impact on the land. Outline how you investigated and remedied this.

Checklist of supporting information	• **Site closure plan** • **List of potential sources of pollution risk** • **Investigation and remediation reports (where relevant)**

9.0 Reference data and remediation (where relevant)

Say whether you had to collect land and/or groundwater data. Or say that you didn't need to because the information from sections 3, 4, 5 and 6 of the Surrender Site Condition Report shows that the land has not deteriorated.

If you did collect land and/or groundwater reference data, summarise what this entailed, and what your data found. Say whether the data shows that the condition of the land has deteriorated, or whether the land at the site is in a "satisfactory state". If it isn't, summarise what you did to remedy this. Confirm that the land is now in a "satisfactory state" at surrender.

Checklist of supporting information	• Land and/or groundwater data collected at application (if collected) • Land and/or groundwater data collected at surrender (where needed) • Assessment of satisfactory state • Remediation and verification reports (where undertaken)

10.0 Statement of site condition

Using the information from sections 3 to 7, give a statement about the condition of the land at the site. This should confirm that:

- the permitted activities have stopped
- decommissioning is complete, and the pollution risk has been removed
- the land is in a satisfactory condition.

Merthyr Borough Recycling Centre Ltd
Unit 5, Pengarnddu Industrial Estate, Dowlais, Merthyr Tydfil, CF48 2TA.

Doc. Ref:	**MBRC-PRSC01**
Report:	**Photographic Record of Site Conditions**
Prepared By:	**Stuart Watcham PhD, BEng**
Client:	**Merthyr Borough Recycling Centre Ltd**
Date:	**13th October 2014**

Disclaimer
Whilst every care is taken to ensure the accuracy of the information herein, no liability or responsibility of any kind can be accepted by Technia Business Solutions Ltd (t/a Technia Environment and Planning) for any errors, discrepancies or omissions. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid. Drawings and descriptions in this report are not intended to represent detailed design.

Report Revision

Version	Date	Author	Checked / App'd	Revision
DRAFT	11/10/14	SCW	NB	FOR APPROVAL
1.0	25/10/14	SCW	NB	APPROVED

1 INTRODUCTION

Technia Environment and Planning has been appointed by Merthyr Borough Recycling Centre Ltd to prepare a photographic record of the site as part of a site condition report for a bespoke environmental permit variation application for waste transfer station with treatment on Pengarnddu Industrial Estate, Dowlais, Merthyr Tydfil, CF48 2TA.

This report includes photography taken during a site walkover on October 10th 2014. The site is currently operating under a historic Waste Management License and a number of Waste Exemptions. Activities consistent with the WML and Exemptions were being undertaken on-site and stockpiles of inert waste, wood, rigid plastics, plastic film and other approved wastes were observed in the yard.

2 PHOTOGRAPHS

2.1 SITE ENTRANCE AND WEIGHBRIDGE



Figure 1. Main site entrance junction looking north.



Figure 2. Main site entrance looking north towards the weighbridge and offices. The higher extents of the workshop building are visible to the right of shot.



Figure 3. Alternative site entrances looking north.

2.2 WORKSHOP AND VEHICLE STORAGE YARD



Figure 4. Workshop and storage yard looking north east.

2.3 YARD



Figure 5. General waste processing areas showing two picking stations to the centre and right of shot and storage bunkers in the left foreground and to the right of shot.



Figure 6. View looking south of the inert waste processing area right of centre and proposed depolluted ELV storage area left of centre.



Figure 7. View looking south towards the proposed wood and gully waste processing and area.

2.4 SITE DRAINAGE



Figure 8. Cut-off drain and silt trap/storage tank for general waste processing area.



Figure 9. Interceptor inspection cover for general waste processing area.



Figure 10. Interceptor level alarm for general waste processing area.



Figure 11. Route of outlet to sewer is indicated by the lighter strip of concrete passing under the vehicle and exiting the site to connect with the sewer at the junction with the highway.



Figure 12. Reverse angle showing route of outlet to sewer from interceptor. Raised curbs channel surface water from the yard area to a surface drain that also connects with the external sewer system.



Figure 13. A spill kit is permanently located within the yard area.

OD2 Guidance Note 16 - Fire Prevention & Mitigation Plan Guidance –Waste Management (Version 2.0), Natural Resources Wales, August 2017

Fire Prevention & Mitigation Plan Guidance – Waste Management

Guidance Note 16

Document Owner: Regulatory Business Board

Version History:

Document Version	Date Published	Summary of Changes
2.0	[Aug-2017]	Document updated
Review Date: August 2019		



WORKING TOGETHER FOR A SAFER WALES – CYDWEITHIO TUAG AT GYMRU DIOGELACH

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What is this document about?

The guidance document has been compiled by Natural Resources Wales (NRW) in collaboration with the Fire & Rescue Services in Wales (South Wales Fire & Rescue Service, Mid & West Wales Fire & Rescue Service and North Wales Fire & Rescue Service).

It represents the minimum appropriate measures required to be put in place by waste operators within Wales to ensure that fires are prevented within their businesses.

Who is this document for?

This guidance has been produced using increased industry and Fire & Rescue Service experience when fighting real waste fires, and improved knowledge attained as a result of a series of burn tests carried out in 2015 and throughout 2016 by WISH (Waste Industry Safety and Health Forum) supported by CFOA (Chief Fire Officers Association).
In 2015 smaller-scale laboratory type testing was conducted at the FPA (Fire Protection Association) research premises. These 'phase 1' tests provided baseline data on parameters such as burn rates and thermal heat outputs.
In 2016 "phase 2" larger-scale waste burn trials were conducted at sites in Yorkshire and Essex. These tests involved much larger volumes of waste and aimed to replicate as closely as practical 'real life' waste fires. The results of these tests matched much more closely the experience of the FRS when fighting real waste fires, and revealed some of the different mechanisms at play during waste fires. Both phase 1 and phase 2 tests were conducted on a variety of wastes such as loose and baled wastes, plastics, paper and board, rubber, wood wastes, waste derived fuels such as RDF and SRF and others.

Natural Resources Wales and the Fire & Rescue Services in Wales will use this guidance to assess the suitability & appropriateness of fire prevention and mitigation measures at permitted waste facilities.

This guidance replaces "Natural Resources Wales Fire Prevention and Mitigation Plan Guidance – Waste Version 1, May 2016" and applies to all new waste permits (relevant standard rule and bespoke) & all relevant existing waste standard rule permits and bespoke, based on a phased implementation.

See section "Submitting your Fire Prevention & Mitigation Plan" for more detail.

***If you are using a printed version of this guidance document, please ensure that it is the most up-to-date version available.**

Contact for queries and feedback

John Rock – Waste and Resources Team, EPP

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1. Introduction and Scope

If you are applying for an environmental permit that authorises you to store combustible waste, or you have an existing permit with a permit condition requiring you to have a Fire Prevention and Mitigation Plan (FPMP), you must adhere to this guidance. It stipulates the fire prevention standards you must follow when formulating a site specific FPMP for your site.

These standards should be in your working plan or management system and implemented on your site.

You will need to follow this guidance if your permit conditions states that you must have a fire prevention plan, or if you need to submit one as part of your permit application.

If you do not follow this guidance or appropriate sector specific advice (e.g. Waste Industry Safety and Health Forum (WISH) - Reducing fire risk at waste management sites (latest version)) when compiling your FPMP **you should ensure that the measures you take are equivalent or superior to this standard**, and that they comply with regulatory requirements.

In order to achieve this you should include detailed assessments to satisfy Natural Resources Wales (NRW) that the

- likelihood of fire
- impact from emissions during or after a fire on the local community, critical infrastructure and the environment
- resources required by the NRW and other emergency responders during an incident
- post incident clean-up and remediation costs

are equivalent or less than would be incurred if the site followed the minimum standards in this regulatory guidance.

The permit determination process may be delayed and we may ask you to revise your FPMP if it does meet the guidance or the equivalent standards.

NRW and/or the Fire and Rescue Service (FRS) may also take enforcement action if it deems that your site does not comply with the required standard.

This guidance does not replace any statutory requirements for sites controlled under local acts of parliament, the Regulatory Reform (Fire Safety) Order 2005 or other applicable legislation. It is your responsibility to check which statutory requirements apply to you.

While not a regulator, insurers have a major role to play and may set their own standards. You should consult with your insurer to ensure that they are involved in your decision-making process, assessments and plans. You may achieve a standard that your regulators are content protects human health and the environment adequately, but which your insurers may not be content with because of property and business interruption risks.

2. Who this guidance applies to and does not apply to

This guidance applies to operators that store any amounts of combustible waste materials including (**but not limited to** [1]):

- paper or cardboard
- plastics
- rubber (natural or synthetic, including whole tyres, baled tyres, tyre shred, crumb and fibre)
- wood & wood composites (planks, boards, pallets, crates, sawdust, shavings & chips
- fragmentiser waste (from processing end of life vehicles (ELV's), plastics and metal wastes from materials recovery facilities)
- rags and textiles
- scrap metals including ELV's
- waste fuels – including residual combustible waste, RDF and SRF
- waste electrical and electronic equipment (WEEE) such as fridges, computers and televisions containing combustible materials such as plastic
- batteries within ELV's
- compost and plant material
- biomass facilities

It applies to operators from these sectors:

- waste metals (end of life vehicle (ELV) sites and scrap metal)
- non-hazardous waste

This guidance contains useful information that can apply to operators in any of these sectors, however you may not have to include all of your activities if you are required to produce a fire prevention plan:

- bio-waste treatment (open windrow, in-vessel composting and dry anaerobic digestion)
- agriculture (intensive farming only)
- incineration
- combustion
- paper and pulp
- cement lime and minerals

If you are in one of these sectors, please contact **Natural Resources Wales** for more information.

1 There may be other wastes that an operator will have to consider which may be mixtures of the above specified wastes or where specific properties of the waste stream present a combustible risk.

Who this guidance does not apply to

This guidance does not apply to landfill sites or to the storage of coal, materials or waste that are:

- flammable (flashpoint of 60°C or lower)
- combustible liquids or gases
- hazardous (excluding any hazardous waste to which this guidance applies, as set out above)
- dangerous substances stored under the COMAH (Control of Major Accident Hazards) Regulations

Gas cylinders, aerosols and combustible liquids are not covered by this guidance but they should still be considered in your fire prevention plan due to the potential they have to cause or increase the impact of fire on a site.

Advice is available in:

'Guidance for the storage and treatment of aerosol canisters and similar packaged wastes'

For advice about other materials and activities not listed above, contact the Health and Safety Executive (HSE), local Fire and Rescue Service or Natural Resources Wales.

3. Submitting your Fire Prevention & Mitigation Plan

This guidance applies to all new waste permits (relevant standard rule and bespoke) and all relevant existing waste standard rule permits and bespoke, based on a phased implementation.

Fire poses a significant risk during the storage of combustible waste materials. Therefore you must ensure that your FPMP is suitable in its measures to prevent the risk of fire at your site.

Standard Rules Permit (New & Existing Applications)

If you want to operate under a standard rule permit you do not need to submit a fire prevention and mitigation plan with your application, however, you must ensure that you have one in place before you start operating on site, and be able to demonstrate this to us.

Please note that the application form includes this and by signing the declaration in Part F of the application you are agreeing to this.

Bespoke Permit (New Application)

If you are applying to operate under a bespoke waste permit and you intend to accept, store and/or treat any of the materials to which this guidance applies, you must submit a fire prevention and mitigation plan with your application**.**

Your FPMP must be produced in accordance with this guidance. Your application may be refused/delayed if your FPMP does not meet the standards as set out in the guidance.

Bespoke Permit (Existing Application)

If you are an existing operator under a bespoke permit, you will also need to submit a fire prevention and mitigation plan with any application to add a new material or include a new activity or to increase the amount of materials stored at any one time, to which this guidance applies. If your application is to increase annual throughput **without** increasing the amount of materials stored at any one time you will not be required to submit a FPMP with your application.

Within your application, you will need to provide written confirmation of the following:-

- This is an increase to annual throughput only
- Storage of combustible materials covered/referenced in the guidance will not increase from current levels
- The methods/techniques used to manage current storage levels (at any one time limits) meet the standards set out in the guidance

Note – that you will not be able to duly make your application without written confirmation of the above.

The permit determination process may be delayed and we may ask you to revise your FPMP if it does meet the guidance or the equivalent standards.

4. Producing your Fire Prevention and Mitigation Plan

Your Fire Prevention & Mitigation Plan (FPMP) **must be a separate document** within your accident management plan which forms part of your written management system. Your management system should also **include a separate written assessment of fire risk** on your site and describe the measures in place to prevent, detect, suppress, mitigate and contain fires in accordance with the **Regulatory Reform (Fire Safety) Order 2005.** Many of the prevention measures will align with measures to ensure waste quantities are within the sites capacity and that wastes are stored and managed properly.

All staff and contractors working on-site should be aware and understand the contents of the FPMP and what they must do:-

- to prevent a fire occurring
- during a fire if one breaks out

It is ideal for your plan to be available both electronically and in hard copy**.** Employees will need to be aware of the plan contents & have access to it at all times; it is also essential that both NRW & FRS also have access to it during an emergency. Many sites place a copy of their plan in an “emergency services box” which can be located at the site entrance or suitable location so that the FRS can

access the plan out of hours in an emergency. In the end, it is of no use having a good plan in place if it is in the burning building and cannot be accessed.

You should ensure that you have regular exercises to test how well your plan works and make sure that staff understand their responsibilities and what actions need to be carried out.

5. Fire Prevention and Mitigation Plan Contents

Your FPMP must include:

- the amount & type of waste received daily and how it is managed
- the total amount of waste & the types and forms (e.g. unprocessed, shredded, chipped, fines or baled) that are stored on site at any one time and how it will be stored
- the maximum time each type of waste will be stored on site and how it will be managed
- the location within the site where each type of waste will be stored
- the maximum size of any waste pile, stipulating the maximum length, width and depth
- the minimum separation/fire break distance required between all waste/baled waste stacks, and between buildings and waste/baled waste stacks
- a clear area must be established around the perimeter of site, this can vary depending on the layout of your site and permitted stack sizes in accordance with the separation distances as illustrated in **Table 2** (this must be available at all times and identified on your site plan
- the fire prevention techniques used, including management of hotspots (signs of potential self-combustion), monitoring, reporting, recording and actions
- techniques used to minimise the risk of fire spreading within the site or from the site
- the steps and procedures to be followed if a fire occurs on your site
- all combustion products and emissions (to air, land and water) from the fire and the emergency response (including the impact on the community, critical infrastructure and the environment) and how they will be minimised
- contact details of sensitive receptors within 1km of your site –
    - **Human receptors** include hospitals, nursing homes, schools, residential areas, places of work, transport networks.
    - **Environmental receptors** include source protection zones, surface waters, potable abstractions, groundwater, protected habitats, fisheries
- how safe access to the site for fire and rescue services and other emergency responders is achieved
- **you must include a site plan(s) drawn to scale showing:**

- layout of buildings (including access points, fire exits & location of utilities)
- areas where hazardous materials are stored (location of gas cylinders, process areas, chemicals, piles of combustible materials, oil & fuel tanks)
- main access routes for fire engines (typical FRS vehicle access requirements are below) & any alternative access points around the site perimeter to assist fire fighting

Type of FRS appliance	Min width of road (metres)	Min width of gangway (metres)	Min clearance height (metres)	Min weight restriction (tonnes)
Water Tender	3.7	3.2	3.7	12.5
High reach vehicle	3.7	3.2	4.0	24
Weight of vehicle may need to be confirmed with your local FRS as various types of vehicles are in use.				

- Location of hydrants and water supplies
- any watercourse, borehole or well located within or near the site
- areas of natural and unmade ground
- the location of plant, protective clothing and pollution control equipment and materials
- drainage systems, foul and surface water drains, and their direction of flow and outfall points
- the location of drain covers and any pollution control features such as drain closure valves and firewater containment systems
- location of “off- site” emergency information pack with site plan (as specified above)
- location of sensitive receptors within 1km of your site –

    - **Human receptors** include hospitals, nursing homes, schools, residential areas, places of work, transport networks.
    - **Environmental receptors** include source protection zones, surface waters, potable abstractions, groundwater, protected habitats, fisheries

- location of the **quarantine area**
- assembly point for staff and visitors to site
- compass rose showing north and the prevailing wind direction

You should also include actions to be taken should a fire occur such as:

- reducing the amount of firewater run-off generated - use sprays and fogs rather than jets
- recycling firewater if it is not hazardous and it is possible to re-use
- applying water to cool unburned material and other hazards, taking care to prevent this water causing or adding to water pollution and/or increasing air pollution
- separating unburned material from the fire using suitable heavy plant
- separating burning material from the fire to quench it with hoses or in pools or tanks of water (this will reduce the amount of firewater produced)
- using soil, sand, crushed brick and/or gravel (if smoke is threatening local communities) to help suppress the fire, although you can only do this when:

    - groundwater vulnerability is low
    - agreed as a part of a firefighting strategy by the FRS and supported by NRW
    - contaminated material is removed and legally disposed of as soon as it is safe to do so

To decide which of these options, or combinations of options, is appropriate you should consider the:

- scale & nature of the environmental hazards and activities that take place
- risks posed to people, the environment and property
- type of materials you store on site, the form they are stored in & the length of time needed to extinguish a fire involving them
- availability of firewater containment facilities
- local topography, weather conditions and fire scenarios that could reasonably be expected on site

6. Common Causes of Fires and Preventative Measures

When producing your FPMP you should consider where applicable, the common causes of fire and the preventative measures you can take to reduce the risk at your site. Some of these risks may not apply to your site or there may be others you need to include in your fire prevention plan. It is your responsibility to identify all possible risks, depending on the activities you carry out on your site.

Some of the risks and measures can include:-

- **Arson or vandalism** - You need to have adequate security measures in place, such as security fencing, intruder alarms and CCTV. Arrangements for outside of working hours should also be considered.
- **Visitors & Contractors** – You should ensure all visitors follow the correct safety and fire prevention procedures. Fire prevention messages can be reinforced around the site using suitable signs.
- **Ignition sources** - You need to keep naked flames, space heaters, furnaces, incinerators and other sources of ignition 6 metres away from combustible and flammable waste.

- **Self-combustion** - (e.g. due to chemical oxidation in stored waste material) what measures you will put in place to monitor and control this issue and help prevent the risk of fire
- **Plant or equipment failure** - You need to ensure that you:-
  - have a maintenance and inspection programme for static and mobile plant and equipment
  - fit vehicles with fire extinguishers, dust filters, spark arrestors and where practicable all bucket loaders are to be fitted with rubber strips to prevent sparks when the bucket comes into contact with hard-standing etc.
  - keep mobile plant that is not being used away from combustible waste
- **Discarded smoking materials** - You should apply a no smoking policy or have designated smoking areas a safe distance from combustible wastes to prevent accidental ignition.
- **Hot works (e.g. welding or cutting)** - You need to ensure all staff and contractors follow safe working practices, such as a permit to work system, when carrying out hot works such as welding and cutting. A fire watch for a suitable period should be implemented once hot works have ceased and in particular at the end of a working day. For further information please refer to relevant **Health and Safety Executive (HSE) Guidance**
- **Industrial heaters** - You should have written procedures that set out the use and regular maintenance of industrial heaters.
- **Plant & Hot exhausts** - You need to ensure that a fire watch/visual check is carried out at regular intervals during the working day and at the end of the day to detect signs of a fire caused by dust settling on hot exhausts and engine parts. Set out in your plan how regular these intervals are, methods to record the inspection, actions taken and concerns. As part of your end of day procedures you should make sure separation distances are observed between plant and material when the site is not staffed
- **Damaged or exposed electrical cables** - Electrics on site should be fully certified by a qualified electrician and you must have written procedures in place that set out the regular maintenance.
- **Reactions between wastes** - You should ensure that you have written procedures within your management system for waste acceptance checks to prevent reactions between incompatible or unstable wastes, including lithium batteries. You must have a **quarantine area** available at all times and identified on your site plan.
- **Hot loads deposited at the site** – use a suitable **quarantine area** for hot loads.
- **Build-up of loose combustible waste, dust and fluff** - Your plan should state how regularly you will inspect and clean the site to prevent the build-up of loose combustible waste, dust and fluff within buildings & around the site

- **'Tramp' metal** that finds its way into moving machinery and causes localised 'hot spots'. Prevent metal getting into moving machinery by pre-sorting and/or extraction by a magnet/eddy current separator, especially when ignitable or explosive materials are present;
- **Batteries within waste deposits** - as part of your reception procedures, you must ensure that every effort is made to remove any form of battery unit from within the waste prior to processing. A number of recent fires within waste processing systems have been caused by batteries entering processing machinery.
- **Batteries in ELVs** - Batteries left connected in un-depolluted vehicles can short circuit and cause fires. You must disconnect or remove batteries from un-depolluted vehicles as soon as possible after reception
- **Cylinders stored at the site** – should be stored in the correct manner when either in/or not in use. Cylinder storage locations should be identified on the site plan
- **Leaks and spillages of oils and fuels** - You need to prevent fuels and combustible liquids leaking or trailing from site vehicles and ELVs. For example, this includes from vehicles:
  - being tracked around the site
  - before or after the de-pollution process

  You must ensure that any materials used to absorb combustible liquids are correctly disposed of to reduce the risk of a potential fire situation.

7. Storage Times and Self-combustion Factors

Many materials can self-combust under certain conditions, and the risk generally increases when materials are stored for prolonged periods, whether internally or externally, and in general the smaller the particle size the higher the risk.

Generally the storage time limits shown below are starting points for your considerations on storage and should be used to inform your stock management and rotation process.
For some wastes these storage times may be too long and you should consider your waste types carefully for self-combustion risk.

Table 1 – Maximum Storage Times

Combustible Waste Type	Maximum Storage Time on Site
Non-shredded or similarly treated wastes (that is wastes whose particle size has not been reduced)	6 Months
Baled and compacted wastes (if kept for longer periods you should consider breaking the bales & re-bale to help reduce risk) Please note that if you intend to do this, you must include this information in your FPMP.	6 Months
Shredded and similarly treated wastes (that is wastes whose particle size has been reduced)	3 Months
Combustible fines/dusts & very small particle size wastes	1 Month

You may have specific permit conditions that will restrict your maximum storage time. You must ensure that you comply with this limit.

It will be the responsibility of the operator to demonstrate a suitable management system prior to any combustible waste being stored for longer than the above periods. It is essential that you contact NRW to discuss the situation and methods to mitigate the risk of fire prior to exceeding the storage periods.

Materials that are at risk of self-combustion if stored for more than 3 months are:

- green material, compost, wood and wood products,
- paper and paper products,
- general/mixed waste including residual waste, RDF and 'fines'
- tyres (whole or processed)
- smaller size or graded materials either stored or mixed
- material that has not had potential hazards removed before stacking e.g. exposed rust (which can generate heat)
- treated materials which are not cold before storage (treatment processes can generate heat)

If you are storing materials at risk of self-combustion for longer than 3 months you must demonstrate what additional measures you will take, including monitoring the piles to reduce this risk. **You must include this information in your FPMP.**

You must demonstrate a clear method to record and manage the storage of all waste on site and ensure you have robust waste acceptance procedures (that form part of your Management System) to prevent receipt of unauthorised waste, or waste that your site does not have the capacity to treat or store.

To help prevent self-combustion taking place you should consider adopting the following general fire prevention principles:

- reduce risk factors (e.g. exposed metal content, proportion of 'fines', mixing of materials and heat generated during treatment)
- minimise stacks sizes (small stacks with appropriate separation are safer than one larger one)
- control moisture levels
- demonstrate good stock rotation for all stored materials and show how this is monitored and implemented daily
- store material in its largest form prior to processing e.g. do not undertake preparatory treatments such as size reduction of green waste unless you are intending on submitting the waste to the treatment process immediately
- monitor and control sub-surface temperature and moisture content with a suitable thermal device (thermal probe/thermal camera) and ensure that this is capable of reaching all parts of a stack (if materials are stored in plastic wrapping you must demonstrate a sampling and testing protocol to ensure a representative number of bales (minimum 10%) are assessed during monitoring
- routinely turn stacks
- detect and control hotspots within stacks (**Note:** steam is a good indicator of self-heating)
- define the maximum storage time of all materials on site and show how this will be monitored and controlled
- minimise external heating during hot weather by shading from direct sunlight

Some of the storage periods within your plan may have to be reduced where there is another requirement to ensure compliance with the permit, e.g. Odour Management Plan or pest control measures.

It is important that alternative waste management options are available should your site reach its safe storage capacity (which should be incorporated as a limit within the site management system).

8. Managing Waste Material Stacks and Separation Distances

Please note that some of the detail & illustrations used within this section have been kindly supplied by WISH (Waste Industry Safety and Health) Forum

This section of the guidance has been produced using increased industry and fire & rescue service experience; and improved knowledge attained as a result of a series of burn tests carried out during 2015-2016 by WISH (Waste Industry Safety and Health Forum) supported by CFOA (Chief Fire Officers Association).
The results of these tests matched much more closely the experience of the FRS when fighting real waste fires, and revealed some of the different mechanisms at play during waste fires. Both phase 1 and 2 tests were conducted on a variety of wastes such as loose and baled wastes, plastics, paper and board, rubber, wood wastes, waste derived fuels such as RDF and SRF and others.

Information and use of the tables and graphs

Some of the standards for storage stacks are simple, such as stack height and width. However, the separation distances will vary dependent on the length of the stack on a sliding-scale. For ease of use, these separation distances are captured within two graphs that appear towards the end of this section.
When calculating your separation distances please refer to the graph that is applicable to the waste type that you are storing:-

- **Graph 1** – Must be used for stack lengths and separation distances for general wastes, such as RDF, SRF (Refuse derived fuel/solid recovered fuel - various types of fuel derived from wastes using various treatment processes), wood, paper etc. (950 °C typical maximum burn temperature).

- **Graph 2** - Must be used for stack lengths and separation distances for plastics and rubber wastes (1,200 °C typical maximum burn temperature).

Within each graph there are four lines shown that can be used:-

- *loose stack to loose stack distances,*
- *loose stack to buildings distances,*
- *baled stack to baled stack distances, and*
- *baled stack to buildings distances*

In order to determine your separation distance, mark your stack length on the horizontal axis of the graph and draw a line up to the relevant graph line depending on the storage method used (stack to stack, to buildings etc.). Next draw a horizontal line across to the vertical axis and read-off separation distance.

If due to size constraints of your site you are restricted to separation distances, the graphs can be used in reverse. Therefore this distance can be marked on the vertical axis and maximum stack length read-off on the horizontal axis.
The terms stack length and width are used in the tables and graphs. However, when considering separation distances based on thermal heat transfer a burn-face could be on the long-side (length of a stack) or the short-side (width of a stack), or length and width could be equal. Both will need to be taken into account.

The aim of the tables and graphs is to give waste site operators practical and standard guidance that can be used without the need to employ a specialist fire engineer to calculate bespoke separation distances. As a result a number of assumptions have been made to avoid complicating the issue and a need to have 'hundreds' of graphs and scenarios.

The main assumptions made include:

- Graphs 1 and 2 assume a **stack height of 4 metres** (the maximum taking into account practical fire-fighting issues and stability). If your waste stacks are significantly lower than this you could employ a competent fire engineer to calculate bespoke separation distances for your site. However, small differences in stack height are unlikely to have a significant effect, and you would need to be confident that your stacks are consistently lower

- To avoid over-complicating the tables and graphs given, a limited number of scenarios have been used (those most common at waste sites). There are other potential scenarios, such as a bale stack next to a loose stack. Further detail can be found in the non-technical summary of the waste burn trial results available on the **WISH web site.**

Finally, when using the graphs please take a practical and cautious approach. Separation distances obtained from the graphs should be rounded-up to the nearest whole number. Measuring stack length or width or height down to the last millimetre is unlikely to have any substantive effect, and would not replicate actual conditions on a waste site, which will vary from day-to-day and week-to-week depending on business activity – if in doubt err on the side of caution.

As part of your waste stack management protocol you should consider adopting the following general fire prevention and mitigation principles:

- manage all stacks to within the maximum sizes and minimum separation distances
- have availability to adequate water supplies or alternative firefighting methods at all times to fight a fire
- enable easy access for emergency vehicles around the whole site
- manage all stacks of materials that can self-combust and demonstrate suitable additional precautions if they are stored for more than 3 months

In summary:

- **Maximum stack height of 4 metres** (or maximum of four bales high whichever is lower) based on practical fire-fighting and stability considerations. The height of a pile should be taken as the longest measurement between the base of the pile and the top. If the ground is uneven this may not be the highest point.

- **Maximum stack width of 20 metres** (provided appropriate access for plant/machinery is available from both sides – **if not maximum of 10 metres**) based on practical fire-fighting considerations.

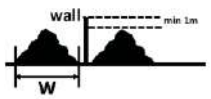
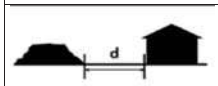
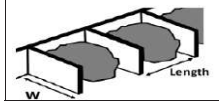
- Stack widths of more than 10 metres (with access from one side) start to degrade the effectiveness of standard fire hoses in applying water to the 'seat' of a fire. It will result in 'spraying' water in the air and hoping it falls on the right spot.

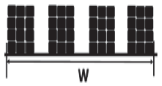
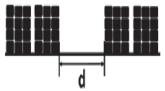
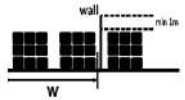
- **Depending on the waste type/s that you store at your site, please refer to the appropriate graph (either graph 1 or graph 2 in this section) to establish suitable stack lengths and**

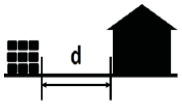
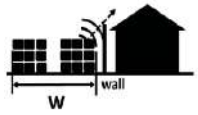
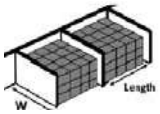
adequate separation distances. Stack length will be a variable based on the separation distance which is achievable at any specific site, so allowing flexibility to account for site dimensions and layout

Table 2 - Summary tables of standard stack separation distances and stack sizes

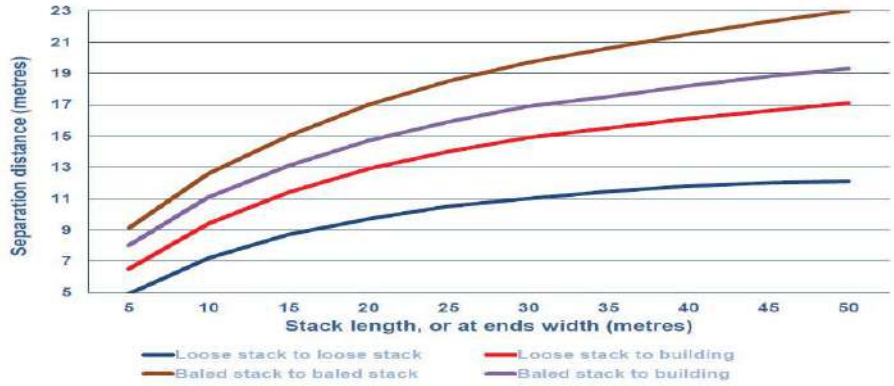
General combustible wastes (typical max burn 950 °C), EXCLUDING plastics/rubber	
Note: *The graphics used in all the following tables are indicative only and should not be considered as being to scale or a guide to stack layout or configuration, number of bales suggested in a stack etc. They are for illustrative purposes only and should be treated as such.*	
Parameter and standard	**Commentary**
1. Loose waste stacks: General wastes (typical max burn 950 °C), EXCLUDING plastics/rubber	
	**Maximum height (h) of 4 metres** is based on practical ability to fight fires using manual means such as standard hoses, and stability of stack to reduce the risk of fire spread from falling/rolling wastes.
	Maximum width (w) of 20 metres is based on practical ability to fight fires using manual means such as standard hoses. **NOTE – 20 metres** assumes good access for plant/machinery is available from both sides of the stack to fight fires. If this is not the case then maximum width = **10 metres**.
	Minimum free-air separation distance will depend on stack length (or at their ends width) – the longer the stack the wider the separation distance required. See graph 1, **blue** line to calculate separation distance for your stacks.

	Walls must be of suitable construction, and a minimum freeboard of **1 metre** left between waste and wall height to account for flame height. Stacks could be 'butt' against walls, but access to rear of stacks may be required for stock rotation and similar – this is a matter for site specific assessment. **NOTE** – access for fire-fighting will not be from both sides. This means maximum stack width = **10 metres**
Note: *When considering a fire wall between the length-sides of stacks the stack width is reduced to 10m, however, use of fire walls between the width-sides of stacks may have benefits.* **See examples of stack sizes & separation distances (page 25)**	
	Separation distance will depend on stack length (or at their ends width) – the longer the stack the wider the separation distance required. See graph 1, **red** line to calculate separation distance for your stack to buildings.
	Heat does not only travel horizontally. A wall height which is too low may result in heat radiated upwards and outwards travelling to an exposed upper portion of a building. Wall height should be sufficient to avoid this. A gap between wall and building should be left for general access. Unless this gap is substantive, access for fire-fighting will be from one side only and max stack width = **10 metres**.
Note: Buildings can be on-site (such as a recycling plant waste hall) or off-site (such as a nearby industrial unit). The separation distances and/or fire wall information given above applies in both cases, including at site boundaries.	
	Maximum width (w) of bunkers = **10 metres** (for reasons of practical fire-fighting as access is unlikely to be from both sides). Length of bunker is for site specific assessment based on stock rotation etc. A minimum of 1 metre freeboard should be left between waste and bunker height. **NOTE** - if open (length) side of bunker/s faces a building/other waste stack then see graph 1 for separation distance.

Baled waste stacks: General wastes (typical max burn 950 °C), EXCLUDING plastics/rubber	
	Maximum height (h) of 4 metres, or four bales high whichever is the lowest, is based on practical ability to fight fires using manual means such as standard hoses, and stability of bale stack to reduce the risk of fire spread from falling/rolling waste bales.
	Maximum width (w) of 20 metres is based on practical ability to fight fires using manual means such as standard hoses. **NOTE** – 20 metres assumes good access from both sides of the stack to fight fires. If this is not the case then maximum width = **10 metres**. **NOTE** – within an individual bale stack adequate gaps for access for stock rotation should be left between rows of bales.
	Separation distance will depend on stack length (or at their ends width) – the longer the stack the wider the separation distance required. See graph 1, **brown** line to calculate separation distance for your stacks.
	Walls must be of suitable construction, and a minimum freeboard of **1 metre** left between waste and wall height to account for flame height. Stacks could be 'butt' against walls, but access to rear of stacks may be required for stock rotation and similar – this is a matter for site specific assessment. **NOTE** – access for fire-fighting will not be from both sides. This means maximum stack width = **10 metres**
Note: *When considering a fire wall between the length-sides of stacks the stack width is reduced to 10m, however, use of fire walls between the width-sides of stacks may have benefits.* **See examples of stack sizes & separation distances (page 25)**	

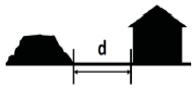
	Separation distance will depend on stack length – the longer the stack the wider the separation distance required. See **graph 1**, **purple** line to calculate separation distance for your bale stack to buildings.
	Heat does not only travel horizontally. A wall height which is too low may result in heat radiated upwards and outwards travelling to an exposed upper portion of a building. Wall height should be sufficient to avoid this. A gap between wall and building should be left for general access. Unless this gap is substantive, access for fire-fighting will be from one side only and max stack width = **10 metres**.
Note: Buildings can be on-site (such as a recycling plant waste hall) or off-site (such as a nearby industrial unit). The separation distances and/or fire wall information given above applies in both cases, including at site boundaries (heat does not stop at a site boundary).	
	Maximum width (w) of bunkers = 10 metres (for reasons of practical fire-fighting as access is unlikely to be from both sides). Length of bunker is for site specific assessment based on stock rotation etc. A minimum of 1 metre freeboard should be left between waste and bunker height. **NOTE** - if open (length) side of bunker/s faces a building/other waste stack then see **graph 1** for separation distance.

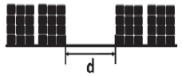
Graph 1. Stack lengths and separation distances general wastes (typical max burn 950 °C)



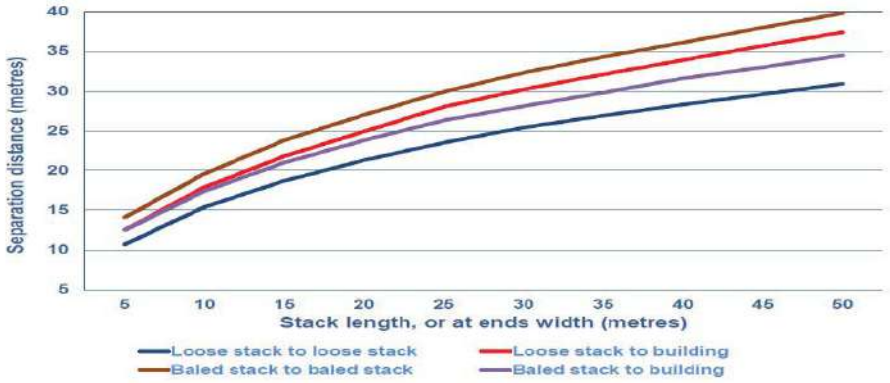
To determine your separation distance, mark your stack length on the horizontal axis of the graph and draw a line up to the relevant graph line (stack to stack, to buildings etc.). Then draw a horizontal line across to the vertical axis and read-off separation distance. This can also be done in reverse. For example, at your site separation distance may be constrained by site size. Therefore this distance can be marked on the vertical axis and maximum stack length read-off on the horizontal axis

See examples of stack sizes & separation distances (page 26)

Plastics/rubber wastes (typical max burn 1,200 °C)	
The waste fire burn tests revealed that burning plastic and rubber wastes have higher burn temperatures and thermal emissions. As a result of this, separation distances are wider than for general wastes. Graph 2 reflects these wider distances. Other information, such as relating to fire walls/bunkers, stack width and height, as given for general combustible wastes, are the same and are not repeated below.	
Loose waste stacks: Plastics/rubber wastes (typical max burn 950 °C)	
Parameter and standard	**Commentary/rationale**
	Separation distance will depend on stack length (or at their ends width) – the longer the stack the wider the separation distance required. See **graph 2**, **blue** line to calculate separation distance for your stacks.
	Separation distance will depend on stack length (or at their ends width) – the longer the stack the wider the separation distance required. See **graph 2**, **red** line to calculate separation distance for your stack to buildings.

Baled waste stacks: Plastics/rubber wastes (typical max burn 950 °C)	
	Separation distance will depend on stack length (or at their ends width) – the longer the stack the wider the separation distance required. See **graph 2**, **brown** line to calculate separation distance for your stacks.
	Separation distance will depend on stack length – the longer the stack the wider the separation distance required. See **graph 2**, **purple** line to calculate separation distance for your bale stack to buildings.
Note: Buildings can be on-site (such as a recycling plant waste hall) or off-site (such as a nearby industrial unit). The separation distances and/or fire wall information given above applies in both cases, including at site boundaries (heat does not stop at a site boundary).	

Graph 2. Stack lengths and separation distances plastic/rubber wastes (typical max burn 1,200 °C)

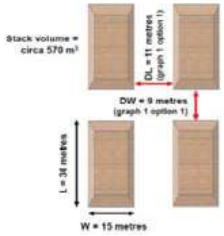


To determine your separation distance, mark your stack length on the horizontal axis of the graph and draw a line up to the relevant graph line (stack to stack, to buildings etc.). Then draw a horizontal line across to the vertical axis and read-off separation distance. This can also be done in reverse. For example, at your site separation distance may be constrained by site size. Therefore this distance can be marked on the vertical axis and maximum stack length read-off on the horizontal axis.

See examples of stack sizes & separation distances (page 26)

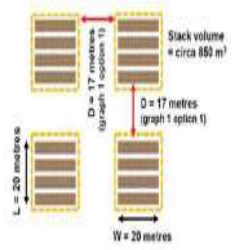
9. Example of Stack Sizes & Separation Distances

Simple loose stack layout, pre-crush wood using free-air separation distances



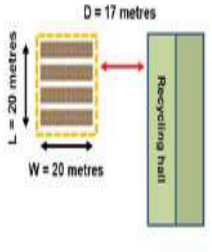
This example below is pre-crush wood stored in loose stacks with free-air separation distances used to mitigate fire spread. Each stack is 30 metres long and 15 metres wide. As wood is a general waste, using **graph 1** blue line (loose stack to loose stack distances) gives a separation distance on the length side of each stack of 11 metres (DL) and on the width side of 9 metres (DW). Each stack has a volume of circa 570 m^3, with total volume across all four stacks shown of circa 2,280 m^3 (equivalent to circa 450 – 500 tonnes density dependent).

Simple bale stack layout, baled paper/card using free-air separation distances



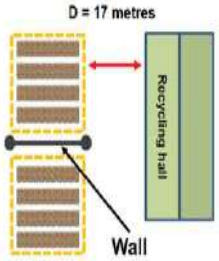
This is similar to above, but using paper/card bales (each individual stack of rows of bales demarked by amber dotted line). These are general wastes, so **graph 1** applies. Stacks are 20 metres square, giving a separation distance from the brown line in **graph 1** of 17 metres each side. Excluding the gaps between bale lines for access, stack volume is circa 850 m^3, with a total volume across all four stacks of circa 3,400 m^3.

Example of restricted separation distance determining stack dimension



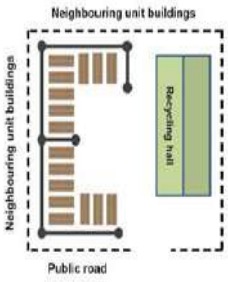
Limited space at this site means the maximum separation distance which can be achieved between recycling building and stack is 17 metres (D in graphic). Using paper/card bales as for example above, **graph 1** purple line gives a maximum stack length of 20 metres (mark 17 metres on the vertical axis of graph 1, draw a horizontal line across to the purple line, and then a vertical line down, giving stack length at 20 metres). This is an example of how the information can be used in reverse in **graph 1** and **graph 2**.

Use of a single fire wall to extend storage capacity



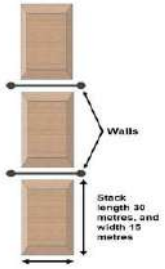
This is the same as above, but the operator wishes to increase overall storage capacity in a limited space. Adding an appropriate fire wall as shown removes the need for a free-air gap at the width ends of the bale stacks. Each stack still has a length of 20 metres, and is still in line with **graph 1**, because the separation distance is determined by the burn-face of each of the stacks. Obviously the integrity of the fire wall is critical – if it fails to prevent fire spread and both stacks ignite then overall burn face will be 40 metres, which would require a wider separation distance. Note – maintaining the 20 metre width of stacks in this example assumes good access for fire-fighting from both sides of stacks.

Use of a bunkers/fire walls to extend storage with buildings at site boundary



All of the above examples assume there is nothing at the site boundary. This example is the same site as example above, but assumes the waste site is on an industrial estate and has neighbouring industrial unit buildings close to its site boundary. Installation of additional walls to form bunkers around the storage stacks provides protection for these neighbouring units without free-air separation distances (a reasonable level of stand-off is still required). However, because access for fire-fighting is not available from both sides, stack width is decreased to 10 metres. In this example, extending the walls has allowed the operator to reduce the loss of overall site storage capacity to only circa 12% compared to the capacity of example above.

Use of fire walls with loose stacks



The use of fire walls is not restricted to bale stacks. This example shows a loose stack layout using fire walls to remove the need for free-air separation distances at the width ends of the stack. Assuming good access for fire-fighting is available from both sides stack width is not affected (shown at 15 metres, but could be the 20 metre maximum). If access is only available from one length face of the stack then width should be 10 metres. This type of layout may be suitable for 'long and thin' waste sites and allows for maximum use of space to be achieved.

Storage of Whole end of life vehicles (ELVs).

You must set out in your FPMP how you will store ELVs. Each vehicle should be accessible from at least one side

- to allow a fire to be fought
- so unburnt vehicles can be accessed and moved to prevent the fire spreading

These rules will limit any row to a depth of 2 vehicles.

Where you store vehicles one on top of another, or on racking, you should limit this to 3 vehicles high so the stack can remain stable during a fire. You should maintain a minimum separation distance between rows or blocks of vehicles in accordance with **Table 2** (depending on the length of the rows).

Batteries in ELVs - Batteries left connected in un-depolluted vehicles can short circuit and cause fires. You must disconnect or remove batteries from un-depolluted vehicles as soon as possible after reception.

Cylinders in ELVs – As part of your depollution process, you must ensure that any LPG tanks within vehicles have been safely removed.

Further advice is available on:-

Removal of LPG Tanks - Guidance

End of life vehicles (ELVs): guidance for waste sites

Depolluting end-of-life vehicles: guidance for treatment facilities

For stack pile sizes and separation distances of any other waste stored at your site (e.g. tyres) please refer to Table 2. You must include your proposed stack pile sizes and separation distances in your FPMP.

Compost Production

For composting activities, the maximum pile sizes do not apply when the waste is actively managed and monitored during the composting process. Waste stored before and after active composting must follow the maximum pile sizes in **Table 2**.

10. Baled Waste Storage

If you are storing waste in bales your FPMP must show how you are reducing the risk of a fire occurring within the bales. It is recommended your plan shows:

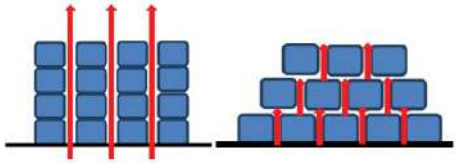
- what sampling and testing protocol you will use to make sure you assess a representative number of bales (minimum 10%) during monitoring
- that you get representative temperature readings from the centre of the bales; and from bales within the centre of each stack pile
- that you turn the bales to make sure the waste stays cold

If baled waste seems likely to exceed the time limits in **Table 1** you should consider breaking the bales and re-baling them to reduce fire risk. However, care should be taken when breaking bales or turning loose piles/stockpiles. Breaking bales and turning loose stacks may itself cause a fire. Self-heating may be occurring within a stack, but because of the lack of oxygen a fire has not occurred as yet.
When you open the bale/turn the stack you may introduce sufficient oxygen to the waste to result in a fire. When breaking bales and turning stacks you should have fire-fighting equipment, such as hoses, at the scene so that you can deal with a fire more quickly if one occurs (hand-held extinguishers are unlikely to be sufficient).

Bales that are stacked more than 4 high pose a serious risk of stack collapse, the stack will become unstable above 4 bales high and can result in the stack collapsing on a person in both a non-fire and fire situation. Stack collapse during a fire poses the risk of increased fire spread as well as the unnecessary risk posed to fire fighters and their ability to fight a fire.

Baled wastes when stored may pose a specific fire risk issue associated with the configuration of storage. Bales of waste are typically stacked directly on top of each other. This can result in continuous vertical air gaps between bales – in effect creating 'chimneys' between individual 'towers' of bales. If a fire occurs, these chimneys can result in energetic air-flows between bales so promoting a more rapid and energetic burn. Interlacing bales can help to break-up these chimneys – arranging bales in the same way as bricks in a wall rather than directly on top of each other. You should consider this for baled plastics/rubber

where burn temperatures are higher, interlacing bales may reduce burn temperature and how energetically a fire may burn.



Far left: Standard bale storage may result in chimneys between bales promoting air-flow during a fire. Left: Interlacing bales may disrupt this chimney effect reducing air-flow and fire intensity

The above assumes that your bales are 'square', as is typical for bales of paper, plastics etc. However, there are other types of baler, such as those used to bale and wrap RDF and similar waste derived fuels. Bales produced by such equipment may be cylindrical rather than square. Such cylindrical bales are stacked interlaced for stability reasons, and so any chimney effect may already be mitigated.

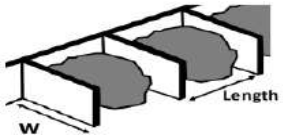
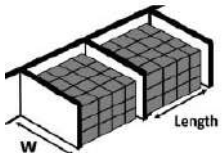
11. Enclosing Stacks Using Bays and Walls

If you use bays or walls between stacks to store waste materials they should be of sufficient height, thickness and construction that offer a **fire resistance period of at least 120 minutes** to allow waste to be isolated to stop fire spreading and minimise radiant heat.

Product specification will need to be established via approved stockists to ensure appropriate standard of fire resistance are met. It is essential that when installing such products that the installation method used is in line with the manufacturers recommended installation requirements.

You should be able to demonstrate:

- full and frequent stock rotation and how this will be monitored and recorded
- protection from wind
- how you intend to check temperature and moisture content of all the material within the bay so that the entire volume of the stack receives representative checks
- the construction of the walls in terms of how they offer a thermal barrier and enable cooling
- how stock capacity will be managed and controlled (using first in first out concept)
- how you will ensure segregation of materials
- how calculation of flame height and radiation has been taken into account in preventing the spread of fire between stacks
- prevention of brands or lighted material moving outside the bay walls
- prevention of bridging across or around walls
- how a 'freeboard' space of 1m at the top and sides of the walls will be physically retained at all times in accordance with the latest available guidance
- the frequency and method of turning stacks
- how the **quarantine area** will be used and how materials will be moved during an incident

	Maximum width (w) of bunkers = **10 metres** (for reasons of practical fire-fighting as access is unlikely to be from both sides). Length of bunker is for site specific assessment based on stock rotation etc. A minimum of 1 metre freeboard should be left between waste and bunker height. **NOTE** - if open (length) side of bunker/s faces a building/other waste stack **see graph 1** for separation distance.
	Maximum width (w) of bunkers = **10 metres** (for reasons of practical fire-fighting as access is unlikely to be from both sides). Length of bunker is for site specific assessment based on stock rotation etc. A minimum of 1 metre freeboard should be left between waste and bunker height. **NOTE** - if open (length) side of bunker/s faces a building/other waste stack **see graph 1** for separation distance.

12. Waste Stored Within a Building

If you are storing waste within a building; you should adopt the following general principles for fire prevention and mitigation of fires at all times:-

- Ensure waste stack sizes and separation distances are appropriate to the risk. **Table 2** can be used as a starting point but not absolute guidance for internal storage.
- Consider the use of fire walls/bunkers.
- Separation between internally stored wastes and building walls, plant & other equipment within buildings will need to be considered. In general fires in internally stored wastes are far more likely to spread to buildings and plant than for externally stored wastes. As a result, your insurer is likely to place more emphasis on internal storage than external storage fire management. You should seek advice from your insurer to ensure that you have met any requirements for fire detection and fire suppression.
- If you are storing wastes internally in large quantities, such as in warehousing, then you should seek competent advice on the precautions to be taken. These will depend on the type of building used, the types of waste being stored and what fire precautions are already in place. This is a specialised area, and the general standards applied to the warehousing of goods may not be appropriate to the internal storage of wastes.
- If the building is heated this could affect the potential for self-heating of the waste and should be taken into account when assessing self-heating risks.

- You must ensure that all escape routes, fire exits, alarm call points and fire extinguishers are kept clear and free from waste at all times
- Ensure electrical equipment and heaters are kept free from waste, including dust and packaging materials.
- Waste storage areas should be fire compartmented away from office areas.
- Waste storage areas should have some means of clearing smoke from the building, such as openable skylights or roller shutter doors, to aid fire-fighting.

Further guidance is given in the Gov. UK document:-
"Fire Safety Risk Assessment - Factories and Warehouses"

13. Waste Stored in Containers

If you store waste in containers that can hold more than 1,100 litres, each one must be accessible so any fire inside it can be extinguished. Examples of these types of containers include skips, roll-on roll-off skips, or shipping containers. Shipping containers should be stacked no more than 2 containers high and secured with a lock outside of operational hours.

If you have a fire, you should be able to move containers as soon as is reasonably practicable in a safe manner to prevent the fire spreading. You should set out in your FPMP the procedures you will put in place to allow this to happen.

For all other containers holding waste, the **appropriate stack sizes** apply as per **Table 2**.

14. Layout of Waste Stacks on your Site

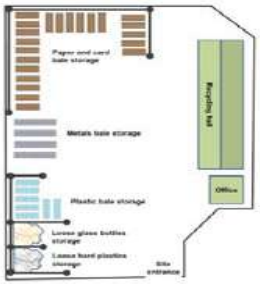
When you have identified the potential stack sizes, storage methods/types and appropriate separation distances required at your site, you can plan the storage arrangements. **See examples of stack sizes & separation distances**

In addition to the above, there are other factors that you may need to take into account when deciding on your site/stack layout. These include the below examples as well as specific site conditions):

- Location of potential ignition sources on your site
- Location/s of occupied buildings and high-asset value equipment and plant
- Escape and evacuation routes around your site and within buildings must not be compromised by stack layout
- Location of flammable and/or hazardous substances kept on site, such as gas cylinder cages, diesel tanks, quarantine areas which may contain non-conforming wastes etc.
- Locations of on or off-site fire hydrants, other water supplies and fire-fighting equipment – you do not want to block access to these with your stack layout

- Proximity and location/s of any infrastructure which may be affected by a fire, such as overhead power lines, major roads, rail lines etc.
- Proximity and location/s of any off-site, third party buildings which may be affected by a fire
- Permitted amounts of wastes, and types of waste, allowed on site
- Location of a 'quarantine' area, as appropriate to site specifics
- Operational practicalities such as movements of vehicles & designated routes
- Stock rotation requirements, seasonality of supply/off-take etc.

You should also consider the prevailing wind, **where fire water will flow** and the **firefighting strategy** that will be used.



This example shows a typical site layout using appropriate stack sizes and walled bunkers to achieve maximum available space.

15. Seasonality and Waste Stack Management

You should demonstrate that your waste stack management is viable and that you are able to prove the suitability of materials, the resilience of the supply chain and end user outlets. You should provide a technical assessment that shows you have confidence that your proposal will be viable in foreseeable market conditions.

If the materials on your site are subject to seasonal variation in demand and/or supply you should demonstrate how you intend to manage these variations. You should be able to demonstrate how you will follow the principle of "first in, first out" so that wastes are stored for no longer periods than indicated in **Table 1**.

All these issues and the contingencies you employ to manage them should be in your management system and implemented before operations commence on site.

16. Monitoring and Turning of Stacks (2)

Stacks should be monitored regularly to ensure that temperature increases & changes in moisture content are minimised. The equipment you use to detect temperature and

moisture content should be capable of operating at any depth throughout the pile. Therefore, if you are proposing to have a stack 4m deep, your thermal monitoring equipment should be capable of operating through the depth of the proposed stack.

You should explain what indicators you will use in relation to temperature and moisture content and the escalation of actions in relation to these indicators.

The turning of stacked waste may be carried out to prevent internal heating of the stack and self-combustion following the monitoring as highlighted above. However, waste storage times on site should be modified to prevent self-combustion as highlighted in the **'Storage Times and Self-combustion Factors'** section of this guidance. The turning of waste stacks if required following monitoring will ensure that the material remains cold and any localised warming is dissipated quickly. Your staff must be trained to detect and manage hotspots.

If you are storing waste in bales your FPMP should show how you are reducing the risk of a fire occurring within the bales. Please refer to Baled Waste Storage for appropriate control measures.

2 *This section does not apply to compost windrows during the composting process.*

17. Fire Detection

You should ensure that you have adequate procedures in place to detect a fire in its early stages so you can reduce its impact; you should seek competent advice on the potential installation of a fire detection system.

Your detection system should be proportionate to the nature and scale of waste management activities you carry out and the associated risks.

Appropriate automated systems may include:

- smoke and heat detectors including temperature probes
- CCTV visual flame detection systems
- spark, infrared and ultraviolet detection

The design, installation and maintenance must be covered by an appropriate **UKAS-accredited** third party certification scheme.

Many insurers have specific requirements for fire alarm, detection and suppression/extinguishing systems. If you fail to meet these specifications and requirements your insurance may be invalidated.

The basic rule here is:

TALK TO YOUR INSURER TO AGREE A WAY FORWARD AND ESTABLISH APPROVAL FOR ANY INSTALLATIONS.

18. Fire Suppression Systems

If you store waste in a building, you should seek competent advice on the potential installation of a fire suppression system. This system should be proportionate to the nature and scale of waste management activities you carry out and the associated risks. Materials must be kept a minimum of 3m below the level of the spray or sprinklers.

When deciding what type of system to install you need to take into account that:

- the fire and rescue service may not be able to enter the building during a fire
- a suppression system may not extinguish a fire, although it may prevent a fire spreading and then allow the fire to be fought effectively by the fire and rescue service
- the water supply to a fire system is reliable and adequate at all times

Appropriate fire suppression systems may include:

- sprinklers
- manual open deluge system
- deluge/water spray systems
- mobile foam trolley
- water monitors/cannons/curtains

You should ensure that the design, installation and maintenance of all your automated suppression equipment is covered by an appropriate **UKAS-accredited** third party certification scheme

Many insurers have specific requirements for fire alarm, detection and suppression/extinguishing systems. If you fail to meet these specifications and requirements your insurance may be invalidated.

The basic rule here is:

TALK TO YOUR INSURER TO AGREE A WAY FORWARD AND ESTABLISH APPROVAL FOR ANY INSTALLATIONS.

19. Firefighting Strategy

It is important that you design your site layout to allow for active firefighting. This will help allow a fire to be extinguished within the shortest time possible.

Active firefighting does not mean that you or your staff have to fight the fire; no one should put themselves at risk by trying to fight a fire.

Active firefighting means having the resources available on site at all times to fight a fire. The resources needed include:

- heavy mobile plant you have available that can be used to move waste around the site, for example loaders, excavators, material handlers

  Note – if you intend to use heavy mobile plant as a method of tackling a fire, you must ensure it is suitable for the task, such as by having completely enclosed cabs, fire and heat protected hydraulic systems, etc.

- the use of portable water carriers/bowsers can prove to be an essential mechanism to help extinguish fire effected waste
- adequately trained staff available
- available water supply
- finances available for additional resources if required

A variety of firefighting techniques can be used together or separately to extinguish a fire.

These include:

- applying water to cool unburned material and other hazards
- separating unburned material from the fire using appropriate heavy plant
- separating burning material from the fire to quench it with hoses or in pools or tanks of water

Firefighting techniques may also include suffocating the fire using soil, sand, crushed brick or gravel. However, you can only do this if:

- Natural Resources Wales has agreed you can do this in the first instance, and
- you remove and dispose of contaminated material as soon as it is safe to do so

All these techniques may be used by staff on site if they are suitably trained and are supervised at all times by the fire and rescue service. However, protecting the health and safety of people on site must be your priority.

20. Water Supplies

You must have sufficient water supplies available to your site for firefighting to take place and to manage a worst case scenario incident (e.g. one (your largest stack) or more stacks on site are on fire).

Depending on your site this could be water in storage tanks or lagoons on site, or access to hydrants or mains water supply.

On larger sites (and especially on sites where reprocessing or power generation takes place) you should consider providing a private fire hydrant system with the necessary supply of water.

Alternative water supplies such as a near-by river, canal, lake, lagoon etc. (in some rare cases wells can be used, but their capacity and recharge characteristics must be

adequate) can be considered within your plan to supplement tanked or mains supplies however these alternative supplies need to be capable of being accessed promptly.

Alternative water supplies also need to be reliable: Relying on a lagoon which is only half full or empty for part of the year may result in water shortage issues.

You must ensure that you have permission to use any water supplies that you have stated within your plan and necessary evidence of this solution is required.

You should contact your respective water supplier to establish water access, available water pressures to your site to ensure that water supplies are available without impacting on local supply.

If necessary, contact your respective Fire & Rescue Service and Natural Resources Wales for further advice.

Use this estimate as a rough guide to calculate the volume of water you will need:

A 300m^3 stack of combustible material will normally require an average water supply of at least 2,000 litres a minute for a minimum of 3 hours.

Note - the total amount of water needed can also vary depending on the waste type that you store within your site.

You may be able to reduce water volumes needed if you have a system that lets the fire and rescue service re-circulate the water they are using to fight the fire (fire water). However, you may need to filter this water and the fire and rescue service will also need suitable adapters to connect to your system. Depending on the waste that you store it may not always be appropriate or safe to re-circulate the water.

21. Managing Water Run-off

You should be able to contain the run-off from fire water to prevent pollution of the environment.

The containment facilities and pollution equipment you need will depend on the:

- size of your site
- amount of waste you store
- firefighting strategy

The CIRIA document **'Containment systems for the prevention of pollution (C736)'** may help you to identify what facilities and equipment you may need for your site.

You must take all the steps that are reasonably practicable to minimise pollution from fire water.

For example, preventing fire water entering:

- surface waters, for example rivers, streams, estuaries, lakes, canals or coastal waters
- into the ground

If you do not manage this issue, you may be committing an offence and Natural Resources Wales may take enforcement action.

Secondary and tertiary containment facilities for fire water run-off include:

- impermeable bunds
- storage lagoons
- shut-off valves
- isolation tanks
- modified areas of your site such as a car park
- pollution control equipment such as fire water booms and drain mats to block drains or divert fire water

You may also be able to divert fire water to your local sewers. You will need agreement in principle from the sewerage company before including this measure in your fire prevention plan (evidence of approval will need to be submitted in the plan)

Your environmental permit may let you store combustible wastes on hard standing rather than an impermeable surface with sealed drainage. If so, you must assess the potential effect of fire water on:

- the local groundwater and surface water bodies
- any well, spring or borehole within 50 metres used for the supply of water for human consumption, including private water supplies

Your FPMP must set out how you will prevent fire water affecting these receptors, if applicable.

22. Designated Quarantine Area

A quarantine area can be used as a designated area to place fire affected waste to ensure that it is fully extinguished. As an alternative approach unburnt wastes can be moved into the quarantine area for isolation and to help prevent it catching fire.

The quarantine area should be within the permitted boundary area of the site and should be large enough to both:

- hold at least 50% of the volume of the largest stack,
- have a separation distance of at least 6 metres around the quarantined waste (this can be decreased if concrete bunkers/walls will be used)

You should set out in your FPMP the location of this area and the volume of waste that it can hold.

For operational reasons you may want to keep the location of the quarantine area flexible. If so, you should identify on your site plan all the areas you could use.

You should keep at **least one** specified quarantine area clear at all times – unless it is being used in the event of a fire.

If you use your quarantine area to store material temporarily (for example, non-permitted wastes) you should make sure you can remove those wastes as soon as is practicable. In the event of a fire, you must remove those wastes immediately. Your FPMP should include details of the procedure you will use to do this.

You should set out how you will use your quarantine area in the event of a fire. You must have the ability to be able to move waste to it as soon as possible.

23. During and After an Incident

Your FPMP must have contingency measures in place for dealing with issues during and after a fire. For example, these could include:

- diverting incoming wastes to alternative sites during a fire
- having a plan for how you will notify those who may be affected by a fire, such as nearby residents and businesses
- contractors that might be used to assist with additional plant for firefighting techniques, removal of waste material, containment and removal of excess water run-off

You also need to set out in your FPMP:

- how you will clear and decontaminate the site
- the steps you must take before the site can become operational again

24. Reviewing and Monitoring your Fire Prevention & Mitigation Plan

It is essential that you ensure your FPMP is kept up to date to ensure that you maintain compliance. Your FPMP should be treated as a live working document and be reviewed regularly to reflect any changes that your business experiences.

Circumstances that would warrant a review of your FPMP can include:-

- Experiencing a fire incident. Following any fire it is essential that your FPMP (and overall fire management measures) should be reviewed and improved as required to address any issues/concerns
- Additional combustible waste streams accepted on site.
- Increase waste volumes accepted.
- Development of site infrastructure – new buildings.
- Installation of new equipment or plant – baler/loading shovel/sort-line/trommel etc.

Areas that could need to be updated can include:-

Staff training:

- Ensure your FPMP is available and that all staff know where it is kept.
- Ensure staff receive training to enable them to competently carry out the procedures and measures contained within your FP&MP-
    - New Starters – Induction Training.
    - At regular intervals - refresher courses, toolbox talks, on-site exercises/drills
    - Ensure training need is monitored and training records kept.

Site Monitoring:

As part of your site operations, areas can include:-

- Site inspections before, during and after shifts to ensure:
    - No identifiable ignition sources
    - All equipment is operating/turned off correctly.
- Waste stacks and separation distances are in accordance with your FPMP
- Monitor, control and record temperature of waste stacks
- Monitor and record residence times of wastes on site
- Plant and equipment are adequately serviced and maintained by qualified personnel. Daily, weekly, monthly checks undertaken and records kept.
- Ensure periodic testing of fire prevention and mitigation equipment is carried out

The methods and procedures you use to maintain compliance should be listed as a separate section within your Fire Prevention and Mitigation Plan.

25. Useful Links from Document

Applying for a permit

https://naturalresources.wales/apply-for-a-permit/?lang=en

Waste Industry Safety and Health Forum (WISH) – WASTE 28 Reducing fire risk at waste management sites issue 2 – April 2017

https://wishforum.org.uk/wp-content/uploads/2017/05/WASTE-28.pdf

WISH - https://wishforum.org.uk/

Regulatory Reform (Fire Safety) Order 2005

http://www.legislation.gov.uk/uksi/2005/1541/pdfs/uksi_20051541_en.pdf

"Fire Safety Risk Assessment - Factories and Warehouses".

https://www.gov.uk/government/publications/fire-safety-risk-assessment-factories-and-warehouses

'Guidance for the storage and treatment of aerosol canisters and similar packaged wastes'

https://www.gov.uk/government/publications/sector-guidance-note-s506-recovery-and-disposal-of-hazardous-and-non-hazardous-waste

Health and Safety Executive (HSE) Guidance

http://www.hse.gov.uk/search/search-results.htm?q=hot%20works%20guidance%20-%20gsc.tab=0&gsc.q=hot%20works%20guidance&gsc.page=1#gsc.tab=0&gsc.q=hot%20works%20guidance%20-%20gsc.tab&gsc.page=1

Removal of LPG Tanks - Guidance

https://www.gov.uk/government/publications/removal-of-lpg-tanks-guidance

End of life vehicles (ELVs): guidance for waste sites

https://www.gov.uk/guidance/end-of-life-vehicles-elvs-guidance-for-waste-sites

Depolluting end-of-life vehicles: guidance for treatment facilities

https://www.gov.uk/government/publications/depolluting-end-of-life-vehicles-guidance-for-treatment-facilities

UKAS-accredited

https://www.ukas.com/

Containment systems for the prevention of pollution (C736)

http://www.ciria.org/Resources/Free_publications/c736.aspx

Pollution prevention advice is available in the **'Guidance on Pollution Prevention' (GPP)** which apply in Wales, Scotland and Northern Ireland.

More information on how to protect groundwater is available on the **groundwater protection pages on Gov.UK**

26. Useful Contact Details

Natural Resources Wales
Cambria House
29 Newport Road,
Cardiff
CF24 0TP
Tel: 0300 065 3000
Email: enquiries@cyfoethnaturiolcymru.gov.uk
www.cyfoethnaturiolcymru.gov.uk

South Wales Fire & Rescue Service
Forest View Business Park
Llantrisant
CF72 8LX
Tel: 01443 232000
E-mail: firesafety@southwales-fire.gov.uk
www.southwales-fire.gov.uk

Mid & West Wales Fire & Rescue Service
Fire Service Headquarters
Lime Grove Avenue,
Carmarthen
SA31 1SP
Tel: 0370 6060699
Email: mail@mawwfire.gov.uk
www.mawwfire.gov.uk

North Wales Fire & Rescue Service
Ffordd Salesbury,
St Asaph Business Park
St Asaph,
Denbighshire
LL17 0JJ
Tel: 01745 535250
Email: business.education@nwales-fireservice.org.uk
www.nwales-fireservice.org.uk

Dŵr Cymru Welsh Water
www.dwrcymru.com

Severn Trent
www.stwater.co.uk

Dee Valley Water
www.deevalleywater.co.uk

Health & Safety Executive (Wales)
Tel: 0300 003 1747
www.hse.gov.uk/welsh

Public Health Wales
Tel: 029 2022 7744
www.publichealthwales.wales.nhs.uk

OD3 WASTE 28 - Reducing Fire Risk at Waste Management Sites (Issue 3), Waste Industry Safety and Health (WISH) Forum, March 2020

WISH Waste Industry Safety and Health Forum

REDUCING FIRE RISK AT WASTE MANAGEMENT SITES

This is good practice guidance based on the latest research and information available. In the pursuit of good fire risk management, parts of it may go further than is needed to achieve basic legal and regulatory compliance. Waste management operators must first comply with the law, regulation, regulatory standards, and the requirements of their permits, licences and similar permissions. However, to achieve good levels of fire risk management you may want to go beyond basic compliance.

This is the third version of the WISH 'Reducing Fire Risk at Waste Management Sites' guidance, the first having been released in October 2014 and the second in April 2017. As for its predecessors, this revised guidance is aimed at providing waste management operators with advice and information to:

- Reduce the likelihood and frequency of fires at solid waste management sites
- Where fires do occur, reduce potential safety, health, environmental, public health, property damage and business interruption impacts

Production of this guidance was facilitated via the WISH Waste Fires Working Group. Representation on the working group includes the following organisations:

- CIWM (Chartered Institution of Wastes Management)
- National Fire Chiefs Council (NFCC)
- ESA (Environmental Services Association)
- EA (Environment Agency)
- HSE (Health and Safety Executive)
- PHE (Public Health England)
- WRA (Wood Recyclers Association)
- TRA (Tyre Recovery Association)

Other organisations were also consulted on specific aspects, such as some of the main insurers on fire engineering issues, and other bodies are corresponding participants.

Involvement in the working group does not imply an organisation's agreement with all aspects of this guidance. The aim of the working group is to hold an open and informed debate on waste site fire risk to arrive at the best, good practice methods of mitigating this risk. WISH believes that this guidance represents best, good practice.

This guidance is supported by the National Fire Chiefs Council (NFCC), the Environmental Services Association (ESA), the Chartered Institution of Wastes Management (CIWM), the Scottish Environment Protection Agency (SEPA), Natural Resources Wales (NRW), and the Waste Industry Safety and Health Forum (WISH).

Guidance from some regulators, or specific sector bodies, may include alternative standards. While WISH may not agree with all the technical standards in some of this other guidance, it welcomes any effort to reduce fire risk at waste management sites. Where appropriate, this WISH guidance includes mention of such documents. However, if you are in any doubt about the standards which apply to your circumstances, you should first seek the advice of your regulators. You must always comply with regulatory standards and guidance.

It is not the intent of this guidance to be inflexible, and options and considerations have been given throughout to allow operators to tailor it to their circumstances. Nor is it the intent to provide a 'one-stop-shop' for waste managers on all aspects of fire risk – existing guidance and standards on general fire risk management and control, and in particular on life-safety, should be read in conjunction with this guidance. It is the intent of this guidance to provide a framework through which operators can reduce the risk of fire on their sites and minimise the business and societal impacts of any fires that do occur. This guidance is intended as an umbrella document. It gives advice applicable to a wide range of waste management and similar sites which handle solid combustible wastes, but it cannot cover every aspect of all forms of waste management operation. Operators need to be aware of other relevant guidance and standards, and of the need for their own specific assessment to tailor solutions to their specific situation and operations.

While we know far more about the combustion properties of wastes and other related issues than when this guidance was originally produced in 2014, fire risk management for wastes is still a rapidly developing field. As knowledge develops and as better information becomes available, further revisions of this guidance will be made to keep it up to date.

CIWM esa environmental services association NFCC National Fire Chiefs Council

Contents

For ease of reading this guidance is split. Section 1 covers general issues such as scope and fire risks. Sections 2 – 7 provide specific guidance for waste management sites in four main areas: Whole site issues, in waste reception, during waste treatment and for the storage of wastes. Appendices are also included on issues such as fire spread in external storage, fire engineering and checklists to help you assess if your fire control is adequate.

To aid readers in seeing what has changed since the 2017 version of this guidance, a summary of main changes is provided at the start of each section, in green italic text.

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Tips and case studies – throughout this publication you will find tips and case studies in green shaded text boxes. These are from the experience of various waste management operators and other persons. They should not be considered part of formal guidance and are there simply to provide informal advice. They are intended to inform and share knowledge and you should consider these tips in the light of your own specific requirements.

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1. Introduction and scope

1.1 WISH waste fires guidance version III (what has changed?)

1.1.1 This is the third version of the WISH waste fires guidance (the first version was issued in October 2014, and the second in April 2017). The 2017 version was substantially different in many respects from the original produced in 2014. The main driver for these changes being the results of phases 1 and 2 of the WISH waste fire tests, conducted in 2015 and through 2016, and which advanced our knowledge of waste fires significantly. The revisions made for this third 2020 version are less substantive, but do include some significant additions and revisions, such as:

- Incorporation of the results of phase 3 of the WISH waste fire tests, such as additional information on the use of interlocking block walls as waste storage bunkers/fire walls
- A new appendix to provide a non-technical summary of the WISH waste fire tests. This was originally produced as a stand-alone document, but has been incorporated into this guidance for ease of use
- The addition of a list of commonly quoted technical and similar standards to appendix 4 on fixed technical fire systems. For each standard listed a brief summary of what it is and what it covers is provided. This addition has been provided as the result of reader feedback on the 2017 version of this guidance
- Various updates based on improvements in knowledge and practice

1.1.2 Despite many improvements in waste fire knowledge and experience, there are still areas where further work is required. Future versions of this guidance will include any developments in these remaining areas of uncertainty.



1.2 WISH waste fire tests

1.2.1 Prior to the publication of the original 2014 version of this guidance a thorough literature review and search was made by the HSL (Health and Safety Laboratories) and the authors of this guidance. The aim was to identify any existing guidance from across the world on waste fires, and any research and similar on the combustion properties of wastes. Very little information was found. This weakness was noted in the consultation process for the original 2014 WISH fire guidance.

1.2.2 To address this gap in knowledge, a series of waste fire tests were conducted:

- In 2015 smaller-scale laboratory type testing was conducted at the FPA (Fire Protection Association) research premises. These 'phase 1' tests provided baseline data on parameters such as burn rates and thermal heat outputs
- In 2016 larger-scale waste burn trials were conducted at sites in Yorkshire and Essex (phase 2 tests). These tests involved much larger volumes of waste and aimed to replicate as closely as practical 'real life' waste fires
- In 2017 a third phase of tests was conducted at the National Fire Training College in Gloucestershire. The principle aim of these was to assess different fire-fighting media and techniques and their effectiveness against waste fires. However, various confirmatory tests were also conducted to check the results of the phase 2 tests, and to assess the use of interlocking block walls in bunkered waste storage

1.2.3 A non-technical summary of phases 1, 2 and 3 of the WISH waste fire tests is provided as appendix 5 to this guidance.

1.3 Risks of fires

1.3.1 Fires involving wastes have the potential to cause significant harm:

- There is the risk of death and/or serious injury and health damage from high thermal energy and smoke inhalation
- Combustion products, even those from non-toxic materials, release airborne pollutants which can cause short, and long-term effects on human health, including potentially to public health
- Firewater run-off can transport pollutants into drainage systems, rivers and lakes, groundwater and soil, threatening water supplies, public health, wildlife and recreational use

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- Property damage can be significant and costly, sometimes running into the £ millions
- Explosions, sparks and projectiles can harm people and spread any fire
- You may be prosecuted under environmental, fire and/or health and safety law. This can be costly in terms of fines, which have risen substantially in recent years. In addition, if personal responsibility can be proven, prosecutions against individual company directors or similar can be brought, the punishments for which if a person is found guilty may include imprisonment

1.3.2 There are also some less direct sources of potential harm, such as:

- The significant cost from the public purse and resources burden for the Fire and Rescue Services (FRS) and other agencies when responding to a fire
- Civil claims from third parties relating to nuisance or potential health effects and/or costs levied by environmental, fire and health and safety regulators
- You are likely to be responsible for the costs of clean-up, both on and off-site under the principle of the polluter pays. This can be expensive, as in many cases the solid remains of combustion products and partially burnt material can be classified as hazardous/special waste
- Interruption to your business and third party/neighbouring businesses - a major fire could effectively put you out of business
- Insurance premiums are likely to rise substantially following a major fire, or you may not even be able to secure insurance at any economic cost
- Reputational costs can be substantial and may affect how the local community and others view you
- A major fire could affect your environmental permit/licence/exemption, including any subsistence or other fees you pay
- If you lease your site a major fire could result in the termination of lease, or burdensome conditions being added to any lease

1.3.3 No one wants to have a fire, but the consequences of a major fire can be disastrous. Simply ignoring or underestimating the risk is not acceptable (legally, morally, commercially or operationally).

1.4 Scope of guidance

1.4.1 This guidance applies to sites where more than 50 cubic metres of solid combustible waste material is stored at any one time, although the principles apply to smaller sites.

1.4.2 Sites which are regulated under an environmental permit/licence/exemption are within the scope of this guidance. The principles of this guidance also apply to sites which are not regulated under a permit/licence/exemption. Whether under a formal permit or not, you must always comply with regulatory standards.

1.4.3 This guidance applies to the storage, treatment and handling of solid combustible wastes such as, but not limited to:

- Wastes from domestic, commercial and other sources
- Paper, cardboard, plastics, wood and wood product wastes of all types
- Rubber (natural or synthetic) wastes, including whole, shredded and crumbed tyres
- Fragmentiser wastes, such as that from vehicle dismantling
- Refuse derived fuels (RDF), solid recovered fuels (SRF) and similar waste fuels
- Any other waste which may pose a fire risk similar to the above

1.4.4 For historic reasons, WISH covers England, Scotland and Wales. However, WISH documents, including this guidance, are freely available to all, no matter their country or location. Fire risk is an issue not constrained by national boundaries.

1.4.5 This guidance supplements but does not replace any statutory requirements under Local Acts of Parliament, the Regulatory Reform (Fire Safety) Order 2005, Fire (Scotland) Act 2005 or any other applicable legislation and regulation. You should gain advice on your duties under statutory requirements.

1.4.6 Because of their specific issues and/or existing guidance this document does not apply specifically to:

- Landfill sites but, it would apply to a recycling plant at the entrance to a landfill site
- Composting sites, including in-vessel, green waste and anaerobic digestion plants, although the principles would apply to facilities at such plants such as over-size materials storage areas/bunkers
- Hazardous/special waste treatment and transfer facilities
- Waste to energy plants, incinerators and similar thermal treatments to the extent of the thermal treatment applied. It would, however, apply to a recycling plant as pre-treatment, reception/storage and mechanical handling of wastes etc at such a facility
- Some specific aspects of ELV (end of life vehicles) operations, such as air-bag dismantling. However, the general principles in this guidance do apply to ELV
- Sites which fall under the COMAH (Control Of Major Accident Hazards) Regulations

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1.4.7 This guidance applies to fire risks associated with combustible wastes. It does not provide detailed guidance on reducing fire risk from ancillary facilities on sites such as welfare facilities, offices and similar or specific fire risks such as diesel storage tanks, gas cylinder storage and similar. You should refer to general and specific guidance for the control of fire risks associated with these non-solid waste aspects. You must also consider the risk from, and to, these facilities in your overall fire plan and assessment as they could be the source of a fire, contribute to its severity or be affected by a fire.

1.4.8 If you do not follow this guidance, or appropriate sector specific guidance, you should seek to ensure that the measures you take are equivalent or superior, and at least that they comply with regulatory and legal requirements, such as general fire law, construction and buildings standards and similar.

1.4.9 It is not the purpose of this guidance to duplicate other freely available general fire guidance which applies to all industries and sectors. This is particularly true for the issue of fire life-safety, for which there are plentiful other sources of information. For example, you will find little mention of issues such as escape path distances in this guidance because information on this type of aspect is easily available elsewhere. You must consider life-safety first.

1.5 Regulators

1.5.1 In most workplaces, including most solid waste management sites, your local Fire and Rescue Authority (FRA) is responsible for enforcing general fire safety and if you need advice you should contact them first.

1.5.2 Other regulators also have responsibilities: The HSE (Health and Safety Executive) covers specific risks and legislation such as DSEAR (Dangerous Substances and Explosive Atmospheres Regulations) and environmental regulators, such as the Environment Agency (EA), Natural Resources Wales (NRW) and Scottish Environment Protection Agency(SEPA) cover environmental and public health risks from fires at waste sites.

Note – at the time of publication of this guidance the three main environmental regulators in Britain (EA, NRW and SEPA) take slightly different approaches regards the standards applying to fire risk at waste management sites. You should ensure that you are familiar with the approach taken and standards required by your environmental regulator.

1.5.3 This multiple-regulators environment for fire risk means that you need to consider your various regulatory audiences. Having a fire plan/strategy agreed with your FRA may not mean that you have satisfied all of the requirements of your environmental regulator. Likewise, being compliant with your environmental permit/licence or similar may not mean you have complied with all general fire and safety law requirements. You must ensure you have covered all aspects of fire management in your assessments and plans. It is your duty as an operator to comply, and not the duty of regulators to ensure your compliance.

1.5.4 Since the publication of the 2017 version of this WISH guidance some sector specific bodies have produced their own guides, such as the WRA (Wood Recyclers Association, Tyre Recovery Association and RDF (refuse derived fuel) Industry Group. These guides provide sector specific advice on how to achieve an approved FPP (fire prevention plan) from the EA (Environment Agency) for England. However, WISH acknowledges that these sector specific guides also include much sensible and appropriate fire risk advice. WISH would recommend that operators in these specific sectors read their sector specific guidance alongside this WISH guidance, while keeping in mind that the aims of the documents and some of the standards included may be different.

Note – currently these sector specific guides are aimed at the regulatory regime in England. Other environmental regulator standards may be different, such as for free-air separation distances between waste storage stacks. You need to understand what the regulatory standards are which apply to your site. This is not to say that operators in Wales or Scotland should not read these current sector specific guides, but that they should keep in mind that there may be differences in the approach taken and standards applied by their regulator.

1.6 Insurers

1.6.1 Insurers also have a role to play and may set their own standards. You should consult with your insurer to ensure they are involved in your decision-making process, assessments and plans. You may achieve a standard that your regulators are content with, but which your insurers may not be content with because of property damage and business interruption risks – different stakeholders may concentrate on different issues and you should take account of this.

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Tip – gaining advice on the technical aspects fire safety can be expensive. Insurers and insurance brokers can often be a good source of free or low charge advice. Many larger insurers have in-house fire technical experts and they have a vested interest in you not having a fire – if you have a major fire your insurer will also suffer cost implications. Insurers are an important stakeholder in your fire plans and can often offer good advice. See appendix 4 on fire/risk engineering for more detail.

1.7 Assessment and plans

Note – this section uses the expression 'fire plan'. Different regulators and other bodies may use different expressions. An environmental regulator may use the expression 'fire prevention plan', or an insurer or fire engineer may use the term 'fire strategy' etc. Often these regulators/bodies are talking about different aspects with the same outcome. An insurer fire engineer when using the expression 'fire strategy' may concentrate on fixed systems, such as sprinklers and water deluges, whereas your local FRS may want to see more about fire risk assessment, fire-fighting tactics and evacuation procedures. However, the basic principle is the same. What is the risk, how are you controlling it, and have you included it in your 'plan'?

For small sites you may be able to combine all of the various requirements of regulators and other bodies into one 'fire plan' document. But, for larger sites it is likely that you will need several documents, and you may also need specific separate documents such as emergency plans and employee training documents. This is an issue for you to decide on. The section below gives the basics, how you apply these to your site will depend on your specific circumstances and the complexity of your operation.

1.7.1 In general, under fire legislation you must carry out an assessment of fire risks at your site and based on this assessment put in place appropriate controls and measures (your 'fire plan'). General guidance on fire risk assessments and plans is available on the gov.uk web site (see appendix 6 on useful links and further reading). Other stakeholders and regulators may also have their own guidance and requirements you need to abide by. However, broadly a fire risk assessment involves:

- Identifying where on your site you have combustible and/or flammable materials
- Identifying where on your site you have potential ignition sources
- Identifying people, both on and off site, who may be at risk
- Identifying other than people what, such as the environment, may be affected and how

- Assessing what you already have in place, such as existing building construction, escape routes, fixed fire systems and similar, and if these are adequate
- From the above information putting in place your plan of controls and measures aimed at reducing the risk of a fire occurring and the impact should a fire occur

1.7.2 It is your duty as an operator to produce your fire risk assessment and from this put in place appropriate controls and measures as part of your fire plan. You may seek the advice of regulators, but in the end, it is not the duty of a regulator to ensure your fire assessment and plan is adequate – this is your duty.

Tip – fire risk assessments and plans can be complicated issues and you are likely to need competent advice if your site is at all complex. However, for smaller sites various cost-effective training courses are available and you could consider having one of your employees trained in fire risk assessment. Whatever the size of your site, this would also give you an accessible and in-house source of fire assessment advice for basic and general fire issues at an operational level rather than having to employ an external person.

1.7.3 Controls and measures as part of your fire plan may be physical, such as fire-fighting equipment or the segregation of combustible materials to prevent fire spread, or procedural, such as evacuation and emergency plans. For example:

- Your fire risk assessment may identify that wastes in a reception area (a combustible material) may be set on fire by hot exhausts on heavy mobile plant (an ignition source). You may decide that an appropriate control would be to instruct plant operatives to clear wastes from around exhausts at the end of each shift – and if so, you should include this in your instructions/procedures to mobile plant operatives
- You may identify that wastes (a combustible material) going through a shredder at your site (potential ignition source for reasons of friction and/or sparks) may be a fire risk. You may decide that an appropriate control measure would be to install an automatic water deluge at the shredder
- You may decide that self-heating (an ignition source) is a risk for some of the wastes (combustible material) you store at your site. You may put in place routine inspections of such wastes using thermal imaging equipment to assess any hot spots, and procedures on what operatives need to do if heating is occurring

1.7.4 Fire risk assessments need not be complicated, although you must ensure that you have identified all possible sources of fire and have appropriate controls in place.

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1.7.5 You must also include in your assessment who and/or what (such as the environment) may be harmed by a fire and/or the consequences of a fire. For the environment or public health, you should use the established model of source, pathway and receptor. For example, if a fire occurs it is likely that water will be used to fight it, at least initially. This firewater will be contaminated with combustion products and other harmful substances. Where will the contaminated firewater run to and could it cause environmental damage, or lead to exposure for members of the public? Your controls should address this type of consideration. Guidance on the management of firewater is contained in CIRIA Report 736 (see further reading section in appendix 6 below) and from your environmental regulator.

1.7.6 It is also recommended as part of your plan that you discuss with your local Fire and Rescue Service (FRS) their likely fire-fighting strategy for your site, which may include a controlled burn to reduce firewater run-off and/or for fire-fighter safety, and if water is to be used an estimate of the likely volumes of firewater that will be produced to help you determine how much containment will be required. Likely FRS fire-fighting response should be part of your assessment process.

1.7.7 For waste management sites there may also be conditions in your environmental permit/licence/exemption regarding issues such as maximum waste inputs and/or storage limits, requirements for environmental and public health protection etc. These are a valid input into your assessment and must be included. Even if no such limits are stated in your licence or permit, the physical limitations of your site will impose practical limits to the amounts of waste can be handled and stored safely. These limitations should be assessed and considered as part of your fire risk assessment. Some environmental regulators may have their own guidance and requirements for fire prevention and similar plans. You should understand such guidance thoroughly.

1.7.8 For some aspects of your fire management you may need to read specialist guidance or take competent advice. For example:

- If you store gas cylinders (either for your use or waste cylinders) then you need to take account of this in your assessment and seek advice on issues such as cylinder cage construction and separation distances for cylinder stores
- If your waste processing plant includes dust extraction you may need to conduct a hazardous area classification (zoning – an assessment of where flammable atmospheres may occur) exercise under DSEAR. There are standard tests you can use to determine whether your dusts would require this approach

1.7.9 Whatever the complexity or otherwise of your assessment and plan the aim should be to ensure you have considered all risks and put in place appropriate controls.

1.8 Technical standards

1.8.1 There is no shortage of technical standards for fire risk: These include:

- British standards (BS standards)
- European standards (EN or BSEN standards)
- Building regulations and standards (may vary from country to country)
- Insurance industry codes and guidance (see tip-box below)

1.8.2 For technical aspects, such as specialist fire-fighting equipment and the standards for the installation of detection systems, you are very likely to require external specialist advice. There is little point, for example, in installing a sprinkler or deluge system if it is not to an adequate specification, is difficult to maintain, has not been installed correctly and/or does not meet your specific needs. See appendix 4 for more detail.

Tip – the insurance industry has produced its own codes on many aspects of fire safety, including technical standards: Ask your insurer for advice as they will often have access to these standards. For example, the guidance contained in standards and technical advice produced by the UK insurance industry through Fire Protection Association/RISC-A and the LPS standards, now produced by BRE Global. Useful other documents include those produced by the US NFPA (National Fire Protection Association) and FM Insurance (FM Global Data Sheets). These standards are generally accepted by insurers and their technical advisors/experts. If your site does not meet these standards then the purchase of insurance cover, or availability of insurance at an economic cost, may be difficult. Asking for insurer advice on technical standards in advance is likely to be better than arguing afterwards (in the end insurers are commercial concerns and they do not need to insure you). But, beware of applying general standards to waste management where it may not be appropriate. See appendix 4 for some issues which may be associated with insurance industry guidance.

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Tip – for technical standards relating to issues such as the installation of fire detection, fire-fighting and fire suppression equipment, the suppliers of such equipment and reputable trade associations can also often be a useful (and likely free) source of advice (although beware commercial interest, and in some cases contradictory advice). Such suppliers, especially when they hold third party certification will be familiar with applicable standards for the products they supply and how they should be installed. However, care should be exercised to ensure that your choice of equipment and supplier is appropriate to your site. For example, an installer of shop and domestic fire equipment may not be that familiar with the standards required for industrial applications. Again, see appendix 4 for further detail.

1.8.3 Overall the technical standards applied to fire controls are complex and you need to be reassured that whatever you put in place meets these standards. If in doubt contact your local Fire and Rescue Service, environmental regulator and insurer.

1.8.4 One issue reported by readers of this guidance is that the specialists they talk to often 'throw-around' document numbers, such as BS this, EN that or NFPA the other, assuming a waste management operator knows what they are talking about. To assist, in 2018 WISH commissioned a review of technical and other similar fire standards which may be of relevance to waste management operators. From this review, a list of commonly quoted standards and similar has been added to appendix 4 of this guidance. For each standard listed a brief summary of what it is and what it covers is provided. This list is not exhaustive but covers the most commonly quoted technical and similar standards.



2. Whole site considerations

Summary of main changes since the 2017 guidance: *Much of the section below is largely unchanged compared to the 2017 edition of this guidance. However, there have been some additions and revisions based on updated knowledge and experience, such as to the sub-sections on mobile plant and vehicles, hot-works and on water supplies.*

Typically, most waste management sites have three main areas of operation:

- A reception area/s where incoming wastes are discharged
- Treatment/processing area/s where wastes may be sorted, shredded, dried, sized etc
- Storage area/s where incoming wastes and/or outgoing wastes may be stored

Not all waste sites have all three areas as above. A simple waste transfer station may only, in effect, have a reception area. However, most recycling and recovery type sites will typically have all three types of area. These three main types of area are considered in more detail in their specific sections (3 – 7) below. This section covers issues which apply to the whole of your site and you should consider these before moving to specific issues.

2.1 Protection of human life

2.1.1 Fire risk management must start with the protection of human life (often called life-safety). This would include having adequate fire escape provision, which is clearly marked, lit, including emergency lighting where required, not blocked and which is kept unlocked during operational hours, and effective evacuation procedures in which all staff are trained. It is not the intent of this guidance to duplicate what is easily available elsewhere and you must ensure that you consult existing other guidance and your competent advisor to ensure that your fire management starts with the protection of human life.

2.2 Location and neighbouring sites/businesses/environment

2.2.1 If you suffer a fire it may have an impact on your neighbours, such as smoke being blown towards a residential area. Conversely, a fire at neighbouring premises may affect you and may even spread to your site. Your general location may also affect the level of fire controls you put in place. For example, if your site is geographically isolated it may take a longer time for the Fire and Rescue Service (FRS) to respond.

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2.2.2 Location factors you may need to consider in your fire assessment include:

- Are there any sensitive receptors including schools, hospitals, care homes, major transport or other key infrastructure (such as main roads, railways, airports, overhead power lines etc), other businesses, shops, residential areas, rivers, canals and protected habitats that could be affected by a fire at your site?
- Where your assessment indicates that there is a risk to sensitive receptors, then you must work with your local FRS and environmental regulator to reduce the risk and potential consequences of a fire
- Do any neighbouring premises pose fire risks to your site or could a fire at your site have a catastrophic effect on neighbouring premises? For example, nearby gas storage facilities or other hazardous material storage/treatment site, garages and workshops storing fuels and similar (even rail lines which can produce sparks). If this is the case, you should liaise with these neighbours to ensure your and their accident/emergency plans take account of the possible risks. And, you may decide to arrange storage so that it is adequately separated from any higher-risk neighbouring premises. You may also want to hold joint fire/emergency plan drills and tests with your neighbours to ensure that in the event of a fire your response is co-ordinated
- How isolated is your site and what is the response time of the local FRS? Are your site fire-fighting provisions, water supply and similar adequate to take account of any delay in the FRS arriving at your site?

Tip – when considering receptors think about the pathway and how a receptor may be affected. For example, a large fire in a waste storage yard may cause damage to an overhead power line from the heat energy from the fire. However, the power line would need to run over the yard or be in close proximity, such as at the site boundary. Conversely, smoke can travel significant distances. For example, during a major fire at a large waste site planes taking-off from an airport 3 km away were delayed because the smoke plume was blowing into the airport's flight path. Think about pathway and receptor and do not limit yourself to a fixed radius around your site for all potential impacts.

2.3 General ignition sources, causes of waste fires and precautions

2.3.1 From industry experience, it is worth noting the general issues below:

- While your employees may know your site rules and what to do in the event of a fire, you must also ensure all visitors, contractors and drivers using your site are aware of the correct safety and fire procedures to follow whilst on site

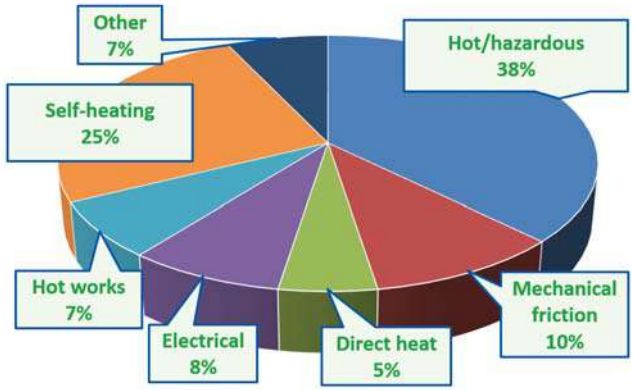
- Discarded smoking materials are a major ignition source. You should apply a no smoking policy or ensure suitable designated smoking areas are provided, situated away from combustible materials. Any designated smoking areas should be signposted and supplied with a 'butt-box', sand bucket or similar for discarded smoking materials
- You must control general sources of ignition such as heating pipes, naked flames, space heaters etc. Stacks of combustible and flammable materials such as waste stacks and fuel storage areas should in general be at least 6 metres away from these sources, or other controls put in place to reduce the risk
- As appropriate to your location you should put site security measures in place, such as security fencing, intruder alarms and CCTV, to minimise the risk of vandalism and arson. Your arrangements should cover both the working day and outside normal hours. If your site is located in an area where vandalism and similar is common you should consider a 24 hours manned security presence, or at least 24-hour coverage such as by drive-by security runs
- Electrical faults, both in processing equipment and general electrical systems, such as lighting and heating, can be a source of ignition. You should have regular and planned inspections of your systems. This should include portable electrical appliances (PAT) testing and fixed electrical equipment. You should also seek competent advice on issues such as grounding and bonding controls for electrical systems
- Fires may smoulder undetected after the end of the working day/shift. You should consider formal site 'close-down' procedures including inspection of the site after work has ceased to reduce the risk of a smoulder being undetected and turning into a fire
- Take advice on how to reduce the potential for fire to be spread by convection across the underside of roofs, through roof spaces and similar barriers to rising hot gases. In the Bradford Football Stadium fire a significant cause of loss of life was hot gasses rising under one part of the stadium roof, travelling along the roof and then descending many metres away at the other end of the stadium upon the spectators there causing asphyxiation and sparking significant secondary fires

Tip – thermographic cameras are becoming more economic to purchase and are also becoming more common in use on waste management sites. Such cameras can be used as part of routine inspections to identify electrical faults, over-heating equipment and other potential ignition sources. They can also be used during fire watches after hot-works, such as welding. Many waste operators who have invested in thermographic cameras enthuse about them and find them a useful tool in many areas, whether fire related or not. Alternatively, this type of service can also be contracted-in, although frequency may be an issue.

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2.3.2 One of the major waste management companies recently analysed its fire report data. This data was from a five-year period, covered 120 plus sites and more than 300 reports of fires/smoulders. This analysis was for general waste recycling and recovery type plants, and may not apply directly to your site, but regards the most likely causation of fires the analysis provides some interesting data:

- 38% of fires were likely caused by hot or hazardous materials and items in wastes accepted at sites, such as hot ashes, lithium, vehicle and other batteries, gas cylinders, flammable liquids, aerosols etc
- 25% of fires were likely caused by self-heating, both in waste reception and storage
- 5% were likely caused by hot surfaces, 8% by electrical faults, 7% by hot-works such as welding and grinding and 10% by friction
- The remaining fires were caused by a variety of other smaller likely causes



Note – the data above is from one larger company with a wide range of recycling and recovery plants. This data may not reflect your specific situation, although it does give a starting point in terms of the common causes of waste fires.

2.3.3 If you have data for fire causation in your organisation you should use this to inform your site fire management and planning – where do your fires occur and what are the causes. If you do not have your own data, the above may provide a starting point.

2.4 Housekeeping and dusts

2.4.1 In general, the smaller the particle size of a combustible material the easier it may be to set alight. Likewise, it is generally easier to set alight loose and free/discarded materials than compacted materials. In particular dusts may pose a distinct fire risk if they come into contact with hot surfaces and other ignition sources.

2.4.2 Some specific aspects of dust control and fire are included in section 4 on waste treatment and for some systems you need to abide by the requirements of DSEAR (Dangerous Substances and Explosive Atmospheres Regulations). However, in general on dusts, small particle size combustible wastes, loose wastes and housekeeping you should:

- Introduce a regular maintenance and cleaning programme for all site areas including site machinery and buildings and ensure good housekeeping. This should aim to keep levels of dust, loose fibre and paper and other combustible materials in buildings and around the site to a minimum. It is recommended that general cleaning of dusts, debris etc occurs at least once a day when a site is operational
- Ensure that as part of your housekeeping that flammable materials, such as oils, greases, fuels, paints etc, are always stored correctly and put back in store after use
- Include housekeeping in your routine site inspections and act to keep your site as free from loose/discarded combustible wastes and dusts as practical

2.4.3 The importance of good housekeeping and dust control is often under-estimated. It has been calculated that a 1 mm layer of general dust if disturbed into the air to a height of 5 m can generate a dust cloud with a density of 100 g/m^3, and at 1 m height 500 g/m^3 – sufficient to result in a fire/explosion hazard on its own.

2.4.4 Dusts which have been allowed to accumulate on plant support structures, building supports, in ventilation ductwork and similar have also been shown to pose a significant fire spread risk. Significant accumulations of dust can form a pathway which allows a fire to spread quickly rather than staying in one place where it can be tackled more easily.

Tip – when designing recycling and similar plants consider access for housekeeping. Higher-level support structures etc are often not easy to access and as a result dusts often accumulate on these, posing a fire and fire spread risk. Or if access is an issue, consider installing angled or 'tented' plates which dusts will tend to fall-off rather than accumulate on

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2.5 Heavy mobile plant and vehicles

2.5.1 Most waste management sites use heavy mobile plant, such as loading shovels, grabs and telescopic handlers. This plant can lead a hard life and is inevitably in direct contact with waste, much of which may be combustible. Other vehicles, such as visiting lorries, may also pose a risk.

Mobile plant can pose ignition risks to the wastes they come into contact with:

- Hot exhausts can ignite wastes trapped near them. You should instruct plant operators of this risk and ensure that wastes are cleared from around exhausts and other hot parts at the end of each shift
- Mobile plant should be fitted with fire extinguishers and you may wish to fit automatic fire extinguishing equipment under plant engine bonnets and other high-risk areas (your insurer may insist on this and you would be wise to check)
- You should ensure that mobile plant is well maintained to a specified schedule, in particular electrical systems which may be a source of fires. Note that maintenance schedules specified by suppliers may not be adequate for waste management use and you should consider whether you need to put in place more frequent maintenance
- Mobile plant should be parked after use away from waste stacks, waste left in reception areas and other places where wastes may be present, or parked in a protected area such as an empty block or similar waste bunker or behind a fire wall
- Mobile plant shovels, blades and similar may produce sparks such as when scraped along a concrete or metal surface/wall. You should consider this during your assessment. For high-risk areas and materials, you may even want to consider precautions such as specialist coatings for mobile plant shovels and blades to limit or prevent the generation of sparks
- The risk above may likely be low in most circumstances. However, if concrete in reception, storage and other areas is poor to the extent that metal reinforcing bar or similar is exposed then the risk of metal-on-metal contact and the production of higher-energy sparks may well increase – timely maintenance and repair of surfaces will assist in mitigating this risk
- If practical, specify the use of non-flammable hydraulic oils. This can be achieved with new plant but may not be practical for older equipment. You may want to check with the manufacturer

2.5.2 Other vehicles can also pose ignition risks:

- Many of the issues listed above, such as hot exhausts, maintenance and hand-held fire extinguishers, apply to other vehicles such as lorries, although it may be impractical to control some of these aspects with third party lorries using your site
- Lorry environmental performance has improved over time, including the use of regenerative filters in exhaust systems, such as those fitted to Euro VI lorries. These exhaust systems can 'over-heat' during their regeneration cycle resulting in a fire risk. If a filter starts to regenerate during tipping or while the vehicle is in close proximity to combustible wastes the driver should be asked to pause the cycle and the lorry moved to a safe place away from combustible materials. Or, you may wish to instruct drivers to push their pause button before they tip

2.5.3 Heavy mobile plant may also be useful in tackling fires, such as:

- Spreading wastes out so that a fire can be more easily tackled
- By removing wastes from the location of a fire to prevent fire spread, such as by 'sweeping' un-ignited wastes away from a pile of waste which is partially on fire or by moving waste stacks away from a stack which is on fire to reduce the risk of spread
- Removing wastes which are smouldering (if safe to do so) to a different location can make fire-fighting easier, such as by moving waste from inside a covered reception hall to the outside (in essence taking the fire outside where it can be fought more effectively), although consideration should be taken as to where smouldering waste is moved to as it could spread a fire through means such as wind-blown embers/brands
- By pushing soils or other inert material such as sand over a fire to starve it of oxygen
- In the moving of smouldering and similar wastes to allow a 'muddy puddle' approach to extinguishing a fire (dousing wastes in a pool of water – see appendix 5 section on phase 3 fire tests for more detail)

2.5.4 However, if you intend in your accident/emergency plan to use heavy mobile plant in this manner you must ensure:

- That plant operatives are trained and competent in the task – and that they are completely aware that any such action must only be done without risk to their own health and safety or that of others
- That the heavy mobile plant is suitable to the task, such as by having completely enclosed cabs, fire and heat protected hydraulic systems etc

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- Such action is included in your site accident/emergency plan
- If you intend to use soils, sand or similar to smother a fire, that you always have an adequate stock of such on site to use

2.5.5 You should also consider where any unburnt, smouldering etc wastes could be moved to using heavy mobile plant – a 'quarantine area'. The size and location of such an area is a matter for site specific assessment. In some cases, such as large pit-type waste reception facilities (such as are common at waste to energy and some other larger waste management plants), it may be better to leave a fire where it is, as it is already contained. You should consider your site's specific situation and needs.

Tip – if you intend to use mobile plant to fight fires you should conduct drills with your operators. For example, by practicing sweeping wastes away from a stack/pile or pushing inert materials over wastes. The retrofitting of fire and heat protection systems (such as heat protection for hydraulic hoses and the use of non-flammable hydraulic fluid) to mobile plant can be expensive. But it is often an inexpensive addition at the point of manufacture. When replacing your heavy mobile plant think about its specification in advance.

2.6 Hot works

2.6.1 Hot-works, such as welding, grinding and cutting, take place at many waste management sites on a regular basis, such as during maintenance and repair. You should at least:

- Ensure staff and any contractors follow safe working practice when undertaking hot working, such as welding, grinding and cutting
- Ensure that fire extinguishers, hoses etc are provided at the scene of any hot work so that they can be used immediately should a fire occur. Such equipment should be stationed adjacent to the pathway of escape from the work area and not in a place where staff using them could be trapped by a fire
- In areas where wastes or other combustible materials are present hot-work should be a two-person job: One person doing the hot-work and a second watching – someone who is welding will rarely look behind them at where any sparks may land
- So far as practical wastes should be cleared away from the area of any hot-work before hot-work starts (any residual waste which cannot practically be moved can be damped down thoroughly with water in advance to reduce the risk of ignition)
- Combustible materials, including mobile plant hydraulic lines, should be covered by a fire blanket, and/or damped down with water as appropriate, before hot-work starts

- Conduct a fire watch at the scene of any hot-work at least 2 hours (or preferably more) after hot-work has finished – sparks from hot-work can smoulder for a significant time period. Note – your insurer may have specific requirements regards fire watch after any hot-works, and you would be wise to check this. Some insurers now require a 4-hour fire watch after hot-works – check, or your insurance may be invalid
- If hot-works take place close to the end of the working day you should still conduct a fire watch (easier is to plan hot-works for earlier in the day so that this is not the case)
- You should put in place a permit to work system to ensure that appropriate controls are in place before, during and after any and all forms of hot-work

Case study – at one waste management site a fire caused by hot-works occurred more than 8 hours after the hot-works had finished. This may have been an extreme example (in this case in combination with a failure to remove and/or damp-down combustible materials in the area – the fire smouldered in these materials unseen) but illustrates the potential risk.

2.7 Site/plant shut-down processes

2.7.1 A significant number of waste site fires occur after working hours. To reduce this risk, you should consider a formal close-down procedure including issues such as:

- Over-run of shredders, conveyors, screens, balers and similar to ensure that they are as clear of waste as practical
- Shut-off and lock-off of electrical power to plant and other equipment (commonly sometimes called lock-out/tag-out)
- Shut-off of other electrical items such as space/room heaters
- Clearance of wastes, debris and dusts which may have accumulated under and around equipment and machinery
- Ensuring that any flammable materials such as fuels have been secured
- A fire-watch at least 2 hours after the end of operations (again you may want to check with your insurer who may have specific requirements here)
- Spread out any waste loads awaiting processing or in reception areas to ensure that there are no undetected hot items or other materials which could start a fire
- Where practical the removal of wastes from processing or reception at the end of the working day, or at least reduce the amount of waste in such areas to a minimum
- Check that mobile plant has been moved to a safe distance or is protected
- Check that fire detection systems have been activated and are working
- Check that security systems have been activated and that gates and doors are secure

Tip – some recycling/recovery plant and equipment includes fans, for ventilation and extraction, for cooling (such as for hydraulic power packs) or as part of the equipment itself, such as for some air separation devices. Whether intended for cooling or not, these fans may have a cooling effect. You may want to consider arranging for fans to run-on for a period after shut-down to promote cooling. However, ensure that on emergency shut-down they stop immediately – such delayed shut-down should only be by using functional stop systems.

2.8 Water supplies

2.8.1 This section covers considerations for general water supply requirements for fighting waste fires. It does not cover:

- Water supplies for fixed technical fire systems such as sprinklers, deluges, water monitors and similar. There are technical standards which apply to these systems, including on water supplies. Appendix 4 covers fixed systems and the standards which may apply. If you have such systems, or are considering them, you will likely need external competent advice and will certainly need to involve your insurer
- Hand-held fire extinguishers. These are essential for life-safety and can be used to fight very small fires. However, they are very unlikely to be effective in fighting larger waste fires and operatives should not put themselves at risk attempting to do so

Tip – the technical standards on required water supplies for sprinklers, deluges etc are complex. Your insurer may have access to such technical standards (such as the FM Global Data Sheets and NFPA standards and relevant BS and EN standards) and may be able to provide such advice to you at low or no cost. In addition, some standards (such as NFPA) are available to read free-of-charge. See appendix 4 of this guidance for more detail.

2.8.2 The majority of larger waste fires are likely to be fought with water, in their initial stages at least. If you do not have a sufficient water supply the outcome of a major fire is likely to be predictable. The amount of water you may need will depend on a series of factors, such as how much and what types of wastes you have on site, how advanced a fire may be before fire-fighting commences and similar.

2.8.3 Fire and Rescue Service (FRS) experience from fighting waste fires indicates that large volumes of water may be required in some cases: Volumes as high as 10,000 litres per minute for several hours or more have been recorded for some very large waste fires. This is a high-end example intended to illustrate the large water volumes which can be required. It is not intended as guidance and some waste fires may require far less water to control (there is no 'standard' answer here).

2.8.4 The volume of water which may be desirable and/or effective is variable and there is the issue of contaminated firewater run-off (see below). For example, a large surface waste fire may require high volumes of water, whereas for a deep-seated fire in a waste stack continuing to spray water onto the stack after the surface fire has been 'knocked-down' may be ineffective because the water may not penetrate the waste pile to any significant degree (see appendix 5, non-technical summary of the WISH waste fire tests phase 3 results for further information). However, and pragmatically, having more water available than may be required is very likely better than running-out before a fire is under control.

- How good is the water supply to your site? If it is only a standard industrial/commercial supply, it is unlikely to be able to provide sufficient water volume or pressure for significant fire-fighting purposes
- Fire and Rescue Services (FRS) vehicles/tenders carry relatively small volumes of water (typically only a few thousand litres, or less) and unless the fire is small relying purely on the FRS to bring their own water supplies is unlikely to be effective
- How close is the nearest public hydrant to your site? Do you know where it is and how to access it? If the nearest hydrant is >100 metres away, or your site is large, you should consider an on-site hydrant/s and/or installing a fire main (distance is not the only factor here – if the nearest public hydrant is across a major road, rail line, on the other side of a canal or similar access may be impractical)
- There are standards for fire hydrants and water supplies, such as BS 750 and BS 9990 and hydrants needs to be checked and tested to ensure they comply. If you are relying on a public hydrant, consult with your local Fire and Rescue Services to check on the water flow and volume available from this public hydrant
- If the above is not practical, do you need to install water storage tanks on your site?
- Are there alternative water sources near to your site, such as rivers, lakes, lagoons, canals etc? And, could the Fire and Rescue Services (FRS) use these alternative sources? If you do identify alternative water sources, you may also need to consult with your environmental regulator to ensure such use is appropriate. Such alternative supplies also need to be safely accessible – a lagoon right next to a building on fire may not be safely accessible and you should consult with your local FRS

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- If you have installed fixed fire suppression/extinguishing systems, such as sprinklers and water deluges, water supply requirements should have been part of the design specification for such equipment. However, you will still need a supply for fire-fighting equipment such as fire hoses and this also needs to be considered

Tip – if you intend to use an alternative water source such as a lagoon, then consider particulates which may be in this source (such as mud, silt etc). You may need to consider large capacity filters and/or floating suction inlet to allow such water to be used – or face the potential for pipes and the pumps handling water blocking entirely or working at a much-reduced effectiveness. In addition, if it will take time to access and use an alternative water supply such as a lagoon, it may be worth pre-installing pipework, pumps and similar to speed the process up.

2.8.5 You should check you have adequate water supplies when you carry out your fire risk assessment. If you have any questions consult your local Fire and Rescue Service (FRS). As above, on larger sites the provision of a private fire hydrant system with the necessary supply of water may be required.

2.8.6 You should include in your assessment whether you would plan to use water to damp-down waste materials (such as stacks) which are not already alight during a fire to minimise the risk of fire spread – if this is the case then your water supply will need to be adequate to do this in addition to fighting a fire.

2.8.7 The location of hydrants, on or off site, should be included in your accident/emergency plan and should remain easily accessible. On-site hydrants should also be tested periodically to ensure they work, and that they flow sufficient water for your needs.

2.8.8 In summary, no fixed guidance can be given regards water supplies, such as you will need 'XX' litres per minute per tonne of waste etc. There are a wide range of variables here, such as type of waste, amount of waste, and type of fire (outside-in or inside-out – see appendix 5 for information on these fire types). However, it is a matter of hard experience that a number of waste operators who have suffered fires have found to their cost that their water supply was inadequate, and you should consider water supply carefully.

2.9 Public hydrants

2.9.1 In addition to the above on the location of public hydrants, for sites which intend to rely significantly on public hydrant provision there are some other factors to consider.

2.9.2 There are standards regards water supply from public hydrants. For example, on industrial estates the flow available should be related to the size of the estate:

- Estates of up to 1 hectare – 1,200 litres per minute
- 1 – 2 hectares – 1,800 litres per minute
- 2 – 3 hectares – 3,000 litres per minute
- More than 3 hectares – 4,500 litres per minute

2.9.3 This type of standard is useful, but you may want to check that your nearest hydrant can really provide the flow you expect. For example, if an industrial estate has been expanded over the years the hydrant system may not have been upgraded accordingly, or if a new housing estate has been built next to an industrial estate overall water flow may be less than desirable. If in doubt contact your local Fire and Rescue Services (FRS) for advice.

2.10 Contaminated firewater

2.10.1 Should a fire occur it will most likely be fought, at least initially, using water (although foams and other agents may also be used). This water will very likely be contaminated once it has been used to fight a fire. Foams may also pose risks to the environment. If this firewater/foam escapes from your site, it may cause pollution – pollution you will likely be responsible for in terms of clean-up costs and potential civil or criminal action:

- All waste storage and stacks should be on an impermeable/fire resistant surface
- You should consider installing secondary and tertiary (back-up) containment facilities for firewater run-off such as:
    - Bunds
    - Storage lagoons
    - Drain shut-off valves/penstocks
    - Isolation tanks
    - Modified areas of your site, such as a bunded car park to contain water
    - Block drains and/or divert firewater to a containment area or facility using pollution control equipment such as firewater booms and drain mats

- All pollution control type valves, equipment and similar should be clearly marked, and their locations noted in your fire plan

Note – analysis has been carried-out on contaminated firewater from waste fires, including as part of phase 3 of the WISH waste fire tests. The specific nature of contamination will depend on a range of factors, such as the type of waste involved. However, in practical terms all contaminated firewater from waste fires should be considered a pollution hazard.

2.10.2 You may also wish to consider in consultation with the Fire and Rescue Services:

- Reducing the amount of firewater run-off by applying water through spray and fog-nozzles rather than jets or installing automatic fire suppression such as deluge systems which can apply water quickly and effectively directly to the heart of the fire
- Recycling firewater if it is not hazardous and it is possible to reuse. If you decide that recirculation may be practical at your site, you should consult with your local FRS first on issues such as suitability and location of and access to any take-off point from sumps or similar (there is little point in planning to recirculate firewater from a sump, for example, if this cannot be accessed easily during a fire)
- Separating burning material from the fire and quench it with hoses or in pools (the 'muddy puddle' approach – see appendix 5 for more detail), or in tanks of water. This has the advantage of reducing the amount of firewater produced
- A controlled burn – any decision to attempt a controlled burn must be taken by the FRS, in consultation with environmental and public health bodies, and should not be attempted by a site operator
- Burying the fire using soil, sand, crushed brick and/or gravel. This may be appropriate if there are limited water supplies and smoke is threatening local people, but it should only be used when:
    - Groundwater vulnerability is low
    - You have consulted your environmental regulator about this option beforehand
    - Contaminated material is removed and legally disposed of

Tip – Before deciding to smother or bury a fire consideration should be given to the likely timescales for the cooling and removal of the resulting entombment. Materials entombed in this way are likely to be insulated from heat loss and therefore liable to reignite upon re-exposure for periods of weeks, months or even years. If the decision is taken to smother a fire with a layer of inert material consideration should be given to ways of minimising the insulating effect of the smothering layer.

2.10.3 To decide which options are appropriate you should take account of the:

- Scale and nature of the environmental hazards on your site
- Risks posed to people, the environment and property
- Type of materials you store on site, the form they are stored in and the length of time and the best strategy needed to extinguish a fire involving them
- Availability of firewater containment facilities
- Local topography and different weather conditions and fire scenarios that could be reasonably expected

2.10.4 The containment facilities and pollution equipment you need will depend on the size of your site, the amount of material you store, and the fire-fighting strategy used. CIRIA C736 (see further reading appendix of this guidance) will help you identify the facilities and equipment you need for your site.

2.10.5 If you make a polluting discharge to the environment you will be committing an offence, unless you have a permit/consent to do so and the discharge meets the conditions of that permit/consent. Firewater discharges to sewer may also constitute a breach of sewage discharge consents and you should consult your sewage provider.

2.10.6 It is not the intention of this guidance to provide a comprehensive guide to contaminated firewater containment and management. Your environmental regulator will be able to provide you with more detail and information, and some environmental regulators have issued guidance which includes this issue.

2.11 Fire detection, alarm and suppression systems - overview

2.11.1 The specification, design, installation, commissioning and use of fire detection, alarm and suppression/extinguishing systems is a complex area, and often one where third-party approvals are required. For this reason, a separate appendix is provided to this guidance on the topic (see appendix 4). You should read this appendix to inform yourself of the options and issues involved. However, in general:

- For plant and equipment (such as recycling and recovery plant) fire detection, alarm and suppression should be part of the design risk assessment. For larger facilities the development of a separate fire strategy document is recommended
- Consider multiple approaches to detection and suppression rather than simply choosing a single item. For example, in some cases using more than one type of detector may be more effective than relying on a single type of detector

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- Buildings systems should be compliant with the relevant building regulations, as supplemented by your risk assessment to take account of waste management use
- All fire detection, alarm and suppression systems should be maintained in good order and tested and checked as required – seek the advice of your competent person to ensure you are maintaining and testing/checking your systems as required

2.11.2 In addition to appendix 4 on fire/risk engineering, specific issues relating to detection, alarm and suppression/extinguishing systems at waste reception, waste treatment and storage areas are included in the relevant specific sections below.

2.12 Non-waste facilities on site

2.12.1 Virtually all waste management sites have offices, weighbridge, welfare facilities and other non-waste facilities. While these are not included specifically in this guidance, you should seek competent advice on fire management for these and you must ensure you comply with relevant standards such as those in buildings regulations:

- Such buildings should be included in your fire risk assessment, be provided with fire/smoke detection and, as required, manual break-glass points unless all areas of the building can be seen from any other area (such as a single room cabin)
- Detection and alarm systems should be connected to the overall system for the site – that is any alarm will cause an alarm across the whole site and visa-versa
- Fire extinguishers and, as required, other equipment of an appropriate type and number should be provided, along with training for personnel expected to use them
- In general, external waste stacks should be separated from such buildings by the separation distances given in appendix 1 of this guidance, option 1, or protected by other means such as fire walls/bunker arrangements. There may also be requirements in your property insurance policy, such as a set stand-off distance between waste storage and buildings, and you would be wise to check this

2.13 Fire appliance access

2.13.1 If Fire and Rescue Services (FRS) vehicles cannot get onto your site and/or cannot access all areas of your site to fight a fire, then the outcome may be disastrous.

2.13.2 Access for FRS vehicles to and around your site should be unobstructed at all times and meet as a minimum the requirements in the table below. You should also consider how fire appliances can turn around and manoeuvre once they have entered your site. Points you may want to consider include:

- If the FRS cannot access all parts of your site (see distances etc in table below), can the FRS access around the edges of your site via a public highway or similar? If not, such as if your site is right against a neighbouring building, then you will need to consider stand-off between stacks and the edge of your site to allow access (and to prevent fire spread – see appendix 1)
- Is there more than one entrance to your site which Fire and Rescue Service vehicles can use? Are you restricted to one entrance and therefore have a need for easier access around your site?
- Are there on-site height restrictions, such as overhead power lines, bridges etc?
- Are there any weight restrictions or issues at the access to or on your site which would make access by FRS vehicles difficult? Larger FRS vehicles, such as high-reach fire tenders, can weigh well in excess of 20 tonnes

Table: Typical FRS vehicle access requirements

Type of FRS appliance	Min width of road (metres)	Min width of gateway (metres)	Min clearance height (metres)	Min weight restriction (tonnes)
Water tender	3.7	3.2	3.7	12.5
High reach vehicle	3.7	3.2	4.0	24
Weight of vehicles may need to be confirmed with your local FRS as various types of vehicle are in use				

2.13.3 If you have any doubts regards how FRS vehicles may be able to access your site, you should contact your local FRS and seek their advice.

Note – the above distances are for FRS vehicle access to fight a fire. They are not distances primarily aimed at preventing or reducing the risk of fire spread such as between stacks of stored wastes. For guidance on such distances in external storage see appendix 1, and for general considerations on storage (both internal and external) see the specific sections on storage below.

Communication, training and drills

2.13.4 Many fires are averted or extinguished while small by the swift action of aware, well trained, and well drilled staff. In the development of your fire risk assessment and plans, you should consider and describe:

- How the key features of your fire assessment and plan will be communicated to your staff, and how will you ensure that they have understood
- How frequently key messages will be reviewed and refreshed with staff through, for example using toolbox talks
- What level of training staff need to play their part in the fire emergency plan, how frequently that training will need to be refreshed and renewed, and what system will be put in place to ensure that training renewal dates are not missed?
- Drills and exercises should be undertaken at regular intervals and should be varied in content to address the range of fires and circumstances that might be encountered on the site. Drills should be conducted at least once a year, and more frequently for higher-risk sites
- The effectiveness of response to drills and exercises (and real fires) should be critically reviewed, including time taken to evacuate, to identify improvements that need to be made and any messages that need to be fed back into your communications and training systems
- If your site/plant has fixed fire suppression/extinguishing systems fitted, such as sprinklers and deluges, then your training should include these. Your operatives need to be aware of how such equipment works, what are the consequences of activating such systems, and what their limitations are
- When the Fire Rescue Service (FRS) should be called, by who, how information will be provided to the FRS on their arrival and throughout the incident (this issue should also feed into your accident/emergency plan – see appendix 3)



3. Waste reception

Summary of changes since the 2014 guidance: *Much of the section below is unchanged compared to the 2017 edition of this guidance. However, various small changes and additions have been made based on developments in experience and knowledge since 2017.*

All waste management sites have reception facilities, such as:

- Enclosed tipping halls where waste is discharged prior to being fed into sorting or similar plant or in preparation for transfer off-site
- Split level reception areas or similar
- Reception pits, where waste may be fed into treatment processes by grab crane, conveyor or similar systems
- External reception areas for wastes such as wood prior to processing

Note – this section is aimed at the reception and temporary storage of wastes in reception for short periods of time, typically not exceeding 72 hours, or shorter. This may be prior to treatment and/or transfer to another site. Note - time limits may be set in your environmental permit/licence or similar which you must comply with. This section does not cover wastes stored prior to treatment or transfer for longer periods of time. If you store wastes for longer periods of time prior to treatment or transfer, then you should also refer to the sections on the storage of wastes below.

3.1 Hot wastes and other hazards in reception

3.1.1 One of the most common causes of fires in reception areas is the receipt of 'hot' loads or loads with hazardous materials in them such as gas cylinders, batteries or containers of flammable liquids, which can subsequently cause a fire. Such fires may not be instantaneous – often hot/hazardous items can 'smoulder' deep in a waste pile undetected, bursting into flame overnight or on the weekend when no one is around to raise the alarm.

Note – research into the times fires start in waste reception areas is often difficult (the exact time a fire starts may not be known). However, data indicates that the most common times are Saturday nights, Sundays and first-thing Monday mornings. The former two times likely being the result of items 'smouldering' in waste piles before bursting into flames, the latter likely the result of items in wastes being disturbed when waste is first moved at the start of the working day, such as the first 'push-up' on Monday morning.

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3.1.2 Hazardous materials and items include a wide range. However, one type has become a specific issue over the past few years – discarded lithium batteries. To address this WISH has produced a specific information sheet for waste operators on fire risk and rogue lithium batteries in waste streams (WISH INFO 08, available as a free download from the WISH web site (https://wishforum.org.uk/). The principles in this information sheet may also be applied generally to other types of battery in waste streams. This information sheet was originally produced by an ESA (Environmental Services Association) work group, and WISH is grateful for their efforts in this area.

3.1.3 You should ensure you have robust waste acceptance procedures that prevent unauthorised waste being accepted, so far as practical, and for limiting their potential impact so far as prevention is not practical:

- Consider implementing a fire-watch at the end of the shift/operational day – hot and hazardous materials and items can 'smoulder' in a stack of waste for some time before causing a full fire. Some wastes may 'steam' when received releasing water vapour which can be mistaken for smoke. Odour can be used as a check, but more effectively the use of thermal imaging cameras or similar may be better
- Consider not accepting higher risk loads late in the working day, or processing such wastes quickly rather than leaving them in reception over-night
- If practical try to empty reception areas of waste at the end of each working day, or if not practical try to minimise the amount of waste left in reception overnight
- All employees in reception areas should be instructed to look for fires, hot loads, hazardous materials and items, smoke and signs of smoulders – and what action to take if they see one (such as the use of heavy mobile plant to move suspect loads to a safe area, dousing suspect loads with water from a fire hose etc)
- Consider instructing your mobile plant operators to spread wastes out when they are received to make identification of smoulders and hazardous items easier
- Consider provision of an 'emergency/quarantine area' for suspect loads. Note – this must be different from your normal quarantine area for non-conforming loads as these may contain hazardous materials which you do not want to expose to hot wastes
- Where detection of loads which may pose a hazard may be difficult, such as pit-type reception facilities, you should consider fitting deluge, water monitor or similar suppression systems to fight any fire which may occur, and good standards of containment to reduce the risk of fire spread from reception to other areas

Tip – there will be times when the delivery of hot loads will be more likely and reminders to reception staff would be useful. Examples are the increased likelihood of "hot" barbecues and ashes in wastes delivered to HWRCs and from domestic sources after bank holiday weekends or during warm weather. Plus consider the likely increase in the appearance of hot ashes and other wastes from garden burners after the first warm dry weekends of spring and the potential presence of hot ashes from bonfires and the residue from fireworks in early November, or at other times of celebration where bonfires and/or fireworks may be an issue. The location of your site may also be a factor. For example, sites near coasts may receive incorrectly discarded emergency flares, or those in holiday areas may have a higher risk of camping-type gas cylinders being received.

3.1.4 If you do discover a hot load, or load containing hazardous materials, you should attempt to trace this back to the customer and take appropriate action to reduce the risk of such occurring again. You should also check your environmental permit/licence conditions, and you may need to report such loads to your environmental regulator.

Note – no matter how good your waste acceptance processes are, the risk of hot and/or hazardous items occurring in waste loads is unlikely to be 100% removed. This is not to say that you should not take precautions, but for many waste operators fires in reception may well still occur, and you should plan for such an eventuality and consider fire risk in waste reception very closely.

3.2 Fire detection, alarm and suppression/extinguishing systems at reception areas – specific considerations

3.2.1 Appendix 4 of this guidance includes detail of fire detection, alarm and suppression/extinguishing systems at waste management facilities, including in waste reception areas. You should read this appendix alongside the specific waste reception issues given below.

- For external waste reception areas providing fire detection, suppression etc may be more difficult than for internal reception areas. However, external detection and suppression/extinguishing systems are possible. Some sites have successfully installed camera type detectors over external reception bunkers and similar, and deluge, water monitors and similar. Just because your reception area is outside does not mean that you should not consider detection and suppression/extinguishing systems in your assessment and plan

- While this section applies to wastes in reception only for short periods of time, the greater the amount of waste in reception at any one time the higher the likely consequences should a fire occur. For large waste management and similar facilities where large amounts of waste are received you should consult your competent advice regards detection, alarm and suppression/extinguishing systems provision
- At some sites incoming materials are moved from waste reception directly into processing areas using conveyors or other mechanical handling systems. In such cases you will need to consider potential fire spread by such interconnection. You should consider provision of automatic fire suppression/extinguishing systems on conveyors to processing areas. You should also consider linking fire detectors so that the plant emergency-stops if a fire is detected to prevent the spread of a fire by conveyors or similar: This issue is discussed in more detail in appendix 4
- In some waste reception areas items of recycling/recovery equipment are located directly in the reception area. For example, a shredder as pre-treatment before waste is fed into a main processing area. In such cases you should consider protection such as listed in section 4 on waste processing, and in appendix 4 on fire systems. For example, for a shredder located in a reception area installing a water deluge system at the shredder
- At some sites the equipment located in reception areas is mobile, such as a mobile shredder. In these cases, you should consider moving the equipment at the end of each day to a safe location, or protecting it such as by a suitable fire wall or parking such plant in an empty waste bunker
- One potential problem with fighting fire in enclosed reception areas is smoke, which may obscure a fire and make it difficult for the Fire and Rescue Services to place water direct to the seat of a fire. You may want to consider, subject to your risk assessment, passive or automatic smoke vents in the roof or upper walls of your building over reception areas. However, you must consider this carefully as vents can cause interaction problems with some fire detection and suppression systems resulting in a delay in activation – you should seek competent advice on this issue
- You should consider potential operational issues which may affect the effectiveness of any suppression system you have installed. For example, if you have installed a sprinkler or deluge system around your reception bunker/push-walls (in essence, a pipe with nozzles installed on top of or just above your push-walls). This is unlikely to work effectively if the height of wastes in your reception area means such systems are 'buried'. Likewise think about height for other reasons, such as waste piled to such a height that electrical lighting may pose an ignition risk

3.3 Other considerations in reception

3.3.1 If during abnormal situations, such as plant breakdowns, you need to exceed your normal reception area capacity you should put in place additional measures, such as a fire watch outside of operational hours. Ultimately you may need to cease accepting wastes so as not to compromise the fire safety of your site.

3.3.2 In most cases waste brought to a waste management site will be 'fresh' from where it arose. However, in some cases wastes may already been stored elsewhere for a period of time. For example, partially sorted wastes taken from one recycling plant to another for further treatment. Do you know how long wastes received at your site may have been stored at another site? If storage was for a significant period of time, there may be a risk of self-heating (see section 5 for more detail on self-heating) and you may want to check.

3.3.3 Finally, on reception areas, your waste reception area has a finite, safe capacity and you should not exceed this. Determine during your assessment what this capacity is and stick to it (there may also be conditions in your permit/waste management licence which must be followed).

Tip – try to think of obvious visual methods to guide your operatives regarding the maximum safe capacity in your reception area. For example, painting an obvious 'max pile height' line on reception bunker walls above which waste must not be piled.





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4. Waste treatment and processing

Summary of main changes since the 2017 guidance: *This section is largely unchanged compared to the 2017 version of this guidance. However, there have been sundry revisions to take account of developments in knowledge and experience.*

Waste processing systems vary widely, and this guidance cannot cover all of the technologies used. However, many recycling and recovery systems commonly include:

- Shredding, bag opening and similar devices which may themselves pose an ignition risk though friction, sparks from metal-on-metal contact, blunt blades and other similar causes. Hazardous items in wastes, such as gas cylinders, lithium and other batteries and flammable liquids containers, may rupture in a shredder causing a sudden and energetic fire, which may spread to other parts of the plant quickly
- Trommel, flat and other screens, air-separators and other gravity-based sorting systems. While these may not pose a high ignition risk, they are often close to items such as shredders. If a fire starts in a shredder or similar it may be just a smoulder because of a lack of oxygen: When fed into a trommel, air-separator etc the waste is then agitated and receives sufficient oxygen to ignite fully. The same mechanism may also apply to hazardous items such as hot ashes which have been wrapped and are opened and exposed to oxygen by the movement of screens and similar
- Mechanical handling systems, such as conveyors, if well maintained, should not pose a high ignition risk, but they can transport already alight waste rapidly around a plant so accelerating the spread of a fire. Many conveyors used in waste management are also rubber, which in itself is combustible
- De-dusting, cyclone and other similar devices – there may be a risk of dust explosion and you should seek specialist competent advice on these items and comply with legal requirements such as those under DSEAR (Dangerous Substances and Explosive Atmospheres Regulations)
- Mains/electrical plant rooms which may pose higher-voltage electrical ignition risks and control panels for items of recycling/recovery equipment

Each of the above common types of equipment is considered below. However, there are other items of equipment used in recycling/recovery systems such as optical sorting systems, magnetic and eddy current processes and other specific recycling/recovery equipment – you should assess any specific fire risks associated with other equipment you may use. You should seek competent advice on this and consider the various fire scenarios and causes which could occur (see appendix 4 for information on plant protection).

4.1 General ignition risks in processing

4.1.1 In addition to the specific risks associated with individual types of equipment, recycling/recovery plant may pose other general ignition risks (the presence of combustible waste is a given as a potential fuel source), such as:

- Electrical faults, faulty or damaged wiring causing sparks and heating
- Friction from slipping conveyors, damaged or worn bearings, damaged or worn drive motors, or metal-on-metal contact
- Direct heat from drive motors, hydraulic power-packs and other items which may generate significant heat
- Direct heat from specific items of equipment, such as optical sorting equipment and eddy current devices

4.1.2 For many of the above potential risks poor maintenance and cleaning regimes can have a role to play. A poorly maintained drive motor is more likely to overheat, a poorly maintained bearing, or one that has not been replaced to schedule, is more likely to collapse causing mechanical heat risk. Likewise, if dust and detritus is allowed to accumulate on items which are normally 'hot' then the risk of ignition will be higher, in particular if dusts etc become contaminated with oils, forming a readily ignitable mixture. Good maintenance, repair and cleaning can go a long way towards reducing the risk of a fire in processing plant.

4.1.3 You should seek advice from your competent person as to what fire suppression and management measures may need to be taken (and see appendix 4 for fire system advice). However, the following sub-sections offer some specific considerations for the common items of recycling and recovery plant.

4.1.4 At some sites processing equipment may be located outside, such as a mobile wood shredder in an open yard, and the fire suppression etc systems listed below may not be practical in such applications. However, this type of equipment often already comes with its own fire–fighting/suppression/extinguishing system installed, such as an automatic extinguisher system built-into a shredder. You may want to consider this type of system. At the least you should consider how you would fight a fire in such equipment. For example, would your fire hoses reach such equipment located in an open yard, and where is the nearest hydrant or other water source located?

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4.2 Shredders, bag openers and similar

4.2.1 This type of equipment poses a higher risk of ignition from friction and/or metal-on-metal and similar contact, or hazardous items in wastes, such as a gas cylinder or battery going through a shredder. The rupture of such hazardous items in shredders and similar is a common cause of fire at waste management plants.

4.2.2 In addition, as shredders etc are often well enclosed for valid machinery safety reasons, fighting a fire may be more difficult as it may not be easy to get at. You should consider installing automatic water deluge or similar systems either in shredder etc housings, or above feed hoppers, as practical, to extinguish fires, and/or at conveyor outputs from shredders etc to prevent fire spread. Detection systems linked to such deluges or similar will need to be fast-acting if they are to be effective (see appendix 4 for detail).

4.3 Trommel screens, other screens, air-separators and similar

4.3.1 While trommel screens and similar may not pose a high ignition risk they can aerate wastes resulting in a smoulder turning into a full fire. For example, a carelessly disposed of disposable barbeque containing hot ashes which is 'bounced' open in a trommel screen. You should consider installing water deluge or similar systems either in trommel etc housings to extinguish fires, and/or at conveyor outputs from trommel screens etc to prevent fire spread.

4.4 Mechanical handling systems, conveyors etc

4.4.1 Conveyors and similar mechanical handling systems may carry a fire rapidly through your plant, and they may be an ignition source themselves as a result of friction:

- Consider conveyor water deluge/sprinkler systems, as identified by your risk assessment. These can be under-conveyor, over-conveyor or to the side of conveyors with deflection plates to divert water onto the conveyor. Under-conveyor systems may pose issues such as being more open to damage and/or causing a restriction to maintenance activities and will likely need protecting. Also see issues with under-conveyor/gantry sprinkler and similar systems with regard to 'shaded' areas under plant and support structures in appendix 4
- Consider installing slip sensors on conveyors to determine if a conveyor is slipping on its drive roller – the friction caused by such slippage may pose an ignition risk

- Fire alarm and detection systems should be connected to plant control systems so that if a fire is detected the plant stops quickly, so preventing burning wastes being transported through your plant

4.5 Balers and similar

4.5.1 Balers and similar equipment are common in many recycling plants. In general, these are robust and encased in steel, for machinery safety and other reasons. This makes then fairly resistant to fire. However:

- Aerosols, gas cylinders etc may rupture in balers. The baler itself may take the forces involved, but significant energy can escape via baler output areas, feed chutes etc and inspection doors/hatches to baler chambers may be 'blown-off' if the energy released is high enough. Baler operating positions and platforms should be away from such potential danger zones to protect the baler operator and others in the area and the physical integrity and robustness of balers, including access hatches and doors, should be sufficient to be able to contain the likely pressures involved
- Baler output areas should be kept clear, so far as practical, of detritus. Energy emitted from a baler output area if a gas cylinder of similar ruptures can result in fire spread, and the presence of detritus will only make this more likely
- You may want to consider suppression/extinguishing systems at areas such as baler feed chutes and hoppers, dependent on design and practical considerations

4.6 De-dusting systems, cyclones etc

4.6.1 The separation/ventilation of dusts and fines using extraction systems, cyclones and similar may pose dust explosion risks. For some of this type of equipment parts of the system such as at bag filters etc may be classified as hazardous areas (commonly called 'zoning'):

- Such systems should be subject to an assessment under DSEAR (Dangerous Substances and Explosive Atmospheres Regulations) and may require hazardous area classification (zoning) – you should seek competent advice on this
- Where required by a DSEAR assessment, controls such as spark detection/suppression, explosion resistant equipment, pressure release systems (such as blast panels) and water deluge or sprinkler systems or similar should be installed
- Any hazardous areas (zones) must be identified and signed – and employees should be aware of any such zones and the precautions to take

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- The standards for electrical, mechanical, protective and other equipment in such systems are likely to be higher than for general electrical systems (ATEX rated) and you should seek competent advice on this
- Maintenance of DSEAR compliant systems should only be undertaken by a competent person (such as 'Compex' training), you may need to check on the competency of contractors or others undertaking this work – a general industrial electrical contractor may not have the knowledge required
- Ductwork associated with de-dusting and similar systems may provide an easy pathway for a fire to spread – that is through the ductwork. You may need to consider suppression systems and/or fire dampers in ductwork to prevent such fire spread, and you should clear ducts etc of detritus and dusts frequently (ducts full of dust have been implicated in fire spread at various waste management site fires)

4.6.2 De-dusting and similar systems are often aimed at the beneficial control of dusts around a plant. However, such systems may also concentrate the explosion/fire hazard posed and de-dusting and similar systems need careful consideration and likely specialist competent advice on their operation, maintenance and repair.

Tip – the materials transfer points at the end of conveyors are often a significant generator of dusts and also often the first areas to be enclosed as part of dust control measures. Such enclosures typically encompass the conveyor end bearings, which can become hot and pose a source of ignition. Suitable measures to address these risks need not be expensive if considered as part of the design and installation of the enclosure.

4.7 Mains/electrical plant rooms and control panels

4.7.1 Mains/electrical plant rooms and control panels pose specific issues, largely associated with the electrical ignition risk they pose:

- Mains/electrical plant rooms should be enclosed and constructed to appropriate fire resistance standards (consult your competent advisor). For critical installations you may want to go beyond the usual standards applied, for property and business interruption risk reasons
- Points where cables leave and enter mains rooms via ducts, tunnels etc should be appropriately sealed to prevent fire spread via such 'holes' in the integrity of the room
- Thermal imaging cameras used in regular surveys can be of use to detect electrical faults early and reduce the risks involved

- Mains/electrical plant rooms should be supplied with suitable (usually CO_2) hand-held extinguishers and doors should have vision panels to allow a fire to be seen before entry. You may want to go beyond this into fixed fire systems (see appendix 4)
- Control panels should either be located in enclosed rooms or constructed to a suitable IP (protection) standard to prevent dust ingress
- Electrical rooms should be fitted with automatic fire detection and manual call points. Depending on business criticality, such rooms or specific panels may also be fitted with automatic fire suppression

4.8 Picking cabins and workstations

4.8.1 Many general recycling plants include one or more 'picking cabin'. These pose specific issues, in particular for life-safety:

- Picking cabins, control rooms and similar should be provided with appropriate fire extinguishers. You may also want to consider sprinklers or other suppression equipment in, and under, picking cabins
- Exits from cabins and similar should be provided with manual break-glass points
- Picking cabins should be provided with suitable smoke/heat detection systems – and these must not be turned off during operational hours
- Picking cabins are often in the centre of processing plant. Escape in the case of a fire is critical (picking cabins are often the only fully occupied location in processing areas). How would your employees escape from a picking cabin in the case of a fire which generates smoke making vision difficult? Escape routes from cabins need to be clear, signposted, lit, obvious and not convoluted and/or difficult to follow. In some cases, the 'standard' maximum escape route distances may be too long and shorter routes may need to be considered
- Some recycling and similar plants have secondary workstations outside of picking cabins, either for picking tasks or other reasons. Such workstations require careful thought in terms of issues such as machinery safety and exposure to dusts and noise. In terms of fire risk, such stations also need careful consideration. For example, placing a secondary workstation next to a higher-fire-risk item such as a shredder is unlikely to be wise
- Operatives in picking cabins and similar should be made aware of the risks associated with gas cylinders, larger lithium and other batteries, containers of flammable liquids and similar and that if such items appear on picking belts that the plant should be emergency stopped and the cabin evacuated until appropriate action can be taken to make the item safe and/or remove it

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4.9 General considerations in processing areas

4.9.1 General considerations for fire management in waste processing areas include:

- Housekeeping in process areas needs to be of a good standard. Dust should be cleared from electrical conduits and systems, hydraulic power packs and similar and drive motors (and any other item of equipment which may produce heat or be an ignition source, such as optical sorting equipment)
- Thermal imaging cameras can be used to detect hot-spots around your plant, such as slipping conveyors, over-heating drive motors, faulty electrical systems etc. Such thermal imaging surveys need not be conducted every day, but can be part of routine maintenance and inspection regimes
- Hydraulic systems, including hydraulic oil tanks, may generate significant heat. In addition, most hydraulic oils are flammable and leaks from hydraulic lines and systems may result a fire which can spread quickly to wastes. In particular if the waste has been doused in hydraulic fluid from a leak first. Fires in mists and sprays of leaking hydraulic oils are a particular risk and can be highly dangerous. You should include hydraulic systems in your routine checking, testing and maintenance systems and you may want to consider installing fire suppression systems at/above hydraulic power packs, or using non-flammable hydraulic oils where practical. Detection systems should be linked to hydraulic systems to produce shut-down and de-pressurisation of the system in the event of a fire detection

4.10 Fire detection, alarm and suppression/extinguishing systems in processing areas – specific considerations

4.10.1 Appendix 4 contains specific advice, much of which is specifically aimed at waste treatment and processing systems. You should read appendix 4 for information on the issues, considerations and options available, and match these to your specific treatment plant – this is not an area where 'one-size-fits-all'.

4.10.2 Processing areas of waste management sites typically contain items of plant etc which have the highest asset value on the site. A simple steel construction building may only have an asset value of <£1 or 2 million, but the processing plant and equipment in the building may have an asset value far in excess of this, often many £ millions. In addition, the loss of processing plant may result in substantial business interruption until plant can be replaced. Loss of plant may be catastrophic to your business.

4.10.3 The issue of fire detection and suppression/extinguishing in processing plant is discussed in detail in appendix 4. The approach taken in processing plant is likely to be different than that followed in reception and storage areas. Detection is likely to be required quicker, extinguishing systems are likely to be preferred over suppression systems, and plant actions such as emergency stopping of the plant if a fire is detected may be critical. If you have invested £ millions in costly processing plant, you would be wise to consider fire protection closely in processing areas.

Tip – it is not the intent of this guidance to provide in-depth insurance advice. However, your insurer is most likely to be interested in in how you are protecting your plant than any other aspect, because loss of plant often equals the largest loss of assets and therefore highest claim level. Take the time to discuss this issue with your insurer.

4.10.4 One potential problem with fighting fire in enclosed treatment areas is smoke, which may obscure a fire and make it difficult for the Fire and Rescue Services to place water direct to the seat of a fire. You may want to consider, subject to your risk assessment, passive or automatic smoke vents in the roof over treatment areas. However, you must consider this carefully as vents can cause interaction problems with some fire detection and suppression systems resulting in a delay in activation – you should seek competent advice on this issue.

4.11 Protecting your plant by separation/segregation

4.11.1 You should consider how your processing area is separated by distance and/or segregation by appropriately constructed barriers, such as walls, from waste storage and reception areas. In fire safety terms such separation/segregation of areas of a building is often called splitting into ‘compartments’ (although true compartments are rare in waste management plants), the aim of which is to prevent or reduce the risk of fire spread. This issue is discussed in appendix 4. Protection should be two-way:

- If a fire occurs in your waste storage and/or waste reception, how is your processing plant protected from fire spread?
- If a fire occurs in your waste processing area, how is fire spread to waste storage or waste reception controlled?

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4.11.2 For example, you may want to consider the use of walls and/or push walls of an appropriate construction and height (both in terms of fire spread and robustness to withstand day-to-day waste management use) to segregate waste reception from waste processing to reduce the risk of fire spread, or to locate waste storage well away from waste processing. Or, you may need to consider other compartment techniques such as installation of wall-protecting deluge systems, automatic extinguishing systems in transfer conveyors to and from processing areas and similar. The principle being to provide a physical barrier between compartments, or where this is not 100% practical protect compartments in other ways.

Tip – your insurer is likely to place much importance on the integrity of the compartments in your building, in particular if a compartment contains expensive plant which should a fire occur may result in a high-value insurance claim. This may be difficult at waste management sites where wastes need to travel between compartments for the process to work, such as holes in walls to allow conveyors to pass through. Discuss this aspect with your insurer and consider how you will prevent fire spread between compartments.



5. Waste storage – general considerations

Summary of main changes since the 2017 guidance: *The revisions to this section are less substantive than those made between the 2014 and 2017 versions of this guidance. However, there have been some significant changes and revisions, such as to the section below on the use of block walls in fire walls or storage bunkers. In addition, some sections, such as on self-heating, have been updated to reflect improvements in knowledge.*

Many waste management sites store combustible wastes: Either wastes brought to site and awaiting processing and/or transfer or wastes/products which have already been processed and are awaiting transport off site. Examples of such wastes include, but are not limited to:

- Baled recyclates such as baled paper, cardboard and plastics
- Baled and wrapped SRF/RDF and other waste fuels
- Loose wastes such as wood, hard plastics, plastic bottle, tyres etc

Note – this section is not aimed at the temporary storage of wastes in reception for short periods of time, typically not exceeding 72 hours or shorter, prior to treatment and/or transfer to another site, or wastes in treatment. Rather it covers longer-term storage of wastes. For guidance on waste reception areas see section 3 above.

Waste storage at waste management sites can be internal (inside a building) or external (such as in stock yard). This section covers general considerations applicable to both external and internal storage. The following sections 6 and 7 cover issues specific to external storage and internal storage respectively. These specific sections should be read together with this general storage section to gain an overall picture of what is required.

5.1 Definitions of terms used in storage sections

5.1.1 For consistency, the following terms are used in all sections/appendices on storage:

- **Stacks** - stored accumulations of all forms of stored wastes, whether baled, as loose materials or otherwise stored
- **Bunkered/enclosed stacks** – wastes (either loose or baled etc) stored in a bunker or enclosure, such as a three-sided enclosure, where the walls of the enclosure are of an appropriate construction and height resulting in an effective fire shield/wall
- **Open stacks** – wastes (loose or baled etc) which are not stored in bunkers / enclosures, such as an open stack of paper bales or open stacks of loose wood

- **Loose** – wastes which have not been baled/wrapped, such as stacks of loose wood, tyres, plastic bottles etc. Such loose wastes could be either bunkered, or open (such as an open pile of loose wood)
- **Baled/wrapped** – wastes which have been baled and/or wrapped, or similar, as discrete ‘packages/items’. Such baled and/or wrapped wastes could be either bunkered or open stacked

5.2 Safe storage capacity

5.2.1 The total amount of combustible waste stored at your site, and how it is stored, will influence the likelihood and size, duration, and impact of a fire should one occur. As part of your assessment you should assess the maximum safe amounts of waste you can store. This assessment should include:

- **For external storage** the stack sizes and separation distances given for option 1 in appendix 1 of this guidance, or from your assessment if your site falls into option 2 in appendix 1, and the considerations in section 6 below
- **For internally stored wastes**, the considerations given in section 7 below, and the general information in appendix 1 as guidance (see section 7.3 for detail)
- **For all storage**, safe access requirements, such as those given above in section 2 for Fire and Rescue Services vehicle access, and safe evacuation routes
- **For bunkered wastes**, the safe capacity of your storage bunkers, including freeboard to take account of flame height
- As applicable, quarantine area/s (of little use if full of wastes already)
- Any other restrictions relating to your site, such as the need for safe traffic movements around the site, stack stability and similar

5.2.2 If you store various different types of waste you should consider whether you also need to include specific storage limits for each type of waste, in particular if a specific waste type poses a higher fire risk such as plastics and rubber wastes.

5.2.3 You should also take account of any restrictions on amounts permitted and storage times in your site’s permit/licence, or other similar regulatory permissions. These may be overall limits, or limits by waste type.

5.2.4 Based on the above you should be able to determine the maximum safe volumes of waste you can store at any one time, and in any one storage location. You should then compare this maximum volume with your waste inputs and processing capacity. Your management system should then be arranged so as to ensure that waste is transported off site before you reach your maximum safe capacity.

5.2.5 If the wastes on your site are subject to seasonal variation in demand and/or supply, it is important that you manage these variations to restrict waste volumes stored on site to within safe levels. Such seasonal variations should be included in your management system. The same principles apply when variations in off-take markets lead to a build-up of stock levels. Seasonal and/or market factors are not a valid reason for exceeding your site's safe storage capacity.

5.2.6 Ultimately your site, and each storage area of your site, has a finite safe, storage capacity. You should not exceed this capacity and your site management systems should manage waste inputs and outputs to achieve this end.

5.2.7 All of the stack dimensions and stack separation distances quoted in this guidance, and in appendix 1, are for 'standard' storage of wastes. For example, a stack of stored bales of waste on the ground in a storage yard, or in a bunker or an open 'pile' of wastes on the floor in a building. They do not apply directly to specialised storage systems such as enclosed silos used to store wood chip or similar wastes, racked storage such as used for some ELV (end-of-life vehicle) storage or similar, or treatment systems such as a large drying hall at a mechanical, biological treatment (MBT) plant, or other similar specialised system. For this type of specialised system competent advice should be sought, and for many it is likely that enhanced fire detection and suppression/extinguishing systems will be required. For some specialised storage systems other standards and codes may apply, in particular insurance industry codes – you should be aware of these.

5.3 Bunkering/enclosing wastes with firewalls as an alternative to limiting fire spread by distance

5.3.1 Reducing the risk of fire spreading from one storage stack to another is a critical component of any site's fire management strategy (see appendix 1 for more detail and examples). This can be achieved in two main ways:

- Leaving a physical, 'free-air', gap between stacks (often called a 'fire break') so that a fire is less likely to spread between stacks
- Placing a firewall between stacks to achieve the same end (this is commonly achieved on waste management sites by bunkering/enclosing stacks, such as by using three-sided enclosures/bunkers)

5.3.2 Overall the enclosure/bunkering of wastes may provide improvements both in terms of segregation between combustible wastes and overall storage capacity. For example, providing bunkered storage will mean that the free-air separation distances in option 1 of appendix 1 of this guidance would not apply (provided that the walls used are of an appropriate construction), that stored waste height does not exceed wall height (including freeboard to account for flame height) and that stored waste does not spill out from the bunker/enclosure. However, there are also potential disadvantages and you must consider these before deciding.

- Bunkering wastes does not remove the need to consider stack size. The combustible occupancy (how much combustible material there is and how energetically it will burn) is not affected by simply placing wastes in a bunker. In addition, bunkering wastes (or other uses of fire walls) does not completely remove the risk of fire spread, it only reduces the risk. Bunkering also does not stop smoke spread
- For very small particle size wastes, such as fines/dusts, and those where self-combustion may be an issue bunker stack size is particularly important. For example, for combustible 'fines' the stack sizes given in appendix 1, option 1, are unlikely to be appropriate because of the risk posed
- Consider stock rotation to remove older wastes – bunkers should be cleared to remove old waste from the back of the bunker frequently to reduce the risk of self-combustion (see below)
- Temporary wall/side structures for bunkers (such as mobile 'A' concrete frames or blocks, or bales of metal and other non-combustible wastes) need to be considered closely. If there are any gaps between blocks or frames, they will be ineffective at stopping fire spread. Permanent walls of a suitable construction are better at resisting fire spread, although tight interlocking blocks can also be effective
- Using combustible materials (such as using bales of paper to enclose loose stored paper) as the walls of a bunker is unlikely to be effective in preventing fire spread – if you choose to use bales to separate wastes then use non-combustible materials such as metals (but, see the information in appendix 1 regards plastics and rubber wastes because of their higher burn temperatures). In addition, achieving a tight and gap-free fit using bales may be difficult and such bunker walls will be less effective than interlocking block or permanent bunker walls

- Using steel walls to segregate waste stacks is an option. However, you should consider heat transfer through the steel, and in external storage that materials such as steel can heat-up in direct sunlight. The same principle may also apply to other materials which can conduct heat to a significant extent
- Using railway 'sleepers' in bunker construction is also an option. However, sleepers are combustible (in particular if they have been treated). They may resist fire for a time but will be far less effective than concrete or similar walls. In general, sleepers cannot be considered as fire walls
- Whatever construction method is used you will need to ensure that the walls are high and thick enough to stop fire spread from heat radiation. The Society of Fire Engineers Handbook 3rd edition (or updates of this), explains how to do this (see further reading and useful links appendix SFPE Handbook). However, and pragmatically, suitably thick concrete or interlocking block walls are likely to effective even if they have not been formally tested and approved
- You should have in place inspection/checking processes to ensure that wastes do not exceed wall height at any point (including leaving freeboard between wastes and wall tops), and that wastes do not spill out from bunkers/bays so defeating any segregation provided to resist fire spread. This also needs to include flame height and freeboard between waste height and bunker/wall height (a freeboard of 1 metre between waste and wall top is typically required)
- Access issues around bunkers should be considered. The ability of the Fire and Rescue Services to fight or contain the fire may be more difficult if access is impeded

Tip – when storing wastes in multiple three-sided bunkers why not plan your bunker layout with fire spread in mind? For example, if you have three bunkers in a row, two of which have combustible wastes in and one with non-combustible wastes, then put the non-combustible waste bunker in the middle so separating the two combustible waste bunkers.

5.3.3 Bunker (and any fire) walls should be sufficiently robust for the use they will be put to. The activities of heavy mobile plant when placing and removing wastes from bunkers, and during pushing-up, can cause damage to bunker walls, and they may suffer damage from other causes. Any holes, splits, cracks and similar will significantly reduce their effectiveness as fire walls. In addition, such cracks, holes etc in walls may promote local air-flows which in some circumstances may increase the risk of self-heating for some waste types or in the event of a fire introduce more air through 'chimney type' effects resulting in a more energetic burn. You should inspect bunker (and fire) walls routinely for damage and repair any such promptly (or take the bunker out of use).

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Tip – for ease of stock rotation, why not have two smaller bunkers rather than one larger? Two smaller bunkers will mean that you can completely empty one bunker while still accepting wastes into the other.

5.3.4 One of the most common forms of fire wall/bunker wall used at waste management sites is the use of interlocking concrete and similar blocks. The effectiveness of such interlocking blocks when used as a fire/bunker wall was tested during phase 3 of the WISH waste fire tests (see appendix 5 for details). In general, the use of interlocking blocks was effective, subject to good construction methods, leaving sufficient freeboard between stored waste height and wall height and similar.

5.3.5 The issue of freeboard is noted several times above. This is the vertical distance between the height of stored waste and the height of the wall. In general, this should be at least 1 metre – less than 1 metre risks reducing the effectiveness of the wall in preventing fire spread. Certainly, allowing wastes to reach the top of, or above, wall height will compromise the effectiveness of the wall. In a similar manner, allowing wastes to spill out of the front of a three-sided or similar bunker will reduce the effectiveness of the wall in preventing fire spread.

5.3.6 Whatever the construction of your bunker and similar walls, if you do suffer a fire they may well be damaged by the fire. For example, concrete block and solid walls may 'spall' as the result of heat from a fire. If you do suffer a fire you should inspect bunker and similar walls for such damage and repair or replace as appropriate.

Tip – why not paint an obvious line on bunker and similar walls above which wastes should not be piled. This provides operatives with an obvious indication of when to stop putting more waste into a bunker or similar.

5.3.7 An extreme form of enclosing wastes is to store them in enclosed containers, such as ISO containers. For example, the storage of wastes in containers at a dockside. In these situations, stack size will not typically apply. Likewise, separation distances will not apply completely as wastes are enclosed on all sides. This approach may be particularly suitable for higher-risk materials such as very small (fines) sized combustible wastes or known self-heating waste types such as mattresses.

5.3.8 However, storing wastes in containers does not completely remove the risk of fire spread. For example, if you store wood, plastics etc in an open-top steel container right next to a building and a fire starts in the container, do not be surprised if the fire spreads to the building. When using open-top containers a gap should still be left between containers and between containers and other items such as buildings.

5.4 Self-heating and storage times

5.4.1 Some materials can spontaneously combust, and the risk generally increases when materials are stored for prolonged periods. In addition, and in general, the smaller the particle size the higher the risk, although this may not always be the case. Ambient weather conditions, density and other factors can also play a role.

5.4.2 Industry fire data indicates that self-heating is likely to be the second most common cause of fires at waste management sites, behind hot/hazardous items and materials in wastes. A significant amount of research has been undertaken into self-heating, including on wastes, and there are some standard tests which can be used. However, the application of such typically small scale, laboratory testing to real storage stacks can be problematic: Stacks often do not behave in the way laboratory tests predict they should. It is known that self-heating can occur in waste stacks, and that it causes fires, but the factors involved are complex and variable including:

- Particle size – generally, the smaller the particle size the higher the risk of self-heating. For example, chipped wood waste is more likely to self-heat than raw or pre-crush wood waste where particle size is much larger
- Ability to shed heat – self-heating may not be a significant issue if the level of self-heating does not reach the ignition temperature of the waste involved. In part, this is dependent on the ability of a waste pile/stack to shed any heat generated. For example, a pile of large particle size wood waste may effectively shed any heat generated via the air gaps between each piece of wood (air circulates through the pile/stack allowing heat from any self-heating to escape). For chipped wood the air gaps will be much smaller restricting the movement of air through a pile/stack so trapping heat in the pile. The ability to shed heat also depends on mass to surface area ratio – the larger the surface area relative to pile/stack size the better the ability to shed heat. Long, thin stacks will be better at shedding heat than square or round piles/stacks for this reason. From research, height of pile/stack is an important factor here. Once pile/stack height exceeds around 4 metres the ability of a pile/stack to shed heat tends to reduce significantly, subject to particle size and other factors

- Density – the higher the density the less likely self-heating may be. For example, baled wastes are less likely to self-heat than loose stored wastes because of their higher density post-baling

5.4.3 There are also other factors involved, such as moisture content. One important factor is the time wastes are stored for. Some waste types can start to self-heat within hours of being stored. However, and in general, for many types the longer wastes are stored for the more likely that self-heating may occur.

5.4.4 In general, the time limits below should be used to inform your stock management. These take account of known risk factors such as particle size and density.

Combustible waste type	Maximum storage time
Non-shredded or similarly treated wastes (that is wastes whose particle size has not been reduced)	6 months
Baled and compacted wastes	6 months
Shredded and similarly treated wastes (that is wastes whose particle size has been reduced)	3 months
Combustible fines/dusts and very small particle size wastes	1 month

5.4.5 The above time limits are starting points for your considerations on storage. For some wastes the above storage times may be too long and you should consider your waste types carefully for self-heating risk. You may also wish to consider whether enhanced fire monitoring and suppression/extinguishing systems may allow you to extend waste storage times. But you should seek competent advice before making this decision and be prepared to prove that your thinking is sound and supported by good technical evidence rather than opinion or general experience (previous experience may not be an adequate indicator of future events).

5.4.6 If baled wastes seem likely to exceed the above time limits, you may consider breaking the bales and re-baling them to reduce fire risk. Likewise, you may want to consider if the turning of loose stockpiles would reduce the risk of self-heating. However, care should be taken when breaking bales or turning loose piles/stockpiles.

- Breaking bales and turning stacks may itself cause a fire. Self-heating may occur within a stack, but because of the lack of oxygen a fire has not started. When you open the bale/turn the stack you may introduce sufficient oxygen resulting in a fire

- When breaking bales and turning stacks you should have fire-fighting equipment, such as hoses, at the scene so that you can deal with a fire more quickly if one occurs (hand-held extinguishers are unlikely to be sufficient)
- Likewise, you should consider breaking bales away from any combustible wastes, such as in a quarantine area, and for loose stacks moving other wastes away from the area before turning the stack
- If you have one, the use of a thermal imaging camera when breaking bales or turning stacks may assist in being able to identify any rapid rise in temperature

5.4.7 Considering the potential risks associated with breaking bales and turning loose stacks, the best approach may be to simply ensure that waste is stored for the minimum practical time on your site.

5.4.8 You should also communicate with your waste off-takers as appropriate. If a waste is stored at your site for a period of time and is then transported to an off-taker site (or another site), how long will it be stored at the off-taker's site? The risk of self-heating may not cease if a waste is transported from one location to another. Likewise, has waste been stored elsewhere before being transported to your site?

5.4.9 In general, on the risks of self-combustion and how you may seek to minimise these:

- You must use a clear recording method to show and record how long all wastes have been on site for, and this recording system should be updated frequently to ensure that it reflects current stock levels and storage times
- You should rotate stock to ensure older wastes are not retained for excessive periods. For example, taking older bales from the rear of a stack before newer bales at the front and emptying storage bunkers to ensure that older waste is removed – the 'FIFO' principle (first in first out)
- Moisture level may be a factor and you may need to monitor this, as practical for the type or waste you are storing and how it is presented (loose, baled etc)
- Keep material in its largest form prior to processing for its end market, for example keeping waste wood in bulk storage and only chipping it a short time prior to transport off site
- Visually inspect stored wastes frequently (at least once a week as a minimum)
- Temperature monitoring may be required (see below)

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5.4.10 If you are storing wastes for any prolonged period of time, even within the timescales in the table above, you should consider monitoring the temperature of the wastes being stored. If you are storing wastes for more than three months you should monitor temperature. There are various methods for doing this, such as thermal probes, thermographic cameras and fixed heat detecting systems. However, none of these are completely accurate at measuring internal temperatures in larger waste stacks. The method you use will depend on the types of waste you are storing and their configuration, such as loose or baled. In particular, you should consider temperature monitoring if you are storing smaller particle size wastes such as SRF, RDF, wood chips and similar.

Tip – temperature probes and thermal cameras can be used to check on stacks, such as to identify whether hot spots are starting to occur. Equipment such as probes must be used correctly. For example, probing to the centre of a stack (difficult and may be impractical for denser wastes such as bales) to determine temperature rather than just at the surface where temperatures may be lower. A starting point for how often you need to check temperature will be risk assessment, including inputs such as your previous experience and advice from a competent supplier of such equipment or similar. The exact method you use to measure temperature will depend on the waste type and how it is presented (loose, baled etc). But, be aware that most methods of temperature measurement, including those which 'look' inside a stack, are not 100% reliable as indicators of actual internal temperatures, and that one part of the interior of a stack may be cool when the very next portion may be much hotter making your measurement potentially unreliable. Likewise, if you break a bale or turn/excavate a stack to determine internal temperature, it will start to cool as soon as you break it, also making any temperature measurement potentially unreliable.

Tip – experience from some waste operators is that self-heating fires are more prevalent in summer than winter (that is during warm weather). This is likely the result of warmer ambient temperatures resulting in energy already being in the 'system'. If you do monitor temperature, you may want to do this more frequently during warm weather than cold.

5.4.11 Overall, self-heating is a complex issue with various potential parameters such as density, particle size, overall size of stack, ambient temperature and ability to shed heat etc. There are tests which you can have undertaken on your wastes, but the application of laboratory type testing to real waste stacks may be problematic. However, it is known that self-heating has been a common factor in various waste fires, and you should be aware of the risks and plan for them.

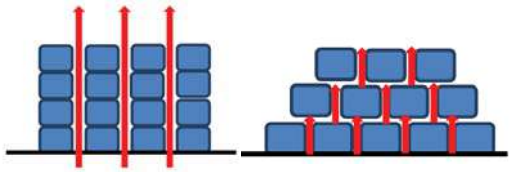
5.4.12 The document Spontaneous Heating of Piled Tyre Shred and Rubber Crumb (Health and Safety Executive – see further reading section) provides further advice on how you can control the risk of spontaneous combustion. Although written for the operators of tyre recovery facilities much of the guidance is generally applicable to the storage and treatment of other materials that can self-combust. Other references to information on self-heating are given in appendix 6, further reading and links.

Case study – one of the larger waste management companies imposed a series of management standards on their sites, such as on storage time, storage rotation, height of storage, not reducing the particle size of wastes until offtake had been arranged, baling wastes to increase density as soon as practical after treatment and similar. Over the period of two years this company halved the number of self-heating fires it was suffering. Self-heating may not be a completely predictable process, but we do know many of the factors involved and good site management aimed at these factors can and does work.

5.5 Baled wastes storage configuration issues

5.5.1 Baled wastes when stored may pose a specific fire risk issue associated with the configuration of storage. Typically bales of waste are stacked directly on top of each other. This results in continuous vertical air gaps between bales – in effect the creation of 'chimneys' between individual 'towers' of bales. If a fire occurs, these chimneys can result in energetic air-flow between bale towers so promoting a more rapid and energetic burn. This issue was identified during the waste burn tests in 2015 and 2016 on baled wastes:

- You should consider interlacing bales to break-up these chimneys – arranging bales in the same way as bricks in a wall rather than directly on top of each other
- In particular you should consider this for baled plastics/rubber where burn temperatures are higher than for other types of wastes (see appendix 1), interlacing bales may reduce burn temperature and how energetically a fire may burn



Far left: Standard bale storage may result in chimneys between bales promoting air-flow during a fire. Left: Interlacing bales may disrupt this chimney effect reducing air-flow and fire intensity

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5.5.2 The above assumes that your bales are 'square', as is typical for bales of paper, plastics etc. However, there are other types of balers, such as those used to bale and wrap RDF and similar waste derived fuels. Bales produced by such equipment may be cylindrical rather than square. Typically, such cylindrical bales are stacked interlaced for stability reasons, and so any chimney effect may already be mitigated.

5.5.3 The effect of interlacing bales in storage will depend on various factors, and generally interlacing bales does not affect maximum heat output once a fire has fully developed. Because of this, interlacing bales would not generally affect the separation distances and stack size information given in option 1 of appendix 1. However, you may want to consider this form of storage, in particular for higher-risk waste types such as plastics and rubber.

5.5.4 What the fire tests did indicate is that interlacing bales slows fire growth within the stack itself. This could allow a fire to be tackled more easily in its early stages before it develops fully. Future waste burn trials will include assessing the effects of interlacing of bales, and some research on this aspect is already available. Future versions of this guidance may be revised based on such research developments.

5.5.5 While not directly a fire issue, interlacing bales may also have stability benefits. Bale stack collapses have resulted in serious and fatal injuries in the past and bale stack stability is a significant risk area. In addition, during a fire bale stack collapse may itself result in fire spread.



6. External waste storage

Summary of main changes since the 2017 guidance: *This section was revised substantially between the 2014 and 2017 versions of this guidance, largely because of the results of phase 2 of the WISH waste fire tests. For this current version fewer changes have been made and this section is largely unaltered compared with the 2017 version.*

Note – readers should read appendix 1 of this guidance on stack dimensions and separation distance information for externally stored wastes in conjunction with this main text.

Typically, more wastes are stored outside than inside buildings. This is for various reasons, such as greater available space and lower cost compared to internal storage. External storage has advantages and disadvantages, such as:

- Fires may be easier to fight than with internally stored wastes because of likely better visibility and easier access, provided that adequate stack size limits and stack separation distances are in place
- Conversely, fire suppression/extinguishing equipment, such as sprinklers and deluges, may be typically harder to design and install
- Fire detection equipment may also be more difficult to arrange

You should consider the merits of internal and external storage when compiling your storage plan for your site.

Externally stored wastes – overall considerations

6.1.1 One of the potential disadvantages of external storage is that, in general, the volumes of waste stored are much larger than for internally stored wastes. A lack of adequate separation distance (or fire walls) and excessive stack size combined with the typically higher overall volumes of waste stored externally can have serious consequences. Some of the largest waste fires experienced have been in external storage – some of these have burnt for days or even weeks and have been extremely difficult to control. Many of these fires have been exacerbated by the Fire and Rescue Services (FRS) not being able to access the fire adequately, and the spread of fire because there has been little in the way of stack separation or physical segregation, such as with fire walls etc. Conversely, well organised external storage stacks of reasonable size and with adequate separation (or fire walls) can be one of the safest forms of waste storage available.

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6.1.2 If you store wastes externally you must consider stack size and separation between stacks, and/or the use of fire walls/bunkers. Appendix 1 gives guidance. You should use the guidance in appendix 1 to plan your external storage.

6.2 Detection, alarm and fire systems at external storage

6.2.1 For external storage areas the use of automatic detection systems poses practical problems, although some types of detection system can be fitted, and you should consider these if practical. Some sites have fitted camera or heat type detectors at external storage stacks and just because your storage is external this does not mean that you should not at least consider detection systems.

6.2.2 For external storage you should at least visually inspect stored wastes. Frequency should be determined by your risk assessment, but you should start with no less than once a week and you may want to increase frequency during the summer months. As noted above, you may also need to consider the use of temperature probes or thermal imaging, as practical.

6.2.3 As for detection, external storage areas pose challenges for fire suppression systems. You should at least consider whether on-site fire hydrants are required and whether you have an adequate water supply with which to fight a fire. You may also wish to consider deluge, water monitors or other systems for external storage areas as part of your assessment. For deluge and similar systems these can sometimes be fitted to external waste storage bunker wall tops, and water monitor systems are in fairly common use in external situations in some other industries.

6.2.4 For specialist storage systems the options for fire suppression will depend on the specific situation. For example, a deluge system fitted to a silo for storing wood chip, or a foam suppression system. For specialist storage systems you should seek competent advice.

6.2.5 Appendix 4 gives more detailed guidance on fire detection, alarm and suppression/extinguishing systems, including for external storage of wastes.

6.3 Arson, vandalism and other specific ignition risks

6.3.1 Some ignition risks may be lower with external storage. However, others may be higher. In particular the risk of arson/vandalism may be higher. It is often more difficult to protect external areas of a site from trespass than it is for buildings:

- You should include arson/vandalism risks (for example, the nature of the location your site is in) and security arrangements in your fire assessment for external storage
- If your site has a history of trespass, theft and/or vandalism you should consider enhancing your site security arrangements

6.3.2 Arson/vandalism may not be the only ignition threat externally stored wastes face:

- Are there any specific ignition risks posed by neighbouring premises, such as sparks from welding conducted outside and/or at your site boundary? Consider these and arrange your storage accordingly. For example, one known recycling plant is located next door to a firework factory which tests fireworks in an external area not far from the recycling plant's boundary – the recycling plant operator only stores wastes at the opposite end of their site to provide as much of a stand-off distance as possible
- There may be other ignition sources external to a site. If you know of any which may be applicable to your site, you should include these in your assessments



7. Internal waste storage

Summary of main changes since the 2017 guidance: *This section was revised substantially between the 2014 and 2017 versions of this guidance, large because of the results of phase 2 of the WISH waste fire tests. For this current version fewer changes have been made and this section is largely unaltered compared with the 2017 version.*

In general, less waste is stored inside buildings than outside, although this can vary from site-to-site. At many sites internally stored wastes are contained in walled bunkers and similar. However, some waste sites do store baled and other wastes inside buildings in 'open' storage and not contained in bunkers and similar. Internal storage has some advantages, but also has disadvantages:

- Fires may be harder to fight than with externally stored wastes because visibility may be impeded by smoke and access for Fire and Rescue Services (FRS) to fight fires may be more difficult
- Because of the above, if life is not at risk the FRS may decide (understandably) to simply contain a fire and let it burn itself out – this may well result in the loss of your building and/or any plant and equipment contained in it
- Conversely, fire suppression/extinguishing equipment, such as sprinklers and deluges, are typically easier to fit than at external storage areas
- Fire detection equipment may also be easier to arrange
- The risk of property and asset loss is likely to be higher than for externally stored wastes. A fire in internally stored wastes may spread to buildings and plant more easily than for externally stored wastes (provided externally stored wastes are adequately separated from buildings)
- While not a fire risk issue, storing wastes internally protects them from the weather, which for some waste types may be a quality issue, and at some sites storage of wastes internally may be a permit/licence requirement for nuisance control reasons

7.1 Internally stored wastes – overall considerations

7.1.1 If you store wastes internally you must consider stack size and separation between stacks, or the use of fire walls/bunkers. The information contained in appendix 1 may not be directly applicable to internally stored wastes, but the overall approach is, and likewise many of the principles are (see sub-section 7.3 below). You should consider the data in appendix 1 as a starting point, but in some cases not as absolute guidance, for the internal storage of wastes.

7.1.2 Separation between internally stored wastes and building walls, plant and other equipment within buildings also needs to be considered. Experience in the industry is that fires in internally stored wastes are far more likely to spread to buildings and plant than for externally stored wastes.

7.1.3 As above, fires in internal storage areas may be more likely to spread to waste processing areas, and damage or loss of buildings and/or plant is always a risk. As a result, your insurer is likely to place more emphasis on internal storage than external storage fire management. You should seek advice from your insurer to ensure that you have met any requirements they may impose.

7.1.4 If you are storing wastes internally in large quantities, such as in warehousing, then you should seek competent advice on the precautions to be taken. These will depend on the type of building used, the types of waste being stored and what fire precautions are already in place. This is a specialised area, and the general standards applied to the warehousing of goods may not be appropriate to the internal storage of wastes.

7.1.5 Overall, for internally stored wastes:

- The best approach ideally may be not to store wastes internally, if practical, within your permit/licence and compatible with any waste product quality issues. Or, failing this to limit the amount of waste you store internally (or limit type of waste – see below on plastics and rubber wastes). Or, at least move wastes which will be stored externally to their allocated external storage areas as quickly as practical
- If practical, larger volumes of internally stored wastes should generally be stored in bunkers, or separated by fire walls – in general the restrictions on space in internal storage situations and the 'free-air' separation distances required would tend to make the use of bunkers and/or fire walls the most practical option in any case
- You may want to consider the use of fixed fire detection and suppression/extinguishing systems more carefully at internal waste storage areas (see appendix 4 for details)
- In particular for plastics and rubber wastes, the higher burn temperatures involved are likely to pose a higher risk of fire spread to buildings and plant. Enhanced and high-specification fire detection and suppression/extinguishing systems should be given careful consideration if you store plastics or rubber wastes internally. The most practical approach may be to not store plastics and rubber wastes internally, if this is practical and allowed in your site permit/licence

- The approach you take to fire risk in internally stored wastes will be dependent on a range of factors, including the layout and size of your building, its construction materials, the configuration of your storage and other factors specific to your building and how you are operating. This is a matter for site specific assessment, and you may need competent advice

7.2 Detection, alarm and fire systems at internally stored wastes

7.2.1 General guidance on fire detection, alarm and suppression/extinguishing systems is given in appendix 4. For internally stored wastes you should read this guidance carefully to ensure that if you do store wastes internally you have mitigated the risk adequately.

7.2.2 At some sites materials are moved from waste treatment/processing directly into internal storage areas using conveyors or other mechanical handling systems. In such cases you will need to consider the potential for fire spread by such interconnection. You should consider the provision of automatic fire suppression/extinguishing systems on the conveyors etc leading to internal storage areas.

7.2.3 One potential problem with fighting fires in internal storage areas is smoke, which may obscure a fire and make it difficult for the Fire and Rescue Services to direct water direct to the seat of a fire. You may want to consider, subject to your risk assessment, passive or automatic smoke vents in the roof over internal storage areas. However, you must consider this carefully as vents can cause interaction problems with some fire detection and suppression systems resulting in a delay in activation – you should seek competent advice on this issue.

7.2.4 You should consider potential operational issues which may affect the effectiveness of any suppression system you have installed. For example, if you have installed a sprinkler or deluge system around an internal storage bunker (in essence, a pipe with nozzles installed on top of or just above your bunker walls). This is unlikely to work effectively if the height you are storing wastes at means such systems are buried. Likewise think about height for other reasons, such as waste piled to such a height that electrical lighting may pose an ignition risk.

7.3 Application of appendix 1 on externally stored wastes to internally stores wastes

7.3.1 The stack separation distance information in appendix 1 is only directly applicable to externally stored wastes, because it is based on data from the waste burn tests conducted in 2016 which were conducted on externally stored wastes. However, there is some application to internally stored wastes and the general principles involved are the same.

7.3.2 The maximum stack heights and widths given in appendix 1 are applicable in outline to internally stored wastes. These heights and widths are based on stack stability, self-heating and effectiveness of fire-fighting using standard hoses. These factors apply to internally stored wastes as much as externally stored wastes.

7.3.3 Deviations from these stack heights and widths (as discussed in option 2 in appendix 1) are likely to require enhanced fire systems if the risks associated with internally stored wastes are to be mitigated. This is a matter for site specific assessment.

7.3.4 At its top end, the stack length information given in appendix 1 is unlikely to be appropriate for internally stored wastes, if for no other reason than those of building size and available space (but, see appendix 1 on separation distances related to length). This is an issue for site specific assessment, although the data in appendix 1 can be viewed as a starting point and guidance.

7.3.5 The ‘free-air’ separation distances between stacks, and stacks and buildings, and their relationship to stack length given in appendix 1 for externally stored wastes may not be directly applicable to internal storage. However, they are unlikely to be factors of magnitude out. As a result, the practical approach for internally stored wastes is likely to be the use of bunkers and/or fire walls between stacks. As for all stored wastes in bunkers and similar, bunker wall construction and height are critical factors.

7.3.6 The mechanisms for fire spread given in appendix 1 will apply to internally stored wastes, although the detail may vary. However, with internally stored wastes other fire spread mechanisms may be important. For example, hot combustion products are unlikely to dissipate to the extent they may with externally stored wastes, and the risk of fire spread through mechanisms such as ‘flash-over’ are likely to be higher. You will need to consider these other fire spread mechanisms more carefully with internally stored wastes, and you may need to seek specialist advice.

8. Disclaimer

Nothing in this guidance constitutes legal or other professional advice and no warranty is given nor liability accepted (to the fullest extent permitted under law) for any loss or damage suffered or incurred as a consequence of reliance on this guide.

The guidance is not a substitute for duty holder judgment and/or professional safety or other advisor’s judgment. Notwithstanding the good practice in this guidance, duty holders are responsible for ascertaining the sufficiency and adequacy of their procedures for verifying and evaluating their organisation’s compliance with health and safety law.

Neither WISH nor any contributor or supporter of this guidance accepts any liability (to the fullest extent permitted under law) for any act or omission by any persons using the guidance.

The Waste Industry Safety and Health (WISH) Forum exists to communicate and consult with key stakeholders, including local and national government bodies, equipment manufacturers, trade associations, professional associations and trade unions. The aim of WISH is to identify, devise and promote activities that can improve industry health and safety performance. www.hse.gov.uk/waste/wish.htm

This guidance is issued by the Waste Industry Health and Safety (WISH) Forum to help control the safety and health risks associated with fires. Following the guidance is not compulsory, unless specifically stated, and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Some parts of the guidance represent good practice and may go further than the minimum you need to do to comply with the law.

Appendix 1: Managing external storage stacks

***Summary of significant changes from the 2017 WISH fires guidance**: The main content of this third version of appendix 1 of the WISH fires guidance is largely unchanged compared to the 2017 version. However, some updates and clarifications have been made based on developments in knowledge and reader feedback, and the structure of the appendix has been changed to assist comprehension. In addition, the sections in the introduction to this appendix contained in the 2017 WISH fires guidance which explained the differences between the 2014 and 2017 versions have been deleted, as these are no longer relevant.*

Note - please read this appendix carefully, rather than simply turning to its summary stack dimension and separation distance tables. The principles in the text are important if you are to interpret this appendix correctly.

Note - this appendix applies to the external storage of wastes. It does not directly cover the internal storage of wastes in buildings, although some of the principles will apply (see section 7.3 of the main text of this guidance). In addition, this appendix applies to the storage of wastes, and not directly to wastes in short-term reception areas, or in treatment/processing areas (see sections 3 and 4 of the main text of this guidance for advice on these areas), although again some of the principles will be relevant.

Note – please also see appendix 5 non-technical summary of the WISH waste fire burn tests for a summary of the underpinning science behind this appendix and for an empirical demonstration of how thermal heat transfer can cause fire spread from waste stack to waste stack.

Note – the stack dimensions in this appendix apply **BOTH** to wastes stored open and in bunkers. The separation distances given **ONLY** apply to open stacks and not to bunkered storage (provided that bunker/fire walls are appropriately constructed and used effectively).



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1. Introduction

1.1. External waste storage stack fire risks

Some of the largest waste fires, and those which have taken the longest to extinguish or bring under control, have been in external waste storage stacks. This is not surprising as typically greater volumes of waste are stored outside than in buildings. These large waste fires have attracted the greatest amount of publicity, and potentially pose the highest risks to the environment and public health because of their size. The adequate management of external waste storage stacks is critical to reducing these risks, and in particular stack dimensions and separation distance between individual stacks (in the absence of fire walls) are key factors.

1.2. Why are stack dimensions and separation distances important?

The larger an individual storage stack of waste the more fuel it will contain and the greater the potential for a larger and more long-lasting fire (more waste = more fuel = larger fire). In addition, the larger an individual waste stack the more difficult it may be to fight a fire. For example, a stack is so large that water from fire hoses cannot reach all of the stack.

A fire in one individual storage stack of wastes may be manageable, provided the stack is of a reasonable size. However, if the fire spreads to other adjacent stacks, then the likelihood of a larger and potentially uncontrollable fire increases. Likewise, a fire may spread from a waste stack to a building or other combustible object.

- Limiting stack dimension limits the amount of fuel a fire has available, making fire-fighting likely easier and more effective (there are other reasons to limit stack dimensions – see below for more detail)
- Preventing fire spread from one stack to another also limits the amount of fuel a fire has available. This can be achieved by either separating stacks (free-air separation) so that a fire cannot jump between stacks, or the use of fire walls to achieve the same effect

However, it is accepted that waste management sites are finite in size, and stack dimensions and separation distances can have a direct effect on how much waste can be stored. Stack dimension limits and separation distance standards need to achieve good levels of fire safety and management, and be cautious and prudent, without going unreasonably beyond what is needed to achieve good levels of fire safety.

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2. Factors affecting separation distances – how did WISH arrive-at its separation distances?

Fire spread has been a major factor in many large fires in externally stored wastes. Obviously, fire will tend to spread within any individual stack of wastes – there is little to stop it. However, fire spread between stacks, or between stacks and buildings etc, is also an important issue. There are two main methods of reducing the risk of fire spread between stacks or stacks and buildings etc:

- Provide an adequate free-air gap (separation distance/fire break) between stacks
- Place an effective fire barrier (wall/bunker wall) between stacks

Note - this section covers free-air separation distances and does not consider fire walls and bunkers (see section 3 below for more detail on these).

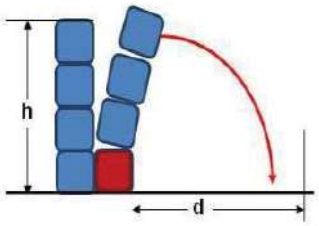
How wide a free-air separation distance needs to be will depend on fire spread mechanism – how a fire can spread. In addition, some mechanisms of fire spread are more useful than others when setting separation distances. In summary, we need to decide:

- What the main potential fire spread mechanisms are?
- Which of these mechanisms is the most 'sensible' and reliable to use as the basis to determine what is an adequate separation distance?

2.1. Fire spread mechanisms

Fires can spread between stacks via various mechanisms. For externally stored waste stacks the most significant potential fire spread mechanisms include:

- Stack collapse: The collapse of a stack on fire resulting in burning wastes falling, rolling etc and coming into contact with a second stack. How far wastes can 'roll' or travel as the result of a collapse varies dependent on the nature of the stack and the wastes, and waste configuration (shape of bale for example). This variability makes stack collapse an impractical mechanism as a guide to separation distances



Example of a stack collapse mechanism, assuming a bale at the base of the stack collapses first. The distance any bale, or part of a bale, will 'roll' is dependent on a range of factors making stack collapse too unpredictable to use as a guide to separation distances between stacks

- Flying/blown 'brands': Burning detritus blown from one stack to another (or building etc). This mechanism is unpredictable and depends on factors such as wind strength and direction, and active fire management can reduce the risk, such as by tackling any flying brands with hoses or similar. Flying brands do pose a risk of fire spread, but because of their unpredictable nature it is not practical to use them as a guide to separation distances
- Thermal energy transfer: Heat produced by a stack which is on fire resulting in the temperature of a nearby stack (or building etc) being raised to its ignition point and also setting on fire. This mechanism is capable of measurement and can be used as a guide to separation distances

The above is not to say that flying brands and stack collapse should be ignored. Site emergency response plans should include mitigations against these fire spread mechanisms. However, they are not useful as a practical guide to determining separation distances between stacks to reduce the risk of fire spread. Thermal heat transfer does provide a practical guide. The WISH waste burn trials conducted in 2015 and 2016 provided data which can be used to calculate separation distances based on thermal heat transfer (see appendix 5 for details).

2.2. Use of thermal emission data to determine separation distances

When an object, such as a waste stack, burns it emits heat. Unless this heat is 'blocked' by an item such as a fire wall, the thermal energy will travel through the air. If another combustible object, such as another waste stack, is placed in the path of this thermal energy it becomes a 'receptor'. The temperature of the receptor will increase, and if it reaches its ignition point (the temperature at which it will burn) this second object will set alight. During the WISH waste fire burn tests, the heat emitted by a burning stack of bales of waste plastic was sufficient to melt a data-logger ten metres away and blister the paint on a porta-cabin nearly 30 metres away. Heat transfer between an emitter and receptor is a common cause of fire spread, and a tried-and-tested method used by fire engineers to calculate safe separation distances between combustible objects/materials.

One of the main outcomes of the WISH waste fire tests was to determine how much heat energy various types of waste emit when they burn. Research has been conducted in the past on this aspect, both on some waste types and more commonly on raw materials which may behave like wastes in a fire. However, such research typically used small scale laboratory type testing. The WISH tests moved beyond this laboratory type testing and involved much larger scale burn tests aimed at replicating what actually happens when a waste storage stack is on fire.

The non-technical summary of the results of the waste fire tests in appendix 5 goes into this topic in more detail. However, the tests resulted in a good set of data on thermal heat emissions for waste storage stacks. In terms of their heat outputs, the wastes tested during the waste burn tests can be split into two broad categories:

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- Plastics and rubber: These waste types exhibited higher heat outputs when burnt during the tests. Surface temperatures during burns in some cases exceeded 1,200 degrees centigrade, and were consistently higher than for other waste types
- Other combustible wastes, such as SRF, RDF, wood wastes, paper etc: These waste types exhibited lower relative heat outputs when burnt. There were variations in surface temperatures, but within a practical range of 850-950 degrees centigrade

The temperatures quoted above are for the most frequent 'worst case'. These two broad categories form part of the basis for the standard separation distances information in option 1 below. However, there are other factors to be considered:

Receptor ignition properties: From the WISH burn tests we know the levels of thermal radiation produced when different types of waste stored in stacks burn. However, there is limited information available on the ignition properties of receptors. The receptor could be another waste stack, a building, parked vehicles, a wooded or bushy area next to a site etc. For the purposes of the standard separation distance information given in option 1 below, two receptor ignition property figures have been used:

- Research into the ignition properties of wastes has been conducted, in particular Swedish research on the ignition properties of baled RDF. This research indicates that a heat input of 10 Kw/m^2 is required to ignite baled RDF
- The accepted national standard for buildings protection regards ignition is a heat input of 12.6 KW/m^2 for solid unprotected surfaces (for non-UK readers please note this figure may be different in your country)

The above provides a practical range. That baled RDF requires less heat input to ignite than a typical building is not surprising. However, different types of waste may have different ignition properties. If you believe that your waste may have a different ignition property, then you could have your waste tested (see option 2 on bespoke distances below).

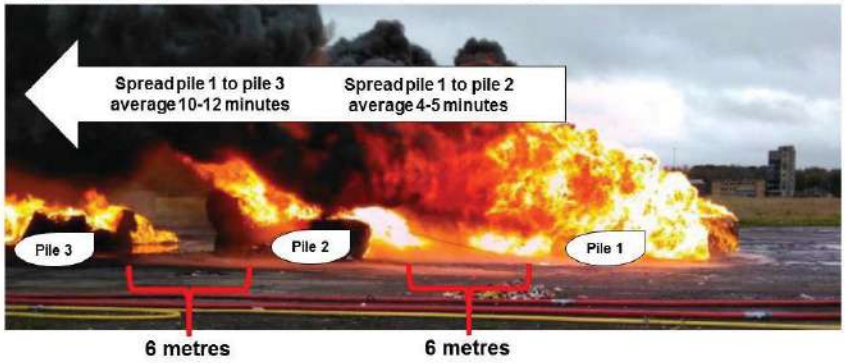
Angle of emitter and receptor: The angle between emitter and receptor is important. Heat transfer between two surfaces parallel to each other will be more effective than between two angled surfaces of the same dimensions. In fire science this issue is accounted for by use of a 'configuration factor'. The separation distance information given in option 1 below takes account of configuration factor for loose stacks. This is the reason why separation distance information for loose pile stacks with an assumed angle of repose of 45 degrees is quoted in addition to 90 degree (vertical) baled and similar stacks and buildings.

The separation distance information in option 1 below takes account of the above issues and translates much complex fire science into practical separation distances. However, it is accepted that there are variables still be to fully be understood, and there is nothing to stop anyone performing their own calculations rather than relying on the standard parameters given in option1.

The potential fire spread mechanisms of stack collapse and flying brands are discussed above and noted as being too variable to provide a practical basis for determining separation distances. However, the separation distances quoted in option 1 below are such that they are also likely to provide a reasonable degree of protection from these other potential fire spread mechanisms.

Some readers of this appendix have expressed surprise at WISH's choice of using thermal energy transfer as the basis for calculating free-air separation distances, and at the size of the distances arrived at. During phase 3 of the WISH fire tests an empirical test of the use of thermal energy to determine separation distances was carried-out (the test was repeated to ensure consistency). More detail is available in appendix 5, but in summary stacks were placed 6 metres apart and the first stack set on fire. The time for the fire to spread between the stacks was then measured. The graphic/photograph below shows the results in synopsis.

Photograph of actual tests. Note, bale stacks in partial collapse and extensive flames result in pre-burn distances not being clear in photograph. This test repeated four times to ensure consistency.



In brief, the results of the WISH fire tests provide the data require to calculate separation distances, and this approach is commonly used by fire engineers as a reliable method'



General views WISH fire tests, from left: Smaller scale laboratory burn tests, the 'porcupine' thermal sensor array used in larger scale stack burns, plastic bales burn test, RDF loose stack burn test, bale burn test general view.

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3. Use of fire walls and bunkers to replace free-air separation distances

An alternative to using 'free-air' separation distances between waste stacks, or stacks and buildings etc, is the use of fire walls. The intent being to provide a 'block' to the heat produced by a burning waste stack so reducing the risk of fire spread. Fire walls can be linear, to separate two objects, or arranged as bunkers, typically in waste management applications three-sided. The topic of fire walls and bunkers is discussed in more detail in the main body of this guidance in section 5 and in appendix 4. Readers should read these sections before deciding on the use of fire walls/bunkers in external storage. However, specific to this appendix on external waste storage:

- When used to protect buildings height of fire wall needs consideration. Heat does not only travel horizontally - walls need to be high enough to protect upper portions of buildings
- Three-sided bunkers only protect from fire spread on the three sides where walls are installed. For the open side the full free-air separation distances need to be used
- Fire/bunker walls need to extend at least 1 metre above stored waste height to take account of flame height, and wastes should not spill/extend beyond fire/bunker walls. Please note that in some of the waste burn tests flame height exceeded 1 metre: The 1 metre freeboard noted above is aimed at achieving a reduced risk of fire spread

In addition, there are some practical aspects associated with fire wall/bunker use:

Fire walls/bunkers can be useful in reducing the space required to store wastes, by removing the need for wide free-air separation distances between stacks. However, access to fight fires is a consideration. What you do not want is to create a 'maze' of fire walls making access to fight a fire difficult, and potentially hazardous. Consider access issues when planning fire walls/bunkers.

It is fairly common practice in external storage at general waste recycling plants to use rows of metal wastes bales to separate stacks of combustible waste bales. The WISH waste fire burn tests showed a significant difference between the heat emitted by many combustible wastes when they burn and plastic and rubber wastes, plastics and rubber burning at much higher temperatures. For example, during the plastic baled waste stack burn test maximum temperature measured at the surface was sometimes in excess of 1,200 degrees centigrade. This is above the melting point of aluminium. The use of metals bales to separate bales of paper or similar may still be valid, but their use to separate plastics/rubber bales or similar may be ineffective. A 'fire wall' constructed of waste metals bales will be of little use if it starts to melt and falls-over.

For sites with restricted space, the use of fire walls/bunkers in external waste storage may be the most effective option to provide an adequate degree of protection from fire spread while maintaining reasonable space requirements on site. In particular for plastic and rubber wastes were separation distances in free-air are wider, because of their higher burn temperatures. However, fire walls/bunkers require good planning to be effective and careful thought should be given to their construction, use, configuration, maintenance and layout.

4. Factors affecting stack dimensions – how did WISH arrive-at its stack dimensions?

Some of the most difficult, long-lasting and largest waste fires experienced in recent years have been in large undifferentiated individual external waste stacks. Such 'mega-stacks' are clearly not acceptable because of the risks they pose, and the difficulties faced by the Fire and Rescue Services when attempting to fight such fires. Limits are required on stack size/dimensions, but as for separation distance what factors such limits may be based on needs consideration.

As outlined above, thermal heat transfer can provide a basis for calculating separation distances. This section considers the factors which may be used, and which may be practical to use, to determine limits on stack size/dimensions.

4.1 Burn-time, self-heating and stack volume as potential considerations

The more waste in a stack the longer a fire may potentially last for: How long, is a function of how much waste there is and the rate at which the fire burns at. During the WISH waste fire tests, the rate of mass loss during burning was measured for various waste types. The results were variable. Rate of burn varied between 1 tonne of some waste types taking only a few hours to burn-out to the same weight of other waste types taking more than 24 hours to burn-out.

For many waste fires the Fire and Rescue Services will fight the fire rather than letting it burn-out. But, in others a strategy of containment (controlled burn) may be used, such as to prevent contaminated firewater entering a nearby watercourse. For controlled burn, setting a time limit of a few hours, or even a day or two, for waste fires to burn-out and applying this to determine standard maximum stack size would result in maximum stack sizes of only a few tonnes for many wastes. This would obviously be impractical at virtually all waste management sites.

In addition, assuming that the Fire and Rescue Services do fight a fire actively, how long this may take will depend on a range of variables such as how advanced a fire is, available water supplies, how quickly they can mobilise, what fire appliances are available at any given time etc. Installing fixed fire systems such as water deluges and oscillating water monitors may increase the likelihood of a fire being brought under control/extinguished more quickly. However, fire/risk engineering is not based on distinct time limits against volumes of material stored, such systems are not common currently in external waste storage, and would in any case likely move a site out of the standard approach of option 1 into the bespoke approach of option 2 as given below.

With the current level of knowledge, setting a distinct time limit to burn-out or extinguishment and using this to try to determine a standard maximum stack size is fraught with problems, and unlikely to be practical. The only practical statement that can be made is that plans should be made to extinguish waste fires as quickly as possible.

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Self-heating is another potential parameter to consider (see section 5 above for more detail). However, self-heating is a complex issue dependent on a wide range of variables, from particle size and density to waste type and external environmental conditions.

Surface area to mass ratio has a role to play, and research indicates stack height is also an important factor. In general, for cone or similar shaped stacks, the larger the stack the lower its surface area to mass ratio becomes, and the less able it is to shed heat caused by self-heating.

However, stack configuration is also a factor. A longer thinner stack may contain many hundreds of tonnes of waste and still largely maintain a surface area to mass ratio which allows heat to be shed, provided stack height is restrained. For example, a bale stack of 50 metres length x 20 metres width x 4 metres height when compared to a smaller stack of 20 metres length x 10 metres width x 4 metres height loses less than 30% of surface area to mass ratio, despite having five times the volume. Please note that in this example stack height remains at 4 metres, because of the role stack height may have in self-heating and for practical fire-fighting reasons (see below on stack height). In addition, larger particle size rigid wastes may allow sufficient air-gaps within a waste stack to allow heat to be shed other than at the stack's surface.

4.2 Practical fire-fighting and stability considerations

Most external stack fires are likely to be fought using manual hoses and similar, in the first instance perhaps by site staff and then by the Fire and Rescue Services. Standard manual hoses have a limited water-throw. This poses practical considerations. If the Fire and Rescue Services are confronted by a 10-metre-high x 60 metre diameter individual waste stack they are unlikely to be able to apply water over all parts of the stack using standard equipment.

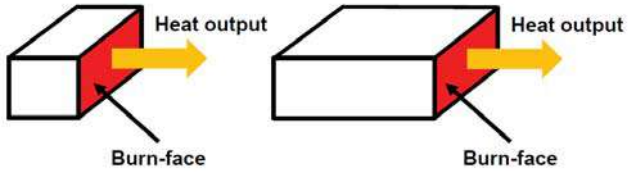
If a fire persists for a longer period of time, more specialised equipment may be brought to the scene, such as high-volume pumps. However, it must be assumed in a fire's earlier stages that standard equipment will be all that is available. The aim must be to extinguish waste fires quickly as the best option. Stack sizes set by using practical fire-fighting considerations reflect this aim.

In addition, stack stability is an issue. Stack collapse is a valid potential fire spread mechanism, and stack stability has other non-fire safety aspects such as falling materials or bales striking a person. Maximum height should also mitigate against stack stability issues.

4.3 Heat transfer and stack dimensions

As noted above, when a stack of waste is on fire it will emit heat. If the separation distance between the stack and another combustible object is insufficient, or a fire wall is not in place, then this heat may cause the second object to ignite.

The amount of heat emitted in any one direction will depend on the dimensions of the 'burn-face' of the stack facing the second object, and not primarily its overall volume. The diagram below illustrates this. The two waste stacks shown are of different volumes, but the burn-faces are the same dimension, and the heat output (represented by the amber arrows) in any one direction will likewise be largely the same.



For example, following the waste burn trials calculated separation distances were modelled for two stack volumes (450 m^3 and 750 m^3), but with the same burn-face dimensions. The difference between the two sets of separation distances was not significant.

Separation distance is largely a function of the amount of heat emitted per unit of area of a burn-face, and the dimensions of the burn-face. As noted above, wastes can practically be split into two categories: General wastes such as wood, paper, RDF etc which exhibit maximum burn temperatures of some 850 - 950 degrees centigrade and plastics and rubber wastes with temperatures of up to some 1,200 degrees centigrade. We know what the heat emissions per unit of area for these two temperatures are, which leaves burn-face dimension as a variable.

For a given stack height, the only variable is length/width. The longer/wider the burn-face the higher the heat output, and the wider the separation distance required to avoid fire spread. There is a 'sliding-scale' relationship between burn-face length/width and separation distance. This is not a straight-line equation. As length/width increases the effect on heat output at any given point on a receptor declines. This is reflected in the separation distance graphs in option 1 below.

Note – the terms 'width' and 'length' are used above. Obviously if a waste storage stack is 10 metres by 10 metres, its width and length are the same, and the terms stop making that much sense. In addition, if a waste stack is on fire its 'width' will emit heat and well as its 'length' – both the width and length will have burn-faces.

4.4 Other considerations

There are some other considerations which support the practical factors noted above:

- Stability of stacks is a fire and non-fire safety consideration. Slips in loose stacks may engulf personnel and bales toppling may strike persons in the area posing a risk of severe or fatal injuries. This would include Fire and Rescue Services personnel tackling a fire

- Stack collapse may impede the fire and rescue services and delay access for fire-fighting
- One technique used during waste fires is to remove unburnt wastes from a stack which is on fire using mobile plant. This is easier if a stack is not too high or too large
- Research indicates that stacks of more than 4 metres high may have problems shedding heat from self-heating, in particular for smaller particle size and/or flexible wastes

With the current state of knowledge, the most practical method of determining standard stack sizes is likely to be a combination of practical fire-fighting experience, stack stability, ability of stack to shed heat from any self-heating and stack configuration/dimensions relating to burn face dimension. This may change in the future as knowledge in this area develops, and in that case a revision to this appendix would be required.

In summary on stack dimensions:

- Maximum stack height of 4 metres (or maximum of four bales high whichever is lower) based on practical fire-fighting, stability and self-heating considerations
- Maximum stack width of 20 metres (provided access is available from both sides – if not maximum of 10 metres) based on practical fire-fighting considerations
- Stack length a variable based on the separation distance, which is achievable at any specific site. This allows flexibility to account for site dimensions and layout



5. External waste storage stack management options

5.1 Introduction to options

As can be seen from the above, calculating separation distances and assessing reasonable stack dimensions is a complicated, time-consuming and potentially costly task. The WISH tests are an extreme example, having been conducted on multiple waste types, stack sizes, variable situations etc, but to date they have taken more than three years and cost in excess of £175,000. However, the WISH tests have resulted in sufficient data for a set of 'standard' separation distances and stack dimensions to be arrived at. These may not be perfect, because of factors such as the variability of wastes, but they do provide a basic set of parameters without waste operators having to expend the time and cost of conducting their own tests.

In addition, as the aim was to obtain baseline data the WISH tests were conducted in the absence of enhanced fixed fire systems being in place, such as automatic water deluge, water monitor and similar systems (there would have been little point in trying to measure thermal outputs for a fire if an automatic deluge system kept putting it out…)

Taking account of the above, and to provide waste operators with flexibility, two options for stack management are given in this appendix.

5.2 Option 1 – standard separation distances and stack dimensions

Option 1 applies to waste management sites:

- With **only basic** fire-fighting provision, such as hand-held extinguishers and 'standard' fire hoses (sites which largely rely on the Fire and Rescue Services should an incident occur)
- **AND**, where waste operators do not wish to have their own bespoke fire engineering calculations performed to arrive at bespoke distances and dimensions

5.3 Option 2 – bespoke separation and distances and stack dimensions

Option 2 would apply to waste management sites:

- With **enhanced** fire-fighting provisions, such as fixed fire systems (for example automatic water deluges, oscillating water monitors or other similar equipment)
- **AND/OR** operators who do wish to have bespoke fire engineering calculations performed on their specific situation and/or wastes

Sections 6 and 7 below describe these options, and section 8 gives examples of site storage layout to illustrate the use of the stack dimension and separation distance information given.

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6. Option 1: Standard separation distances and stack dimensions

6.1 Introduction to standard separation distances and stack size option 1

Note - this option 1 is aimed at waste management sites which **ONLY** have a basic level of fire provision, such as hand-held fire extinguishers and standard fire hoses, **AND** where operators do not wish to have bespoke fire engineering calculations performed. If your site has fixed fire protection systems at external storage such as automatic oscillating water monitors, or you wish to have bespoke fire engineering data calculated, then option 2 may be more applicable.

The standard separation distance and stack dimension tables/graphs given below have been split:

- Information and standards for **general** wastes (typical maximum burn temperature of circa 950 °C), **excluding** wastes which are predominantly plastics and rubber. These are split into tables for loose waste stacks and baled waste stacks
- Information and standards for wastes which are **wholly or mostly plastics and rubber** (typical maximum burn temperature of up to circa 1,200 °C). These are given separately because of the significantly higher thermal outputs of these types of waste. As for general wastes, tables are split for loose storage stacks and baled storage stacks

Please read the notes and information given to ensure you understand what each means.

6.2 Information and use of the tables and graphs

Some of the standards set in this appendix are simple, such as stack height and width. However, separation distances will vary dependent on the length of the stack (see above) on a sliding-scale. Because of this separation distances are shown as graphs. Two graphs are provided:

- **Graph 1.** Shows stack lengths and separation distances for general wastes, such as RDF, wood, paper etc (950 °C typical maximum burn temperature – see above). Four lines are shown on the graph: Loose stack to loose stack distances, loose stack to buildings distances, baled stack to baled stack distances and baled stack to buildings distances
- **Graph 2.** Shows stack lengths and separation distances for plastics and rubber wastes (1,200 °C typical maximum burn temperature – see above). Four lines are shown on the graph: Loose stack to loose stack distances, loose stack to buildings distances, baled stack to baled stack distances and baled stack to buildings distances

To determine your separation distance, mark your stack length on the horizontal axis and draw a vertical line up to the relevant coloured graph line (stack to stack, to buildings etc). Then draw a horizontal line across to the vertical axis and read-off separation distance. This can also be done in reverse. For example, your separation distance may be constrained by site size. The distance you can achieve can be marked on the vertical axis and stack length read-off on the horizontal axis.

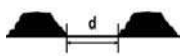
For convenience, the terms ‘stack length’ and ‘width’ are used in the tables and graphs. However, when considering separation distances based on thermal heat transfer a burn-face could be on the long-side of a stack (length) or the short-side (width), or length and width could be equal. **Both** need to be considered – fire spread via heat can occur on **any** open side of a stack.

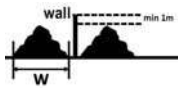
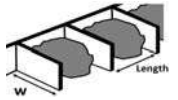
The aim of the tables and graphs is to give waste operators practical guidance they can use without the need to employ a specialist fire engineer to calculate bespoke separation distances. As a result, assumptions have been made to avoid complicating the issue, and a need to have multiple graphs and scenarios. The main assumptions made include:

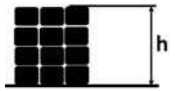
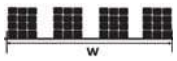
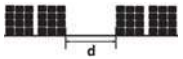
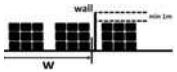
- That emitter (waste stack) and receptor (other waste stack or building) are parallel to each other. If this is not the case, then separation distance may reduce
- That loose waste stacks (piles) have an angle of repose of 45 degrees. If your loose stack has an angle of repose steeper than this then separation distance may increase, or if shallower distance may decrease
- Typical maximum burn temperature for the two broad categories of waste types noted (general wastes and plastics/rubber wastes) have been used. These reflect the typical worst-case fire scenarios observed during the WISH burn tests, such as ‘inside-out’ loose stack fires and bale ‘chimney effect’ fires (see appendix 5 for details)
- A receptor ignition property of 10 kW/m^2 has been used for waste stacks, based on research into the ignition properties of baled RDF. If you believe your wastes have a different ignition property you could conduct testing to prove this
- A receptor ignition property of 12.6 kW/m^2 has been used for buildings. This is the value commonly used for buildings with unprotected surfaces. However, for example, if your building is of concrete construction with no doors, windows or other openings in its face opposite your waste stack then the value of 12.6 kW/m^2 may be too low
- Graphs 1 and 2 assume a stack height of 4 metres. If your stacks are lower than this, you could employ a fire engineer to calculate bespoke separation distances. However, small differences in stack height are unlikely to have a significant effect
- To avoid over-complicating the tables and graphs a limited number of most common scenarios have been used. There are other potential scenarios, such as a bale stack next to a loose stack. However, the scenarios shown provide a basic set of standards
- ‘Adequate access to allow fire-fighting’ is used as a term in the tables. This should generally be a minimum of 5 metres, but may be varied dependent on site conditions, such as are there obstacles etc which would make 5 metres too narrow. In addition, access should be good on **all** sides of a stack, not just its length

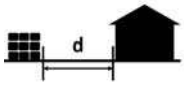
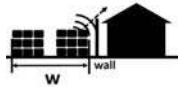
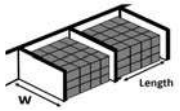
Finally, when using the graphs below take a practical and cautious approach. Separation distances should be rounded-up to the nearest whole number. Measuring stack length, width or height down to the millimetre is unlikely to have a substantive effect and would not replicate actual conditions on a waste site, which will vary from week-to-week – if in doubt exercise caution and prudence.

6.3 Summary tables of standard stack separation distances and stack sizes: OPTION 1

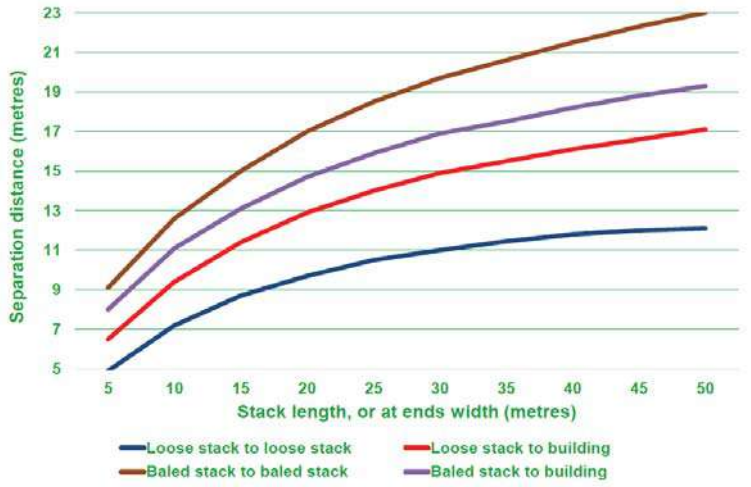
A. General combustible wastes (typical max burn 950 °C), EXCLUDING plastics/rubber	
Parameter and standard	**Commentary**
***Note:** The graphics used below are indicative only and should not be considered as being to scale or a guide to stack layout or configuration, number of bales suggested in a stack etc. They are for illustrative purposes only and should be treated as such. The terms length and width are used, but these are interchangeable, and **ALL** sides of a stack need to be considered.*	
1. Loose waste stacks: GENERAL wastes (typical max burn 950 °C), EXCLUDING plastics/rubber	
 **Max height (h) of stack = 4 metres**	Maximum height (h) of 4 metres is based on practical ability to fight fires using manual means such as standard hoses, and stability of stack to reduce the risk of fire spread from falling/rolling wastes.
 **Max width (w) stack = 20 metres (10 if access one side only)**	Maximum width (w) of 20 metres is based on practical ability to fight fires using manual means such as standard hoses. **NOTE** – 20 metres assumes good access from all sides of the stack to fight fires (minimum 5 metres). If this is not the case, then maximum width = **10 metres**.
 **Min ‘free-air’ separation distance between stacks (d) = See graph 1**	Separation distance will depend on stack length (or at their ends width – consider all sides of your stack) – the longer (or wider) the stack the wider the separation distance required. See graph 1, **blue** line to calculate separation distance for your stacks.

	**Alternative fire wall between stacks. Max stack width (w) = 10 metres**	Walls must be of suitable construction, and a minimum freeboard of **1 metre** left between waste and wall height to account for flame height. Stacks could be 'butt' against walls, but access to rear of stacks may be required for stock rotation and similar – this is a matter for site specific assessment. **NOTE** – access for fire-fighting will not be from both sides. This means maximum stack width = **10 metres**
Note: *Readers may look at the option above and ask: "Why would I do this as stack width is reduced to 10 metres and I might as well just have one 20-metre-wide stack". When considered as a fire wall between the length-sides of stacks this is a valid point. However, use of fire walls between the width-sides of stacks may have benefits. See the example stack layouts in section 6 below.*		
	**Min distance to buildings (d) = See graph 1**	Separation distance will depend on stack length (or at their ends width) – the longer the stack the wider the separation distance required. See graph 1, **red** line to calculate separation distance for your stack to buildings.
	**Alternative wall between stacks and buildings. Max stack width (w) = 10 metres**	Heat does not only travel horizontally. A wall height which is too low may result in heat radiated upwards and outwards travelling to an exposed upper portion of a building. Wall height should be sufficient to avoid this. A gap between wall and building should be left for general access. Unless this gap is substantive, access for fire-fighting will be from one side only and max stack width = **10 metres**.
Note: *Buildings can be on-site (such as a recycling plant waste hall) or off-site (such as a nearby industrial unit). The separation distances and/or fire wall information given above applies in both cases, including at site boundaries (heat does not stop at a site boundary).*		
	**Bunkered wastes. Max width (w) of bunker = 10 metres**	Maximum width (w) of bunkers = 10 metres (for reasons of practical fire-fighting as access is unlikely to be from both sides). Length of bunker is for site specific assessment based on stock rotation etc. A minimum of 1 metre freeboard should be left between waste and bunker height. **NOTE** - if open (length) side of bunker/s faces a building/other waste stack then see graph 1 for separation distance.

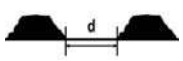
2. Baled waste stacks: GENERAL wastes (typical max burn 950 °C), EXCLUDING plastics/rubber		
	**Max height (h) = 4 metres or no more than four bales high, whichever is lower**	Maximum height (h) of 4 metres, or four bales high whichever is the lowest, is based on practical ability to fight fires using manual means such as standard hoses, and stability of bale stack to reduce the risk of fire spread from falling/rolling waste bales.
	**Max width of stack (w) = 20 metres (10 if access one side only)**	Maximum width (w) of 20 metres is based on practical ability to fight fires using manual means such as standard hoses. **NOTE** – 20 metres assumes good access from all sides of the stack to fight fires (minimum 5 metres). If this is not the case, then maximum width = **10 metres**. **NOTE** – within an individual bale stack gaps for access for stock rotation should be left between rows of bales. The gaps shown in the diagram left are illustrative only – you need to ensure adequate access, including use of forklifts or other plant for stock rotation
	**Min 'free-air' separation distance between stacks (d) = See graph 1**	Separation distance will depend on stack length (or at their ends width) – the longer the stack the wider the separation distance required. See graph 1, **brown** line to calculate separation distance for your stacks.
	**Alternative fire wall between stacks. Max stack width (w) = 10 metres**	Walls must be of suitable construction, and a minimum freeboard of **1 metre** left between waste and wall height to account for flame height. Stacks could be 'butt' against walls, but access to rear of stacks may be required for stock rotation and similar – this is a matter for site specific assessment. **NOTE** – access for fire-fighting will not be from both sides. This means maximum stack width = **10 metres**
Note: *Readers may look at the option above and ask: "Why would I do this as stack width is reduced to 10 metres and I might as well just have one 20-metre-wide stack". However, use of fire walls between stacks may have benefits. See the example stack layouts in section 6.*		

	**Min distance to buildings (d) = See graph 1**	Separation distance will depend on stack length – the longer the stack the wider the separation distance required. See graph 1, **purple** line to calculate separation distance for your bale stack to buildings.
	**Alternative wall between stacks and buildings. Max stack width (w) = 10 metres**	Heat does not only travel horizontally. A wall height which is too low may result in heat radiated upwards and outwards travelling to an exposed upper portion of a building. Wall height should be sufficient to avoid this. A gap between wall and building should be left for general access. Unless this gap is substantive, access for fire-fighting will be from one side only and max stack width = **10 metres**.
Note: *Buildings can be on-site (such as a recycling plant waste hall) or off-site (such as a nearby industrial unit). The separation distances and/or fire wall information given above applies in both cases, including at site boundaries (heat does not stop at a site boundary).*		
	**Bunkered wastes. Max width (w) of bunker = 10 metres**	Maximum width (w) of bunkers = 10 metres (for reasons of practical fire-fighting as access is unlikely to be from both sides). Length of bunker is for site specific assessment based on stock rotation etc. A minimum of 1 metre freeboard should be left between waste and bunker height. **NOTE** - if open (length) side of bunker/s faces a building/other waste stack then see graph 1 for separation distance.

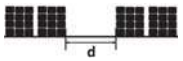
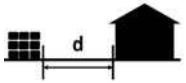
Graph 1. Stack lengths and separation distances GENERAL wastes (typical max burn 950 °C)



To determine your separation distance, mark your stack length on the horizontal axis of the graph and draw a line up to the relevant graph line (stack to stack, to buildings etc). Then draw a horizontal line across to the vertical axis and read-off separation distance. This can also be done in reverse. For example, at your site separation distance may be constrained by site size. This distance can be marked on the vertical axis and maximum stack length read-off on the horizontal axis (see section 6 on example stack layouts below for illustration of this use).

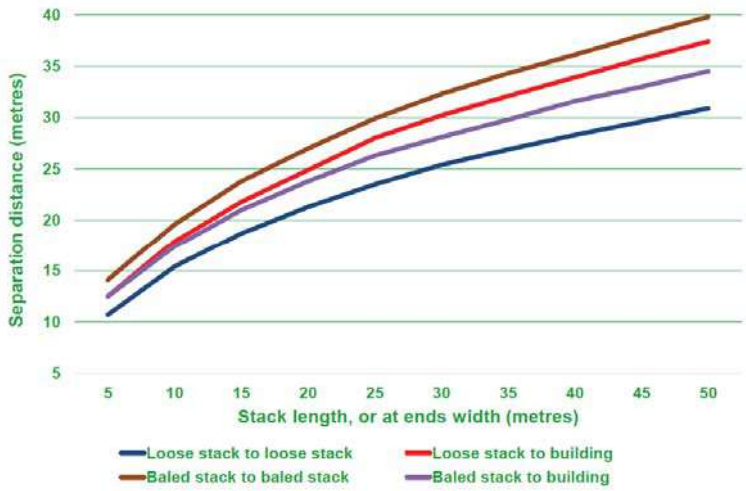
B. Plastics/rubber wastes (typical max burn 1,200 °C)	
The waste fire burn tests showed that burning plastic and rubber wastes have higher burn temperatures and thermal emissions. As a result, separation distances are wider than for general wastes. Graph 2 below note these wider distances. Other information, such as relating to fire walls/bunkers, stack width and height, as given for general combustible wastes, are the same and are not repeated below.	
Parameter and standard	**Commentary/rationale**
Note: *The graphics used below are indicative only and should not be considered as being to scale or a guide to stack layout or configuration, number of bales suggested in a stack etc. They are for illustrative purposes only and should be treated as such.*	
1. Loose waste stacks: Plastics/rubber wastes (typical max burn 1,200 °C)	
 **Min 'free-air' separation distance between stacks (d) = See graph 2**	Separation distance will depend on stack length (or at their ends width) – the longer the stack the wider the separation distance required. See graph 2, **blue** line to calculate separation distance for your stacks.
 **Min distance to buildings (d) = See graph 2**	Separation distance will depend on stack length (or at their ends width) – the longer the stack the wider the separation distance required. See graph 2, **red** line to calculate separation distance for your stack to buildings.
Note: *Buildings can be on-site (such as a recycling plant waste hall) or off-site (such as a nearby industrial unit). The separation distances and/or fire wall information given above applies in both cases, including at site boundaries (heat does not stop at a site boundary).*	

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2. Baled waste stacks: Plastics/rubber wastes (typical max burn 1,200 °C)	
 **Min 'free-air' separation distance between stacks (d) = See graph 2**	Separation distance will depend on stack length (or at their ends width) – the longer the stack the wider the separation distance required. See graph 2, **brown** line to calculate separation distance for your stacks.
 **Min distance to buildings (d) = See graph 2**	Separation distance will depend on stack length – the longer the stack the wider the separation distance required. See graph 2, **purple** line to calculate separation distance for your bale stack to buildings.
Note: *Buildings can be on-site (such as a recycling plant waste hall) or off-site (such as a nearby industrial unit). The separation distances and/or fire wall information given above applies in both cases, including at site boundaries (heat does not stop at a site boundary).*	

Note - wastes are variable. The data above, and in graph 2 below, for plastics and rubber wastes are based on wastes which are wholly or mainly plastics or rubber. Some of the waste types included in the general wastes section and graph 1 above will contain a proportion of plastics/rubber, such as SRF and RDF. However, the proportion of plastics/rubber in such wastes is typically limited. If your waste type is a mixture but contains a substantial proportion of plastics/rubbers you may want to consider using the data above as for plastic/rubber wastes, or you want to have your waste tested to determine its burn temperature and thermal heat emissions. The 2015 and 2016 waste burn tests were conducted on 13 different types of waste (see the non-technical summary of the tests in appendix 5). The wastes tested were selected to be the most typical, but your wastes may vary from those tested. If you do decide to have your waste tested, WISH would be grateful if you could provide the result to it for the benefit of the waste management industry and future revisions of this guidance.

Graph 2. Stack lengths and separation distances plastic/rubber wastes (typical max burn 1,200 °C)



To determine your separation distance, mark your stack length on the horizontal axis of the graph and draw a line up to the relevant graph line (stack to stack, to buildings etc). Then draw a horizontal line across to the vertical axis and read-off separation distance. This can also be done in reverse. For example, at your site separation distance may be constrained by site size. This distance can be marked on the vertical axis and maximum stack length read-off on the horizontal axis (see section 6 on example stack layouts below for illustration of this use).

7. Option 2: Bespoke separation distances and stack sizes

Note - this section covers bespoke options for sites with enhanced fire systems at external storage areas, and/or those operators who wish to have bespoke fire engineering calculations performed on their specific situation or wastes. Option 1 above covers standard stack sizes and separation distances for sites with only basic fire systems in place, such as hand-held extinguishers and standard hoses, and operators who do not wish to have bespoke fire engineering calculations performed.

7.1 Introduction to bespoke separation distances and stack sizes - option 2

This section considers the factors which may move a site from option 1 (standard sizes and separation distances) to option 2 (bespoke sizes and distances). Sun-section 7.2 covers enhanced fire-fighting provision which may move a site from option 1 to option 2. Sub-section 7.3 covers bespoke fire engineering calculations for those operators who wish to consider these.

In terms of physical fire-fighting improvements, this appendix restricts itself largely to the common configurations of external waste storage, such as open stacks and stacks with fire walls or in three-sided bunkers etc. It does not consider specialised systems, such as silo storage of wood chips, or rack storage of end of life vehicles. This type of specialised storage needs specific assessment. In the case of silo storage this may include fixed water deluge systems within the silo, activated by fire detection systems such as those which monitor for early-stage fire combustion products. If you have a specialised storage system you should consult with competent fire/risk engineers to decide upon the system you will need (see appendix 4 of this guidance for more information).

7.2 Potential factors for inclusion in bespoke options: Fire-fighting provision

To move away from the standard stack sizes and separation distances given in option 1 above, any additional fire-fighting provision should address one or more of the under-pinning considerations which led to the standard parameter being set. Look at the considerations in the sections on separation distances and stack dimensions of this appendix used to set the standard parameters in option 1. Any rationale to move away from these standard distances and dimensions in option 1 must be directed at these considerations to be valid.

For example, stack width and height in option 1 are based partially on practical fire-fighting considerations, in particular using standard fire hoses. To move away from option 1, any additional fire-fighting provision needs to be aimed, at the least, at these practical fire-fighting considerations.

Example: You may have a three-sided bunker at your site containing larger particle size combustible wastes in storage (if you have smaller particle size wastes practical fire-fighting would not be the only consideration – self-heating may also be an issue and in this case the example below may not be appropriate). Option 1 gives a maximum width ((w) in the diagrams in option 1 for bunkers) of 10 metres. This is based on the practical aspects of fighting a fire using standard hoses – a width of more than 10 metres may mean that water from a standard hose cannot reach the rear of the bunker effectively. To address this consideration, you could install a dry fixed water deluge system on the top of the walls of the bunker (pipework with spray heads directed into the bunker). This deluge being fed by a pipe which ends in a 'dry-riser' connection. In the event of a fire the FRS can connect their hoses to this dry riser and introduce water into the system, so allowing the application of water across the bunker area. This may overcome some of the practical restrictions of fighting the fire using standard hoses and allow you to increase the width of waste (w) in the bunker to beyond 10 metres.

However, the above example does not overcome potential water supply issues. The Fire and Rescue Services (FRS) may be able to 'plug-into' the dry-riser, but do they have sufficient water to sustain the effective use of the deluge over a period of time sufficient to fight a fire adequately? FRS fire tenders only carry limited amounts of water, which may run-out before a fire is extinguished or under control.

Example: To overcome this you may install your own on-site water supplies, such as a fire water tank and pumps, to feed your deluge system (or a lagoon with pumps). This would remove the need for the FRS to supply water. It would also allow a quicker application of water because the deluge could be activated using your water supply before the FRS arrive. You may decide on manual activation of this deluge system, such as a button located in a safe place which operative push to activate the system.

However, what if your site is not manned 24/7? If a fire occurs out of working hours no one will be there to operate the deluge (or any other system) manually.

Example: To address this you may decide to install fire detection at the bunker which would automatically activate the deluge. This is likely to be quicker than a manual activation, in particular if your site is not occupied 24/7 (manual activation obviously requires someone to activate the system).

The examples above tackle the under-pinning practical fire-fighting reasons for setting a 10-metre width as given in option 1. Having a deluge aims at the ability to place water over the area of a bunker, and not rely completely on the use of standard hoses. Having an adequate water supply to feed a deluge aims at the practical limitations of the volume of water the FRS can carry in their fire tenders. Having automatic activation of the deluge system from fire detection aims at the practical issue of how long the fire and rescue services may take to attend your site, and set-up, and that your operatives are not on a 24/7 dedicated fire-watch at the bunker.

The above are example of the types of systems and approach which may move a site away from the standard specifications in option 1. The degree to which a site can move away from option 1 is a matter for technical fire/risk engineering assessment and will depend on a range of factors such as combustible occupancy (in the above example - the wastes in the bunker), technical specification of the fire system chosen (in the above example a deluge system) and other factors. For most waste operators this is unlikely to be a process they can pursue without competent fire engineering advice.

Note - all fire systems, such as deluges, must be specified, designed, hydraulically balanced, installed and commissioned to appropriate fire/risk engineering standards, and suitable third-party approval may also be required. This is not a matter of purchasing a length of hose, putting some holes in it and attaching it to a bunker wall. See appendix4 of this guidance for more details.

Detection systems are mentioned briefly in the example above. Detection systems are not in common use at external waste storage areas. This is largely because many types of detector do not work that well in external environments. However, there are systems which do work in external environments and are in use at some waste management sites. Having a detection system may allow early warning of a fire, provided it is reliable and capable of detecting a fire effectively in an external environment. However, on its own having a detection system in place at external waste storage is unlikely to be a reason for a site moving from option 1 to option 2, unless they are used in combination with other measures such as automatic fixed fire suppression/extinguishing systems. Having early detection of a fire is one thing, being able to do anything about the fire once detected is another matter.

7.3 Potential factors for inclusion in bespoke options: Bespoke calculations

The data given in option 1 is partially based on the results of the WISH waste burn test and also includes an assumption on the ignition properties of waste based on other research (the 10 kW/m^2 figure used). If you believe that the burn properties of your waste/s when stored in your specific stack configuration or their ignition properties are different then you always have the option of having your own tests conducted. If you do decide to do your own testing you should consider all of the factors involved, including that small-scale laboratory type tests may not provide realistic data for real-life waste storage stacks (see non-technical summary of the waste burn trials in appendix 5).

One of the main reasons you may wish to conduct your own testing is that you may believe that your wastes differ in composition from those tested during the WISH waste burn tests, and therefore will have different burn properties. For example, in option 1 above SRF and RDF are included in the general waste category (maximum burn temperature of some 950 °C) rather than the plastics and rubber wastes category (maximum burn temperature of some 1,200 °C). This is because of the results of the waste burn trials. However, if your SRF, RDF or other waste mixture contains substantive proportions of plastics/rubber then its burn temperature may be higher.

In addition, there are various assumptions made in option 1, such as on building construction, orientation of stacks to stacks or to buildings, loose stack angle of repose etc. These assumptions have been made based on knowledge of typical waste sites and aimed at operators who do not wish to have bespoke calculations conducted and simply want a 'standard solution'. If you believe that your specific site situation is different you have the option of having specific bespoke fire engineering calculations conducted to give you bespoke separation distance information.

Note - such bespoke fire engineering calculations as noted above very likely need to be carried-out by a competent fire engineer. Not many waste operators will have the required competence to perform such calculations in-house.

However, you should consider this route carefully. Unless your site-specific issues, waste types and storage configurations etc are significantly different than those outlined in option 1 you could spend a lot of time, trouble and resource on bespoke calculations with little return.

WISH would appreciate that if you do conduct your own tests or have bespoke fire engineering calculations conducted that you provide the information to WISH – such data may benefit the wider waste industry and inform future revisions of this guidance.



From left: Water deluge head mounted above external waste storage bunker wall (example only – deluge etc systems can be mounted lower or direct on walls), camera-type detector in external use above a waste bunker, standard bale storage ('A' frames in place for use as fire walls as required)

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8. Examples of stack layout

8.1 Introduction and factors when planning stack layout

The graphics below are examples to illustrate how the stack dimensions and separation distances in option 1 above can be applied to stack layouts, including the use of fire walls/bunkers. The principles would also apply to option 2 bespoke dimensions and separation distances.

For reasons of simplicity only stack dimensions and separation distances are used in the graphics. However, there are other factors you may need to consider when deciding on your stack layout. These include the below (you should consider your specific site conditions):

- Location of potential ignition sources on your site
- Location/s of occupied buildings and high-asset value equipment and plant
- Escape and evacuation routes – must not be compromised by stack layout
- Location of flammable and/or hazardous substances kept on site, such as gas cylinder cages, diesel tanks, quarantine areas which may contain non-conforming wastes etc
- Locations of on or off-site fire hydrants, other water supplies and fire-fighting equipment – you do not want to block access to these with your stack layout
- Proximity and location/s of any infrastructure which may be affected by a fire, such as overhead power lines, major roads, rail lines etc
- Proximity and location/s of any off-site, third party buildings which may be affected by a fire
- Permitted amounts of wastes, and types of waste, allowed on site
- Provision of a 'quarantine' area, as appropriate to site specifics
- Operational practicalities such as movements of vehicles
- Stock rotation requirements, seasonality of supply/off-take etc

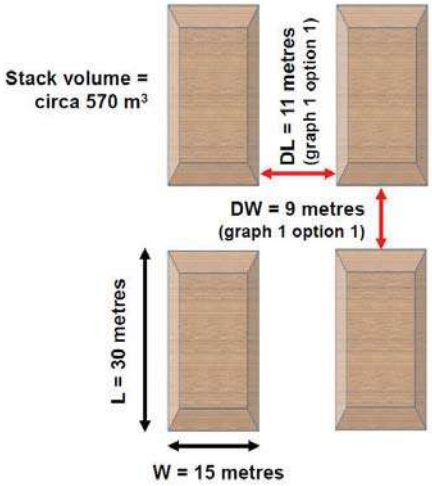
You are also likely to require a scale map of your site, and of the surrounding area (the one/s in your emergency response plan may be suitable).

Tip – you may want to cut-out 'shapes' from card or similar, representing items such as storage stacks (to scale). Plus, lengths of card representing separation distances etc (again to scale). You can move these around the map of your site to experiment with different layouts. Once you have settled on your layout you may also want to mark stack boundaries on the ground, such as with yellow road markings or similar, as an aid to operatives, and so you can see easily your storage plan is being obeyed.

Once you have decided on your storage stack layout you should record this and review it if anything changes. You should also induct your employees on your plan.

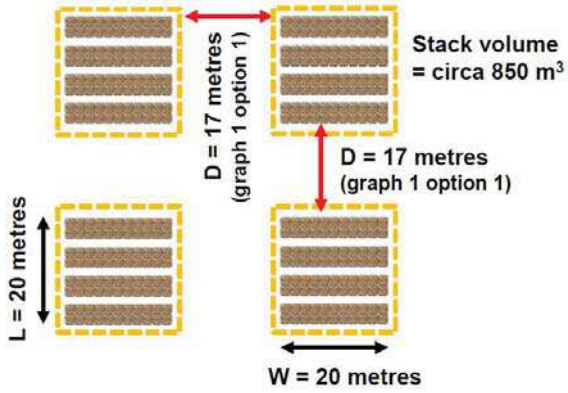
8.2 Examples of stack layout

A. Simple loose stack layout, pre-crush wood using free-air separation distances



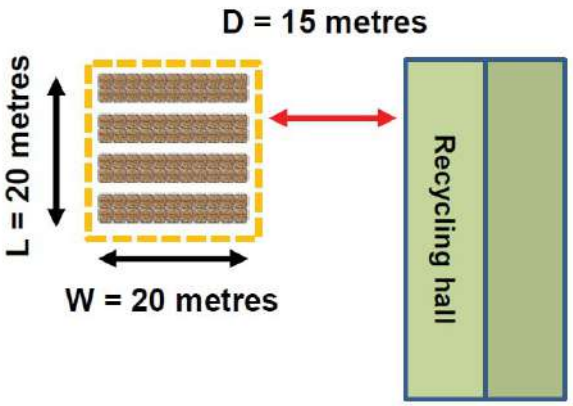
This example is pre-crush wood stored in loose stacks with free-air separation distances used to mitigate fire spread. Each stack is 30 metres long and 15 metres wide. As wood is a general waste for purposes of option 1, using graph 1 blue line (loose stack to loose stack distances) gives a separation distance on the length side of each stack of 11 metres (DL) and on the width side of 9 metres (DW). Each stack has a volume of circa 570 m^3, with total volume across all four stacks shown of circa 2,280 m^3 (equivalent to circa 450 – 500 tonnes density dependent). **NOTE: BOTH** length and width sides of stack considered.

B. Simple bale stack layout, baled paper/card using free-air separation distances



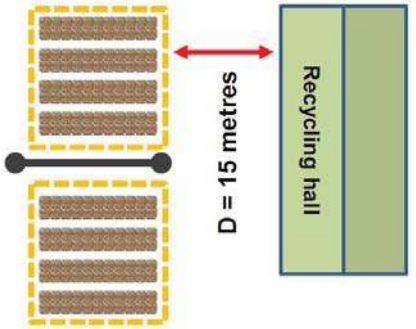
This is similar to above but using paper/card bales (each individual stack of rows of bales demarked by amber dotted line). These are general wastes, so graph 1 applies. Stacks are 20 metres square, giving a separation distance from the brown line in graph 1 of 17 metres each side. Excluding the gaps between bale lines for access, stack volume is circa 850 m^3, with a total volume across all four stacks of circa 3,400 m^3.

C. Example of restricted separation distance determining stack dimension



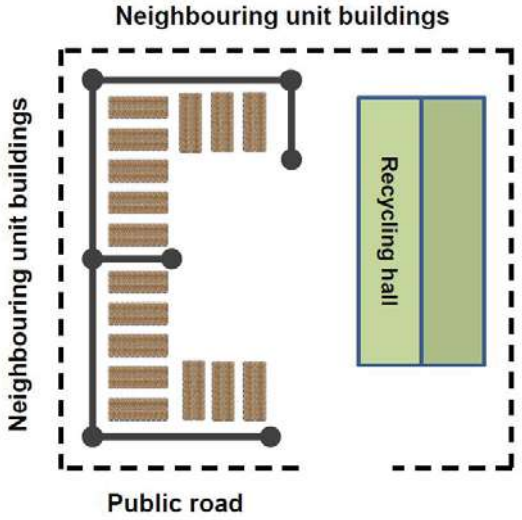
Limited space at this site means the maximum separation distance which can be achieved between recycling building and stack is 15 metres (D in graphic). Using paper/card bales as for example B above, graph 1 purple line gives a maximum stack length of 20 metres (mark 15 metres on the vertical axis of graph 1, draw a horizontal line across to the purple line, and then a vertical line down, giving stack length at some 20 metres). This is an example of a reverse use of the data in graphs 1 and 2.

D. Use of a single fire wall to extend storage capacity



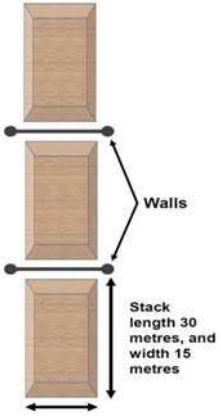
This is the same as C above, but the operator wishes to increase overall storage capacity in a limited space. Adding an appropriate fire wall as shown removes the need for a free-air gap at the width ends of the bale stacks. Each stack still has a length of 20 metres, and is still in line with graph 1, because the separation distance is determined by the burn-face of each of the stacks. Obviously, the integrity of the fire wall is critical – if it fails to prevent fire spread and both stacks ignite then overall burn face will be 40 metres, which would require a wider separation distance. Note – maintaining the 20-metre width of stacks in this example assumes good access for fire-fighting from both sides of stacks.

E. Use of a bunkers/fire walls to extend storage with buildings at site boundary



All of the above examples assume there is nothing at the site boundary. This example is the same site as example D above but assumes the waste site is on an industrial estate and has neighbouring industrial unit buildings close to its site boundary. Installation of additional walls to form bunkers around the storage stacks provides protection for these neighbouring units without free-air separation distances (a reasonable level of stand-off is still required). However, because access for fire-fighting is not available from both sides, stack width is decreased to 10 metres. In this example, extending the walls has allowed the operator to reduce the loss of overall site storage capacity to only circa 12% compared to the capacity of example D above.

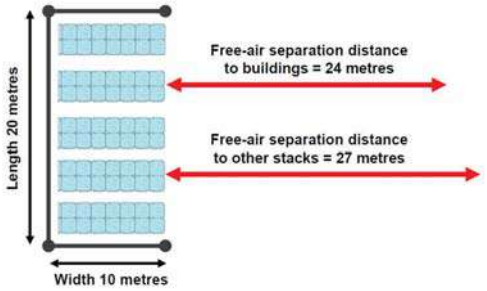
F. Use of fire walls with loose stacks



The use of fire walls is not restricted to bale stacks. This example shows a loose stack layout using fire walls to remove the need for free-air separation distances at the width ends of the stack. Assuming good access for fire-fighting is available from both sides stack width is not affected (shown at 15 metres but could be the 20-metre maximum). This type of 'sausage link' layout may be suitable for 'long and thin' waste sites and allows space to be maximised.

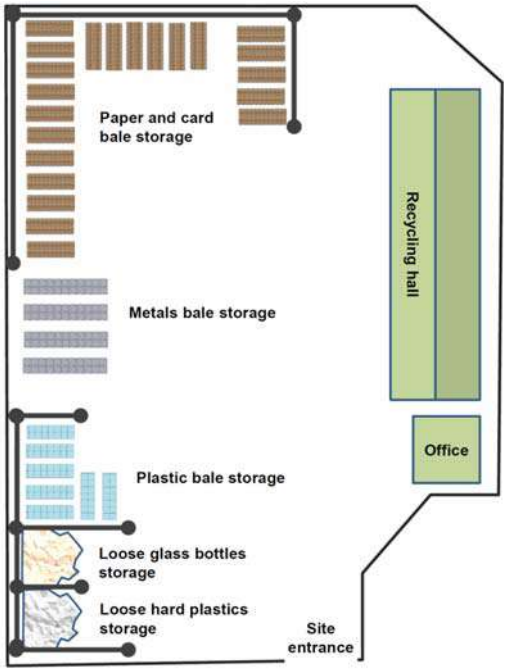
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G. Plastic and rubber wastes



All of the above examples are for general wastes. For plastics and rubber wastes free-air separation distances are wider because of their higher burn temperatures (see graph 2 option 1 above). Use of bunkers is likely the practical option with this type of waste, such as the example of baled plastics shown here. However, an appropriate free air separation distance still needs to be left at the open side of the bunker (from graph 2 using stack dimensions shown).

H. Overall site storage example



For more complex sites overall site storage layout will require careful thought, either to be in line with the standards in option 1, or any bespoke solutions under option 2. The layout shown here simply an example, however: Paper and board bales are partially bunkered to preserve separation distances, but not on one side as distance is not an issue to the bunkered baled plastics bunker or baled metals, which are themselves not bunkered. Plastics bales are bunkered, with adequate free separation distance at the open side of the bunker. Loose glass (non-combustible), stored in a bunker for non-fire reasons has been placed between the plastic bales bunker and loose plastics bunker as a further precaution.

Appendix 2: Producing an accident/emergency plan

1.1 Accident/emergency plans are about how you plan for a disaster, such as a fire, and are aimed at reducing its potential effects. Potential effects could be to human health and safety, your buildings and/or plant, the environment, neighbouring premises and members of the public etc. All waste sites should have accident/emergency plans (often aimed at various potential types of disaster). Some organisations may want to go further than accident/emergency planning into disaster recovery and business continuity planning, but these topics are outside of the scope of this guidance. Accident/emergency plans are nearly always a requirement of environmental permits/waste management licences. Some environmental regulators have also produced guidance on emergency plans and response, and you should be familiar with any such relevant to your site.

1.2 Although you are responsible for producing the accident/emergency plan for your site, liaison with your local Fire and Rescue Service (FRS) and environmental regulator is recommended, as it will assist the FRS and environmental regulator with managing the risk in their area, enabling them to respond more effectively should a fire occur.

1.3 Larger waste fires tend to result in a 'multi-agency' approach – in addition to the FRS and your environmental regulator you are also likely to have the police on site and potentially other agencies such as those concerned with public health. You should anticipate this and tailor your emergency response accordingly. For example, how would you co-ordinate communications during a major incident between multiple agencies?

1.4 Your insurer is also likely to be interested in your plan, in particular property damage, disaster recovery and business continuity aspects. Consider discussing your emergency plan with your insurer, who may have relevant advice to give.

1.5 The effectiveness of your plan will depend on how well you train your staff. All staff and contractors working on-site must be aware of your plan and what they must do during a fire. You should have regular exercises (drills) to test how well your plan works and that staff understand what to do. There is little point in having a good quality emergency plan if no one has read and understood it.

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1.6 Your plan should be available electronically and in hard copy**.** Give careful thought to where your plan is located. Employees need to have access, but the FRS also need to have access during an emergency. Many sites place copies of their plan in an 'emergency services information box' (also called a premises information box) located at the site entrance or similar so that the FRS can access the plan out of hours in an emergency. In the end, it is no use having a good plan in place if it is in the burning building and cannot be accessed.

Tip – an increasing number of Fire and Rescue Services (FRS) vehicles have on-board computers. If you lodge an electronic copy of your emergency plan with your local FRS, then they will be able to access your plan on the way to your site. Contact your local FRS and ask about this.

2. Content of your plan

2.1 The content of accident/emergency plans may differ, but should at the least include:

- Communication arrangements, such as named emergency contacts, key holders, incident controllers etc with their telephone numbers and likely response time (for out of hours)
- Communications arrangements with neighbours/nearby premises which may be affected
- Hazardous and combustible materials on site, including wastes, including locations, amounts, hazardous properties and other details - locations should be marked on your site map
- Specific hazards, such as gas cylinders, fuel stores etc – again mark on your site map
- Normal number of people working on site and usual hours of work
- Fire-fighting equipment on site (and off as relevant) and where this is located, such as location of fire hydrants, fire extinguishers, hoses, drench systems the Fire and Rescue Services (FRS) can plug-into via dry risers (and location of these risers) etc
- Location/s and detail of any fixed fire systems on site, such as sprinklers and water deluges, including locations of any external activation points for such systems
- Any other equipment on site which may be of use during a fire, such as heavy mobile plant which could be used to assist the FRS
- Any specific environmental issues, such as drainage issues for firewater, protected habitats neighbouring the site, aquifers underlying the site etc
- The procedures, such as evacuation, taking a role call after evacuation, fire-fighting and summoning the FRS, which employees and others on site must follow in the event of a fire. This must include the period before the FRS arrives
- Outside of issues such as how to call the FRS, these procedures should also include

    - Incident controller identification – who will be your main point of contact with the FRS and how are they identified?

- Procedures to ensure access is clear for FRS vehicles
- Communication of life-safety issues, such as any persons missing following a role call after evacuation has occurred
- Use of pollution control equipment to block drains and/or divert firewater to a containment area and/or operate any pollution control facilities, such as drain closure valves/or penstocks
- Processes outside of the normal, such as using soils to cover fires, removing un-burnt materials with mobile plant, re-circulating firewater to reduce run-off etc
- Processes relating to isolation of utilities connections such as gas and electricity

2.2 If you expect your employees to fight a fire until the FRS arrives then they must be trained to do so and any fire-fighting by site employees must not be to the risk of their health and safety.

2.3 As part of your accident/emergency plan you should have a map of your site showing at least:

- Layout of buildings (externally and internally, including fire exits and other access points)
- The above should include locations of storage bunkers, fire walls and other similar features
- Location of all stored wastes (externally and internally stored), what these wastes are, how much is in each storage area typically etc, and noting any specific wastes which may pose specific hazards such as plastics and rubber wastes
- Location of your quarantine area, as applicable
- Any locations where hazardous materials are stored on site (location of gas cylinders, process areas, chemicals, stacks of combustible materials, oil and fuel tanks etc)
- Main access routes for fire engines and others and any alternative accesses
- Access points around the site perimeter to assist fire fighting
- Location of hydrants (on and off site) and water supplies, including lagoons, water tanks etc
- Location of fire extinguishers, hoses and other fire-fighting equipment on site
- Any watercourse, borehole, or well located within or near the site
- Areas of natural and unmade ground
- Location and layout of fixed plant (such as recycling plant and equipment), and where mobile plant is usually parked out of normal work hours
- Location of protective clothing and pollution control equipment and materials
- Drainage systems, including foul and surface water drains, and their direction of flow and outfall points
- Location of drain covers, and any pollution control features such as drain closure valves/penstocks and firewater containment systems
- Location of utilities isolation points, such as for gas, electricity and water

- Location of any nearby sensitive receptors, such as schools, hospitals, residential, care and nursing homes etc, plus any protected habitats, water boreholes, wells and springs etc used for drinking water etc
- Location of any specifically hazardous off-site facilities, such as a gas storage yard next to your site, or another waste management site which a fire could spread to
- Location of any infrastructure which may be affected by a fire such a major road, rail lines, overhead power lines etc (note for this and the above off-site items a separate map of a different scale may be useful)

2.4 Your plan should also detail disaster recovery measures as appropriate including:

- Communications with customers and similar to stop wastes continuing to arrive at site during, and if the site is damaged to the extent it will not reopen quickly, after a fire
- The removal of burnt material using appropriate and lawful disposal – you will need to consult with your environmental regulator to ensure this
- The safe re-commission of plant
- Salvage operations

2.5 Following any fire your accident/emergency plan (and overall fire management measures) should be reviewed and improved as required.

2.6 It is not the intent of this guidance to be the comprehensive guide to accident/emergency planning and you should seek competent advice as to the detail content of your plan. Guidance is also available from various sources, such as the Environment Agency (and other environmental regulators), your local FRS and the Health and Safety Executive.

Tip – involve your local FRS in the production of your plan, or at least lodge a copy with them. Inviting your local FRS to your site so that they can familiarise themselves with site access, location of fire-fighting equipment, water sources etc and include this in their own plan for the site can also be of benefit – if your local FRS is familiar with your site this could save vital minutes should you have a fire.

Appendix 3: Checklists

The checklists below are not comprehensive, but they will allow you to make an outline assessment of your fire management. If you have any specific issues relating to your site, you should consider these in addition to the below. The below may be adequate for a small site, but for larger and more complex sites greater depth is very likely to be required, although the below can be used as baseline to start from. If you answer 'yes' to a question, then you may want to add detail in the 'comments and actions' column. If you answer 'no' to a question you should at least note in the 'comments and actions' column why, and preferably add actions to remedy the situation.

Note – alongside each individual table heading a reference to the relevant part of this guidance is given. You should complete the checklist with reference to these relevant sections to ensure you capture and consider all the detail required.

Issue/consideration	Yes / No	Your comments and actions
Basics: Advice and consultation (sections 1.3, 1.4 and 1.6)		
Do you have access to competent advice on fire management, fire risk assessment and plans, and if so who?		
Have you searched to ensure you are aware of and have seen relevant guidance on fire management for your site?		
Are any standards set in your environmental permit / license / exemption relating to fire management?		
Have you consulted with your local Fire and Rescue Services (FRS) on your site fire management and plans?		
Have you consulted with your environmental regulator on your site fire management and plan/s?		
Have you consulted with your property and business interruption insurer on your site fire management, plan/s?		
Has the advice of your environmental regulators, FRS and insurer been included in your fire management plan/s?		

Basics: Assessments and plans (section 1.5)		
Do you have in place a fire risk assessment for your site, including identification of ignition sources and fuels/combustible materials?		
Does your assessment, and the plan/s based on this, include protection of human life issues (life-safety)?		
Does your assessment, and the plan/s based on this, include protection of the environment?		
Does your assessment, and the plan/s based on this, include protection of your assets, property and plant?		
From this fire risk assessment have you produced and put in place a written plan/s to control fire risk?		
Does your plan/s include physical aspects such as fire-fighting equipment and procedural such as instructions to employees?		
Does your plan/s take account of the likely fire-fighting strategy your local FRS may take should a fire occur on your site?		
Have you reviewed your plan/s to take account of your consideration and actions from this checklist?		
Have you included non-waste facilities such as site welfare facilities and offices in your plan/s?		
Have you included fuels and ignition sources outside the scope of this guidance (derv tanks, gas cylinder stores etc) in your plan/s?		
Whole site considerations: Location and neighbouring premises (section 2.2)		
Are there sensitive receptors (infrastructure, schools, hospitals, care homes, water sources etc) which could be affected by a fire?		
If yes, have you considered these in your plan/s? Does your plan/s include off-site and well as on-site risks?		
Could a fire at your site have a catastrophic effect on a neighbouring site, such as a gas storage yard or similar hazardous installation?		

Could a fire at a neighbouring site (such as petrol stations, gas storage facilities etc) have a catastrophic effect on your site?		
If yes, have you liaised with your neighbour/s to ensure your and their plans account for this, including communication issues?		
Do you know what the likely response time for your local Fire and Rescue Services will be to attend a fire at your site?		
If your local FRS would be unable to attend your site quickly, have you accounted for this in your plans?		
Whole site considerations – general ignition sources and precautions (sections 2.3, 2.4 and 2.7)		
Have you identified all potential ignition sources/causes of fire at your site and included these in your plan/s?		
Have you included general ignition sources such as lighting, heating etc in your plan/s?		
Have you banned smoking on site and/or provided smoking areas away from combustible materials – and do you enforce this?		
Do you conduct appropriate routine testing of electrical equipment, both fixed systems and portable (PAT testing) equipment?		
Do you have adequate security arrangements (including out of hours) to reduce the risk of arson/vandalism?		
Have you considered a formal site close-down procedure to detect smoulders which may result in a fire after work has ceased?		
Do you have a housekeeping regime in place aimed at minimising litter, dusts, loose paper/fibres etc?		
Do you have appropriate storage facilities for hazardous materials such as paints, solvents, derv etc?		
Are the means of escape from buildings and from your site in adequate – do you have adequate fire escape provision?		
Have your employees been inducted on the fire precautions at your site, including emergency actions and escape?		

Have your employees been trained in the use of fire suppression equipment such as hoses and extinguishers?		
Do you include fire precautions in your site rules used with contractors, visitors, third party lorry drivers etc?		
Whole site considerations – heavy mobile plant and vehicles (section 2.5)		
Do you instruct plant operators/vehicle drivers to clear combustible materials from around exhausts etc at the end of each shift?		
Are your mobile plant/vehicles at least equipped with hand-held fire extinguishers?		
Are your mobile plant/vehicles equipped with automatic and built-in fire extinguishing systems?		
Do you maintain your heavy mobile plant/vehicles to prevent electrical faults and similar potential causes of fires?		
Do you park mobile plant/vehicles away from waste storage, reception and other waste areas after use?		
Have you considered the role mobile plant can play fighting fires, such as moving wastes away to prevent fire spread?		
If yes, have you trained your employees in the use of heavy mobile plant to fight fires?		
Whole site considerations – hot works (welding, grinding, cutting etc) (section 2.6)		
Do you have appropriate controls in place to minimise the fire risks of hot work (including permit to work systems)?		
Do these include the provision of extinguishers and/or hoses at the scene of any hot work?		
Do these include an instruction that all hot works are a two-person task (one watching and one doing)?		
Do you conduct a fire watch at least 2 hours (or longer as appropriate – some insurers require 4 hours) after hot works?		

Whole site considerations – water supplies (section 2.8)		
Have you assessed the water supply to your site relative to your potential fire risk – and is it adequate?		
Do you know where the nearest public fire hydrant to your site is – and is this in your emergency plan?		
If the nearest public hydrant is >100 metres away have you considered an on-site hydrant?		
Have you considered potential alternative water supplies such as lakes, lagoons, rivers etc in your plans?		
Have you considered the installation of on-site water tanks and mains to feed fire systems?		
If you have sprinkler, deluge etc systems in place have you gained advice to ensure your water supply is adequate to feed them?		
Have you discussed water supplies with your local FRS, and your environmental regulator?		
Whole site considerations – fire water and fire waste (section 2.9)		
Do you have a drainage plan for your site which identifies all places contaminated fire water may run to?		
Have you included the potential environmental effects of contaminated fire water run-off in your plans?		
Do you need to put in place containment systems to prevent contaminated fire water escape?		
Have you considered ways to reduce the amount of fire water which may be produced in the event of a fire?		
Have you considered in your plans how you would dispose of fire water and/or burnt materials which may remain after a fire?		
Have you consulted with your local FRS and environmental regulator on contaminated fire water issues?		

Whole site considerations – non-waste facilities (section 2.11)		
Have you included non-waste facilities (offices, welfare facilities, weighbridge cabins etc) in your plans?		
Are external waste storage stacks the distances given in appendix 1 (or otherwise protected) from offices, welfare facilities etc?		
Whole site considerations – fire appliance access (section 2.12)		
Have you assessed your site to ensure that FRS vehicles can access it easily (all access points)?		
Have you assessed your site to ensure that FRS vehicles can move around your site easily?		
Do these assessments include access widths, weight and heights of FRS fire tenders and vehicles?		
Are there any obvious issues with access to and around your site, such as overhead power lines, bridges etc?		
Whole site considerations – communications, training and drills (section 2.13)		
Are all of your employees trained in your fire plan/s and do they know what to do in the event of a fire?		
Do you test your emergency response (evacuation etc) frequently (fire drills etc), including with your local FRS as practical?		
Do you use toolbox talks and other communications tools to ensure your employees are aware and reminded on fire risks?		
Waste reception – hot/hazardous/flammable loads (section 3.1)		
Have you included specific issues relating to waste reception and reception areas in your plans?		
Does this include the potential for hot loads and/or hazardous materials in loads which may cause a fire?		
Have you put in place controls such as fire watch at the end of the day, not accepting high risk loads at the end of the day etc?		

Have you instructed and trained your employees to be on the look-out for hot loads and hazardous items?		
Waste reception – management (sections 3.2 and 3,3)		
Have you considered the potential for a fire to spread from your reception into other parts of your site/buildings?		
Have you considered the protection of any plant (such as shredders) located direct in your reception area/s?		
Have you considered abnormal situations in your plan/s and any additional precautions you will take in such situations?		
Have you determined the maximum safe amount of waste you can have in your reception area/s at any one time?		
Do you have a management system to ensure these maximum safe amounts are not exceeded?		
Did your consideration of maximum safe amounts in reception include any environmental permit/licence limits?		
Waste treatment/processing – general considerations and detection (section 4.1)		
Does your assessment include general plant/equipment fire risks such as direct heat and electrical and mechanical faults?		
Do you have an adequate maintenance programme in place to reduce the ignition risk posed by electrical and mechanical faults?		
Do you have housekeeping regime in place to remove dust and loose materials from motors and other potential ignition sources?		
Waste treatment/processing – specific items of equipment considerations (sections 4.2 – 4.8)		
Have you considered fitting fire suppression to shredders, bag openers etc which may pose a friction/spark risk of ignition?		
Screens and trommels can provide air to a smoulder resulting in a fire – have you considered fire suppression at screens/trommels?		

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Conveyors/other mechanical handling equipment can spread a fire rapidly. Does your plant shut-down in the event of a fire detection?		
Have you considered slip-sensors on conveyors to detect potential friction and heating issues from this?		
For de-dusting systems and cyclones etc have you considered dust explosion issues?		
For de-dusting and cyclones etc have you had a DSEAR assessment completed and as required zoned such areas?		
Where de-dusting and cyclone etc have been assessed as being 'zoned' have you put in place appropriate precautions?		
Have you included specialised items of equipment, such as optical sorting systems, eddy-current devices etc, in your assessment?		
Are your mains/electrical plant rooms enclosed and appropriately constructed?		
Have you provided suitable fire detection and fighting equipment in mains/electrical plant rooms?		
Are control panels either in enclosed rooms or suitably protected from dust ingress?		
Have you included the risks posed by hydraulic systems (including fire spread should hydraulic fluid escape) in your assessment?		
Have you considered fire suppression such as sprinklers or similar at hydraulic power packs?		
For balers, are baler operative working platforms and areas out of the path of any potential 'blast' from gas cylinders etc?		
Have you considered gantry level sprinklers or similar at picking cabins above bunkers which may contain combustible wastes?		
Does your picking cabin/s or other workstations have manual fire alarm points and extinguishers at the least?		
Is fire escape from your picking cabin/s or other workstations easy, well-marked, lit and clearly understood by your employees?		

Waste treatment/processing – protection of plant and equipment (sections 4.9 – 4.11)		
Have you considered if a fire in waste reception or storage could spread to your plant? What have you done to protect your plant?		
Have you considered if a fire in your plant could spread to reception or storage areas? If so, what have you done?		
Have you considered a formal plant close-down procedure including running the plant to clear excess wastes, at the end of the day?		
Have you considered a fire watch at the end of the day to detect any smoulders which may result in a fire?		
Waste storage (internal and external) - general considerations – capacity (section 5.2)		
Have you determined what your site's overall maximum safe waste storage capacity is?		
Have you split this into safe storage capacities for different wastes types, different storage areas etc?		
Have you included issues such as seasonal variations and marketplace variations in your considerations?		
Have you included consideration of any higher-risk wastes in your storage capacity considerations?		
Have you included any environmental permit/licence standards in your storage capacity considerations?		
Have you a management system in place to ensure that you do not exceed your maximum safe storage capacity/ies?		
Waste storage (internal and external) – use of bunkers and fire walls (section 5.3)		
Are any bunkers/fire walls you use in storage adequate in terms of the fire spread protection they provide?		
Are any bunkers/fire walls you use in storage adequate in terms of their robustness and resistance to damage?		
Do you inspect any bunkers/fire walls routinely to check for damage, cracks, holes etc which may reduce their effectiveness?		

Does your stock rotation include removing wastes from the back of bunkers etc to prevent older wastes building-up?		
Do you have procedures and rules in place to ensure wastes are not stored beyond bunker capacity (height including freeboard and spill)?		
If you use bales of metals as a fire break, have you considered their effectiveness with higher-risk wastes such as plastics/rubbers?		
Waste storage (internal and external) – self-combustion and storage times (section 5.4)		
Have you considered whether the wastes you store may self-heat and pose a self-combustion risk?		
Have you set maximum storage times for wastes which may pose a self-combustion risk?		
Are the maximum storage times you have decided on in line with the times in this guidance?		
Do you have a management system to ensure wastes are not stored longer than maximum, and if they are what action you take?		
Does this management system include the rotation of stock to ensure that older stock is transported off site before newer stock?		
If you break bales or turn stacks as a control for self-heating, do you have controls in place to prevent ignition during these tasks?		
Have you considered monitoring of temperature in loose wastes stored externally, such as by using a temperature probe?		
Waste storage – external storage areas – general considerations (sections 6.2 and 6.3)		
Do you inspect your external waste stacks routinely to detect potential fire risks and ignition sources?		
Have you considered more frequent inspections during times of higher risk for vandalism etc, such as holiday periods?		
Have you considered fire detection and/or suppression/extinguishing systems at external storage stacks?		

Waste storage – external storage areas – stacks sizes and separation distances (appendix 1)		
Do you have an external storage plan which includes maximum amounts of waste to be stored in any one area?		
Do you have a management system in place to ensure maximum stack sizes and minimum separation distances are complied with?		
Have you read and understood the two options given in appendix 1 of this guidance, and decided which applies to your site?		
If you have decided option 1 given in appendix 1 of this guidance applies, why is this the case?		
If you have decided option 2 given in appendix 1 of this guidance applies, why is this the case?		
If option 1 applies, have you produced a storage plan which complies with separation distances/bunker specifications given in appendix 1?		
If option 2 applies, have you produced a storage plan which gives its own bespoke separation distances/bunker specifications?		
If option 1 applies, have you produced a storage plan which complies with stack dimension information given in appendix 1?		
If option 2 applies, have you produced a storage plan which gives its own bespoke stack dimension information?		
Does your plan (either option 1 or 2) include safe access for fire-fighting purposes?		
Does your external storage plan include all of the factors relating to layout given in appendix 1, section 6.1 of this guidance?		
Waste storage – internal storage areas – general considerations (section 7.1)		
Do you have an internal storage plan which includes maximum amounts of waste to be stored in any one area?		
Do you have a management system in place to ensure maximum storage capacity/ies are complied with?		

As part of this plan, have you considered the advantages and disadvantages of internal storage given in section 7.1?		
If you store higher-risk wastes such as plastics and rubber internally, have you considered risks and controls carefully?		
Have you sought advice (such as from your insurer) on the protection of buildings from fires in internally stored waste stacks?		
Waste storage – internal storage areas – separation distances, stack sizes and bunkers (section 7.2)		
Have you considered the separation distances/fire wall use issues in appendix 1 and applied these to your internal storage?		
Have you considered the stack size information in appendix 1 and applied this to your internal storage		
Fire detection, alarm and suppression/extinguishing systems (appendix 4)		
Have you considered fire detection, alarm and suppression/extinguishing systems at your waste reception?		
Have you considered fire detection, alarm and suppression/extinguishing systems at your waste processing area?		
Have you considered fire detection, alarm and suppression/extinguishing systems at your waste storage area/s?		
Where you fitted such systems, have you considered the design and specification issues in section 1 of appendix 4?		
Is your fire detection system reliable, robust and effective (see section 2 of appendix 4)		
Is your fire alarm system reliable, robust, clear and effective (see section 3 of appendix 4)		
Have you assessed your fire suppression/extinguishing systems against the issues in section 4 of appendix 4?		
Is your water supply adequate for your fire suppression/extinguishing systems, fire hoses etc (see section 5 of appendix 4)		

Have you considered plant control system interactions between your fire detection and plant systems?		
Have your fire suppression/extinguishing systems, site hydrants, hoses etc been commissioned to your insurer's requirements?		
Are your fire suppression/extinguishing systems, site hydrants, hoses etc tested and checked routinely to your insurer's requirements?		
Emergency/accident plan (appendix 5)		
Does your site accident/emergency plan include all of the issues listed in section 2.1 of appendix 3 of this guidance?		
Do the maps/plans accompanying your emergency plan include all of the issues listed in section 2.3 of appendix 3?		
Have you consulted on your accident/emergency plan with your local Fire and Rescue Services?		
Have you consulted on your accident/emergency plan with your environmental regulator?		
Have you consulted on your accident/emergency (and disaster recovery) plan with your insurer?		
Have you trained-out your accident/emergency plan to all of your employees – are they clear what to do in an emergency?		
Is a copy of your emergency plan posted in an obvious (and secure) location at your site entrance?		
Have you provided a copy of your accident/emergency plan to your local Fire and Rescue Services?		
Do you review your accident/emergency plan at least once a year to ensure it is up to date?		

Appendix 4: Fire/risk engineering for waste management plants/sites: Detection, alarm and suppression/extinguishing systems

Introduction

Note – this appendix covers a wide range of technical issues, many of which are likely not relevant to smaller waste management operations. However, some of the principles may still apply. Treat this appendix as a basic guide to fixed fire systems, and issues with these in waste management use.

Even the smallest waste management site is likely to require some basic form of fire detection, alarm and/or extinguishing/suppression, such as standard fire hoses, or at least quick access to a good water supply such as a public hydrant. The larger and more complex a site/plant is, the more complex and comprehensive the fire strategy and planning required. As a result, the more likely that more advanced fire systems may be required, such as sprinklers, deluge systems, water monitors, complex detection systems and similar. For very large and complex plants multiple systems are likely.

You may already have some fire systems in place at your site. However, what is acceptable to regulators and insurers has changed significantly over recent years and continues to change. A small open-air civic amenity/HWRC site is still very unlikely to require sophisticated fire systems, but increasingly these are being required at even fairly basic transfer and recycling/recovery sites, and for large and complex plants higher standards are very likely to be expected.

There are various reasons behind this shift. The industry's fire record is an obvious driver, which has led to an increasing focus by regulators and the imposition of tougher guidance on the application and enforcement of fires issues in permitted activities. One of the other main drivers is asset protection and insurance. Waste management is not a popular industry for property insurers because of fire risk, and the standards being required by insurers are increasing. Your insurer is a key stakeholder: Waste management companies which fail to satisfy their insurers are likely to find insurance increasingly difficult and costly to obtain. Insurability to one side, if you have invested significant funds in a complex recycling, recovery or similar plant it makes good business sense to protect your investment.

All of the above means that waste management operators are increasingly having to consider technical fire/risk engineering – a specialised and complex discipline. Unless you work for a very large company with its own in-house competent fire engineer, you are likely to need an external competent advisor to help you identify what type, specification and design of detection, alarm and extinguishing/suppression system/s would be effective and practical.

- As a waste operator, you do not need to be a fire/risk engineer, but the more you know about the principles the more likely it is that you will end-up with systems which are effective and match your needs. This is the same as if you were purchasing a new loading shovel. Simply asking a supplier for a loading shovel is not enough. What size, what wastes will it handle and how, what attachments are required, are there any site restrictions relevant, what controls will I need to have in place when using it etc? Just asking a fire consultant/supplier for a sprinkler system without having an ongoing engagement with them risks you ending-up with a system which may be ineffective or does not fit with your needs
- Waste management sites are not warehouses, offices or shops. Wastes are not standard stored products. Applying standard fire systems to waste management sites/plants risks any system fitted being ineffective in the event of a fire
- Knowledge on how wastes burn, and which types and specifications of fire systems are effective with waste fires, is a rapidly developing area. What was acceptable five years ago is unlikely to be acceptable today. You may be able to identify fire engineering guidance and standards which apply to your waste management operations, but you must also ensure that these are up to date and still relevant. The rapid development of understanding in this area means that standards based on older assumptions may no longer be considered valid

This appendix is not comprehensive and will not make you a fire/risk engineering expert, and it is not intended to be a technical document or provide all of the information you may need to ensure your fire systems are adequate. It does intend to give you a basic level of information on some of the issues involved. You should always seek competent advice and assure yourself that your systems are effective, appropriate and that they will work in the event of a fire.

Tip – many larger insurance companies and insurance brokers have in-house fire/risk engineers. You should liaise with your insurer to gain access to this advice, and to ensure that any fire systems you install are to your insurer's requirements. What you do not want to do is to install an expensive system to find-out that your insurer will not accept it and that further systems and/or work is required.

Note – while your insurer may be a critical stakeholder, there are others. Environmental regulators will also have requirements, as will your local fire and rescue services (FRS). You will need to satisfy all of these stakeholders and accept at times that they may have differing priorities, standards and requirements. Your insurer may be a good place to start, but you should also consult with your environmental regulator and local FRS to ensure whatever systems you decide on satisfy all stakeholder requirements.

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Note – this appendix does not cover the issue of contaminated firewater run-off and control in any detail. When deciding on what fire systems you may want to install you should consult with your environmental regulator and available guidance on this issue. For example, if you install a high specification water deluge, where will the water go when you use it?

Note – the main body of this guidance is arranged in sections covering waste reception, treatment and storage. In each of these sections specific fire systems issues relating to reception, treatment and storage are discussed, plus a reference to this appendix. You should read the specific mentions in the main guidance under reception, treatment and storage alongside this appendix.

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1. Design of fire systems

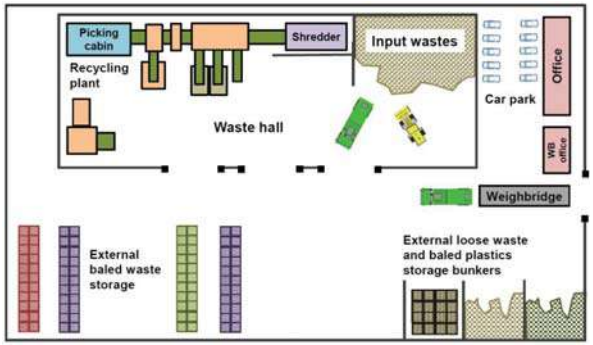
Note – if you are familiar with the basics of fire/risk engineering, such as the differences between sprinkler, deluge, water monitors, detector systems, suppression and extinguishing systems etc, you may want to read this section first. However, if you are not, you may want to skip this section and read the rest of this appendix first, then return to this section. Throughout this section the example of a basic recycling plant is used to illustrate the issues raised. This is simply an example and should not be considered any form of recommendation as to what systems may be appropriate for your plant/site. Please also note that the graphics used are not to scale and are intended simply as illustration.

1.3. What do you want your fire system to achieve?

Suppose you have decided that you want to install fire systems at your plant/site, or you may have existing systems which you want to upgrade. A starting point is to consider 'what do you want your fire systems to achieve'. This may seem an obvious question, but one which is often missed-out.

Life safety is paramount, and you must ensure the safety of your employees and others on your site. It is not the intent of this appendix to repeat guidance on fire life-safety, which is freely available elsewhere. But, in all of your decisions, life safety must be your top priority. Beyond life safety, you will likely want to protect the parts/components of your site which have the greatest value to your business. This may be the capital cost of replacement/asset value, and business interruption impacts.

The illustration below shows an example recycling operation, consisting of a waste hall, waste reception area within the hall, recycling plant (shredder, screens, over-band magnets, baler etc) and external storage for baled and loose recyclates. Ancillary facilities such as offices and weighbridge are also shown. This example will be used to illustrate the principles you may want to follow.



1.4. Factors for design and design process

Asset value, cost and time of replacement and business interruption

For most recycling facilities it is the recycling/recovery equipment/plant itself which represents the highest asset value. Total or partial loss of equipment/plant as the result of a fire may cost £ millions. Loss of plant is also likely to represent the highest business interruption risk. Even fairly minor damage to a recycling plant as the result of a fire can result in significant downtime, extending to weeks or even months.

In addition, within your plant there may be items of equipment which are more critical than others. 'Standard' parts such as conveyors and drive motors may be capable of replacement fairly quickly. But, a bespoke shredder, optical sorting array or similar may take far longer to replace. What in your plant is critical, and which items would take the longest to replace? A start here would be your asset list, which should list all of the components of your plant, and their values. However, please remember to include control systems, cabling etc – this may not be identified on your asset list but may be costly and take a significant period of time to replace.

At the other end of the scale, a fire in an external waste storage bunker may be spectacular but may not involve significant asset damage or business interruption. Your environmental regulator may take a completely different view of this, and this is one of those areas where you may need to satisfy the differing demands of different stakeholders.

Often buildings may not be as critical as plant and equipment. For example, if you lost part of your waste hall from fire could you continue to operate (subject to permission from your environmental regulator)? What temporary arrangements could you put in place if you lost part or all of a building?

- List the asset/replacement values/cost of plant and equipment on your site – try to be as specific as possible and drill-down to details such as individual critical components
- Consider likely timescales to replace, in particular for critical and/or bespoke items of equipment which may take longer to replace. Do not forget the control systems associated with your plant as these can take significant time to replace
- List the asset/replacement value/cost of buildings and other ancillary facilities on your site and likely replacement times, including porta-cabins and similar and possible temporary arrangements you may be able to put in place

Note – the asset values you have listed may not be replacement cost. If your plant is old, then you should factor in inflation. If your plant was supplied from abroad, have currency exchange rates changed? Would installation, design and similar be more expensive today?

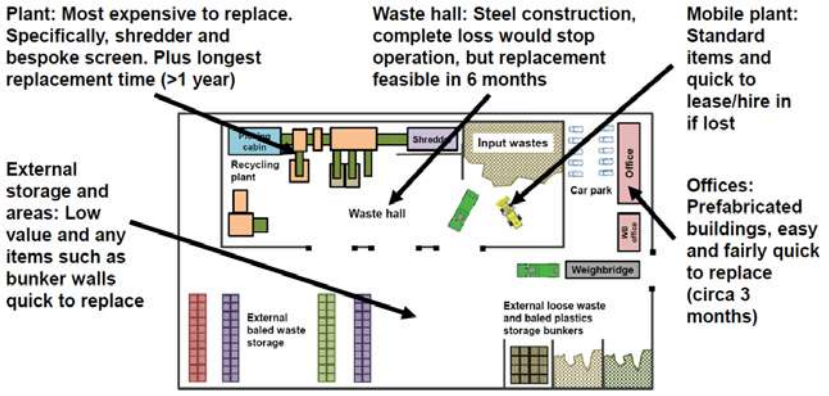
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- Based on replacement times, consider what your business interruption costs might be for any loss of an item of plant, building etc. It may be that a fairly minor or cheap component poses a higher business interruption risk than a larger or more expensive item (if this is the case, you may want to hold such a component in stock rather than have to wait for order and replacement times)
- Consider what you would do if you lost your plant. For many waste management operations this would include diversion of wastes to alternative waste management facilities. What would this cost you in terms of transport and gate price? Even complete loss of a facility for a time would often not result in total business interruption, as the wastes would be diverted elsewhere – the cost would be the 'increased cost of working' during diversion

The above process should give you a good idea of which parts of your site you want to protect the most. And, potentially those parts which you can 'ignore' (at least partially) in terms of protection as they would be easy, cheap (or at least less expensive) and quicker to replace.

Do not forget the contents of buildings, such as ICT equipment, or plant control systems. It is often the case that replacement of a plant control system and its associated wiring and ancillaries takes just a much time as replacing the plant itself. In addition, if your plant control systems are old, they may not still be 'supported', and a complete redesign of control systems may be required – this can take time.

You should now be in a better position to answer the question: 'what do I want to protect'. However, answering the question: 'what do I want my fire systems to achieve' also requires thought.



Combustible occupancy

Once you have the information above, the next step is to add combustible occupancy - what will burn on your site, how much of it is there and locations. Wastes are the obvious combustible occupancy at waste management sites. For example, in the above illustration the wastes in the reception area, wastes being processed by the plant, wastes in external storage etc. Be specific, for example, mixed commercial wastes in reception, mixed wastes on conveyors, plastics, paper, metals etc in storage. What do you have on site which will burn and where is it?

But, do not forget other combustible occupancy:

- Not only wastes burn. Rubber conveyors, wiring, hydraulic oils in power packs etc also have substantial combustible occupancy
- Do your buildings contain combustible items, such as insulation? If you are planning a new site/plant then specifying non-combustible wall, insulation and panels would be a good start (and may be required by your insurer)
- Diesel and other flammable materials stores

Fire scenarios and risks

Next you may want to consider what the likely fire scenarios and impacts at your site may be. Industry data indicates that the most common causes of fires at waste management facilities are hot/hazardous materials in wastes (such as lithium batteries, badly extinguished hot ashes etc) and self-heating. There are other causes, such as mechanical heat and friction, electrical faults and the 'usual suspects' of discarded smoking materials and hot works such as welding and grinding. Management controls, site procedures and rules etc should be targeted at these ignition risks, but in terms of fire systems likely scenarios should be considered as an input to design. There may be other potential sources at your site – think about these.

Apply this thinking to your assessment of asset values, replacement costs and business interruption and/or increased costs of working. Overlay potential fire scenarios with combustible occupancy and the information you have listed regards asset values and replacement times and costs.

For example, if you lost your weighbridge (a critical and fairly expensive component) to a fire it is unlikely that you would be allowed to continue to operate until it was replaced. Debris under the weighbridge may accumulate, and a discarded cigarette from a driver may ignite this. How likely is this to damage the weighbridge substantially, and provided you control debris build-up by housekeeping and enforce site smoking rules, how likely is this scenario? In addition, a temporary weighbridge could be hired-in fairly quickly.

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Conversely, for example, a hazardous item such as a lithium battery or gas cylinder may ignite wastes being fed into the shredder at the start of your recycling process, and such a fire could spread quickly to the rest of your plant via the action of conveyors. The outcome of such a fire could be disastrous in terms of asset value and business interruption. Likewise, self-heating or discarded ashes could cause a fire in wastes in your reception area, and such a fire could spread to the waste hall, and recycling plant. Consideration of fire scenarios will inform the nature and specification of fire systems.

Under-pinning design concept

At this point you will almost certainly want some external input, such as from a competent fire/risk engineer/consultant. However, you will have the basic information you need to conduct a meaningful and effective conversation with the fire/risk engineer, and you should be able to start to answer the question: 'what do I want my fire system to achieve?'

The job of the engineer/consultant is to start turning your aspiration into a working and practical 'under-pinning design concept'. You may already have some basic ideas of what you want, but these may not be practical, would not be achievable within standards, or may be very expensive – you may need to consider alternatives and go through several iterations before you have something which is workable, represents good risk management, and is cost effective and compliant with standards.

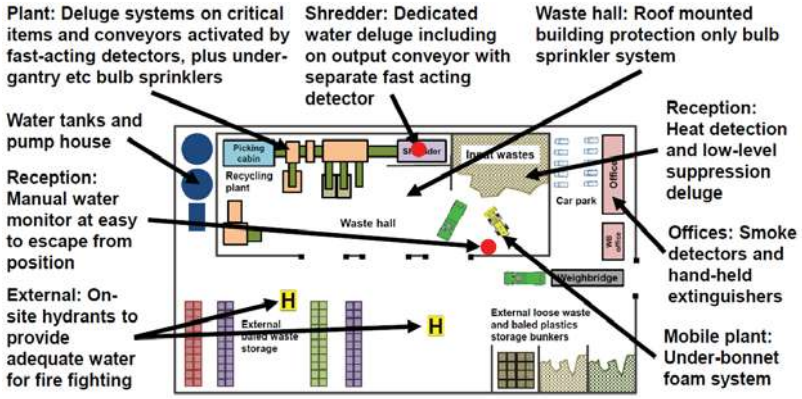
For example, you may decide that you want to protect against a fire in your shredder, as described above. One option may be installing a water deluge system above the shredder (this is simply an example - there other options). Such a deluge would need to extinguish any fire, rather than only suppress it. This would inform the specification, water density requirements etc for the deluge. The deluge would need to activate rapidly, so you would need a fast-acting detection system such as IR/triple IR. And, the detector would also need to emergency stop the plant to prevent any fire being spread via the movement of its output conveyor. You may also want a deluge system over the shredder output conveyor as a back-up, activated by the same detector.

Likewise, for example, you may want to install a heat-detecting type detector system at the waste reception area, to give early warning of a fire. You may decide that you would only want to suppress a fire in this area to allow time for your local Fire and Rescue Services to arrive, and for your operatives to use the site's loading shovel to excavate the waste and take it outside to be drenched (see below on links to procedures etc). One option may be a low-level water deluge system, or oscillating water monitors. You may also decide you want a manual system, such as a manual-use water monitor for use in fighting such a fire. And, for out of hours fires (common in this type of scenario) the alarm may need to be monitored 24/7 such as by an external 24-hour responder system. Or, alternatively if your site is occupied 24/7, you may decide that you will rely on manual systems only at your reception area, such as manual hoses or water monitors.

If a fire does develop out of control, you may want to protect the waste hall itself, such as by installing roof mounted sprinklers. If this system is only aimed at building protection, a suppression sprinkler system may be adequate, and its specification and water density requirements may be fairly low.

These are only examples and illustrations of options and scenarios. You should take the time with your competent fire/risk engineer to assess each scenario and its potential impacts across the whole of your site, including business interruption.

This should include external areas and ancillary facilities and buildings. For example, you may decide for practical, asset value and low business interruption risk reasons that you will not provide any automatic fire systems at external waste storage areas, but that you will provide on-site fire hydrants to allow such fires to be fought with an adequate water supply. Likewise, you may decide that you will install smoke detectors and alarm in site offices but no suppression/extinguishing systems and that you will rely on hand-held extinguishers in offices.



Part of your under-pinning design concept should certainly include likely water demand requirements for the options you are investigating. Water tanks and mains to feed fire systems are often the most expensive parts of a system, and there may be practical issues to consider, such as gaining planning permission for large water tanks. You do not want to commit to a system/s which you cannot put in place, or which would be too expensive relative to the risks posed.

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Note – the location of water tanks and pump rooms needs consideration, although for many waste sites space restrictions may mean there are few options. Ideally, tanks should be in an easily accessible location where the Fire and Rescue Services (FRS) can access them if required. The diagram above shows water tanks in one corner of the illustration site. This may not be the ideal location and away from the building may be better. Ultimately, practical considerations are likely to dictate location, but at least accessibility should be considered.

This appendix is mainly concerned with fire/risk engineering as applied to fire systems such as detectors, suppression/extinguishing systems etc. However, there are other aspects of fire/risk engineering which you may want to include in your design. For example, using the above illustration, having identified the risk of fire spread from your reception area to your plant, you may also want to increase the height of the separating wall between reception and plant as a physical barrier to fire spread. Or, you may want to reroute your plant control systems and cabling to reduce the risk of fire damage to this type of component. Take the opportunity of the design process to consider wider fire/risk engineering aspects. See specific sections below on fire compartments and walls and smoke vents for examples.

Consultation with stakeholders

Your under-pinning design concept will now need testing against stakeholder needs. The best place to start is likely to be with your insurer, but you will also need to consult with your environmental regulator and local Fire and Rescue Services. They will all have their own priorities and input. This can be a frustrating process, but one which is essential if you are to achieve a solution which is acceptable. Be prepared to change your design concept based on the needs of your stakeholders.

Detail design

Once you have acceptance from your critical stakeholders your under-pinning design can be developed to detail design, giving a scope which suppliers and installers can work to. This would include specific water densities and flows, scope of systems, hydraulic calculations etc. It should also include the standards/codes your fire systems need to be designed, procured and installed to.

Your detail design must also fit with the design of your recycling/recovery plant and, where relevant, the building it is in. There is little point in a detail fire systems design in isolation which ignores the design, layout and configuration of your plant and/or building.

Tip – different insurers sometimes have different requirements regarding approvals and certifications of fire system components, such as for detectors, suppression/extinguishing systems etc. At some point in the future you may want to change insurers. If you have committed to specific standards individual to one insurer, which other insurers may not accept, this may be difficult. Try to future-proof your design. Some level of over-specification may be relatively inexpensive (a marginal cost) during initial design and installation, but much more expensive to retrofit.

Installation and commissioning

Installation is a critical phase. You may have a good quality detail design document and scope, but actually transforming this into reality can be another matter. In addition, if you have specified particular standards you want to make sure this is what you get.

If your plant is a new build, then installation of fire systems will need to be co-ordinated with installation of the plant, construction of buildings etc. For example, it is usually easier to install a roof-mounted sprinkler system before installing recycling/recovery plant, but obviously gantry/low level sprinkler systems require the plant to be in place before installation. Manifolds to feed fire systems need space, pipework needs to be routed taking account of plant layout. Likewise, installation of water tanks and water mains will need to be co-ordinated with civil engineering works. Project management and managing the interface between your plant installer, buildings contractor and fire systems designer and installer is critical.

If you are adding fire systems to an existing plant the interface between your day-to-day operations and installation will need managing. Installing fire systems takes time and may require shut-down for phases of the installation. Night/weekend working may be possible, but likely more expensive.

If possible, try to ensure that your insurer is involved during the installation phase, such as arranging site visits during installation by your insurer's fire/risk engineer. They may well spot issues which can be addressed easily during installation, but which would be more difficult and costly to address at the end of installation. Your competent fire/risk engineer should also be involved during installation to ensure you are getting the quality and detail of what you have asked for.

For example, changing spray heads on a deluge system if they are not up to standard may be fairly straightforward, assuming the pipework is to standard. But, having to dig-up a new underground water main because sectional control valves have not been installed to the correct standards and locations will be far more expensive and time consuming.

All fire systems, detectors, alarms, plant controls linked to alarms/detectors and suppression/extinguishing systems, require commissioning to ensure they function correctly. Based on this commissioning your system can be certificated. Your insurer may want to witness this commissioning or have specific requirements for commissioning. Consult with your insurer to ensure their needs are met. You may also want to invite other stakeholders to witness commissioning.

Summary of process

Step	Comment
Asset value/replacement cost	List assets and their values and replacement costs. Include plant and equipment, control systems, buildings and ancillary items
Business interruption impacts	For the above assets identified, how long would they take to replace? What would be the lead-time for replacement?
Identify critical components	From asset value/replacement cost and replacement lead-time identify the critical components of your plant/site which you want to protect
Combustible occupancy	What do you have at your site which can burn? Waste may be the obvious items, but what other combustible or flammable materials are present?
Fire scenarios	What are the most likely fire scenarios at your site? How would these fire scenarios occur and their causes? What fire spread risks exist?
Under-pinning design concept	Using the above, and likely working with an external competent fire/risk engineer, identify options for fire systems and produce an under-pinning design concept
Consultation	Check your under-pinning design concept is acceptable to your insurer, environmental regulator and Fire and Rescue Services
Detail design	Work-up your under-pinning design concept into a detail design and scope which a fire systems designer and installer can work to
Installation	Install fire systems. Keep your insurer and other stakeholders involved throughout to ensure required standards are met
Commissioning and testing	Commission and test your fire system to ensure it does what you expect it to do, including plant actions. Likely your insurer at least will want to witness commissioning

1.5. Links to site procedures/plans, training and employee awareness and knowledge

Emergency response, disaster recovery and business continuity planning

Elsewhere in this guidance emergency planning is covered. Your fire systems, and the process by which you arrived at what fire systems you want, should feed into your emergency plan. And, you may want to expand your emergency plan to include disaster recovery and business continuity planning.

As part of the process above you will have identified plant, buildings etc replacement costs and timescales, waste diversion plans and costs etc. These are valuable inputs into a business continuity plan. If you suffer a major fire resulting in your plant being down for a significant period of time, business interruption costs are very likely to be a major factor. Planning in advance, such as waste diversion planning, listing potential suppliers and lead-times etc for replacement plant, buildings, temporary buildings etc can save valuable time when you are trying to get back to 'business as usual'. Every week you are down for costs money.

This type of information is also valuable to your insurer to calculate the likely costs associated with a major fire at your site. If you have under-estimated replacement costs and/or business interruption costs you may find yourself under-insured. Conversely, good planning can reduce the potential impacts, and therefore may have a positive effect on your insurance premiums.

Your emergency plan should also include information on what fire systems you have in place. For example, you may have installed a 'dry-riser' as part of your fire systems, through which the Fire and Rescue Services (FRS) can introduce additional water to your systems. This needs to be included in the emergency services information part of your emergency plan so that the FRS know this option exists at your site and where the dry-riser is. Likewise, if you have installed a deluge system with a manual activation point in a safe location, this needs to be marked on your emergency plan. And, you should consult with your local FRS so that they are familiar with your fire systems, such as by Fire and Rescue Services visits to your site.

However, if a fire does occur at your site it may not be your local FRS who attends – they may be busy on another call. You should anticipate that a different FRS may attend, who are not familiar with your site. Controls for fire systems, dry-risers etc need to be clearly signed and obvious, and your emergency services information pack should include clear directions and information.

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Case study. A real example shows the value of this. At a fire at a waste management site the detection and alarm system was linked to a 24/7 responder service. The local FRS were out on another call, and so an alternative FRS from a nearby town was called to the scene instead. They had never been to the site before. They arrived before any site staff. The building the fire was in had a manually activated deluge system, the controls of which were in an obvious lean-to building next to the waste hall. But, the controls for the deluge were not clearly marked. The Fire and Rescue Services pushed the obvious and large red button in the middle of the control panel, thinking that this would activate the deluge – it was actually the emergency stop for the deluge system pumps… Site staff arrived and wasted critical minutes re-setting the system before the deluge could be activated (fortunately the fire was controlled and extinguished with only minor damage).

Employee awareness, information and training

Your employees need to know what your fire systems are and, in outline, how they work. This issue is covered in more detail in the specific sections below. However, in brief if you have manually activated systems your employees need to know what these are, how to operate them and what they are designed to achieve. Your employee procedures, rules and training should include your fire systems.

As part of your planning and design process as above you may have identified actions you expect your employees to carry-out in the event of a fire. For example, using the site's loading shovel to excavate wastes to allow them to be drenched outside a building, or to use site fire hoses to damp-down areas next to a fire to reduce the risk of fire spread. If you expect your employees to perform such actions then they must be trained, competent and aware of the risks involved. Identify where in your planning and design process you expect intervention by your employees and include this in your procedures, awareness and training for employees.

1.6. Selecting the right consultant/contractor/supplier

Your insurer is very likely to have requirements for designers and installers of fire systems, such as the BRE 'red book' (search the internet for BRE red book for details). However, such accreditations may not be sufficient to ensure waste management operators achieve effective fire systems. Experience is that 'standard' fire systems may not be effective at waste management plants/sites. The reasons for this are discussed in more detail in the sections below. However, just selecting a designer, consultant, installer etc from a standard approved list may not be sufficient for waste managers.

Your insurer may also insure other waste management operators/sites and may be able to suggest suppliers, consultants, engineers and installers who have waste management experience:

- Ask your peers/competitors – fire safety is not a competitive event and sharing knowledge across the industry will only help in the longer-term
- Ask potential suppliers, engineers, installers etc if they have previous waste management experience and whether they can provide references
- Be wary of potential suppliers, engineers, installers etc who simply suggest a standard solution rather than taking account of your specific situation

You may also need more than one supplier. For example, a contractor who installs fire systems may not be able to also provide detail design services. For larger waste management operations, it is common to have a design fire/risk engineering consultant and a separate installer, although they obviously need to co-operate and consult with each other.

Having considered the basics of design, the sections below now take a look at specific types and components of typical technical fire systems.

2. Fire detection

2.1. Detection introduction

Detection systems typically aim to provide one or more of the consequences listed below:

- Activation of an alarm to inform people that a fire may have started to allow them to evacuate and/or take measures to fight or suppress a fire, or for more advanced systems to inform the Fire and Rescue Services (FRS) or 24 hour responder (formally an 'alarm receiving centre') direct via ICT link that a fire may have started. Please note that some FRS have conditions on the use of alarm receiving centres and you should discuss this with your local FRS
- Early warning of a developing situation that may lead to the outbreak of fire (such as thermal imaging/heat detection, or detectors which look for combustion products before flames or other obvious signs of a fire are apparent). Typically, this form of early warning is intended to allow actions to be taken to prevent an actual fire starting
- Activation of a fire suppression/extinguishing system or systems, such as a deluge system
- Plant actions, such as the emergency stop of conveyors to prevent a fire spreading
- Other actions, such as the closing of automatic fire doors and/or shutters

Often detectors perform multiple tasks, such as a flame/visual type detector activating a water deluge system and an alarm to inform people that a fire has started. To respond to a fire, you first need to know that a fire may have started or may be about to start. Unless you have employees in every part of your site/plant 24/7 all dedicated to watching for fires, detection systems are likely required.

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2.2. Fire detection system types

Fire detectors come in many different types and specifications, such as:

- 'Standard' smoke' detectors – these may be acceptable in an office or welfare facility, but are very unlikely to be appropriate in an operational environment
- Beam detectors – these 'throw' a beam of light to a receptor. Typically, smoke interrupting the beam activates the detector
- Aspirating detectors – typically, these draw air through a network of tubes to a detector which looks for smoke and/or other combustion products which may indicate a fire has started
- UV/IR/triple IR detectors and similar 'visual' type detectors – these 'look' for specific light frequencies associated with flames, sparks and fires
- Heat sensing systems such as heat-camera type detectors which react to temperature changes – obviously these look for heat and temperature changes
- Heat sensitive wires which react to changes in temperature
- Video type/pattern recognition systems which 'look' for smoke or other signs of fire
- Specialised systems such as carbon monoxide sensing or other combustion product sensors

The above are only examples – there are various other types of system and variations on existing types of system. New systems come to the market all of the time. Key is ensuring that the detection system you specify will do what you want, is reliable and is effective.

Tip – fire detectors come certificated to various standards. Your insurer may have specific requirements, such as only accepting detectors certificated to LPCB (Loss Prevention Certification Board) or FM (Factory Mutual). There are also EN standards which all should comply with. Check with your insurer before you fit a system, or risk fitting one they will not accept. That a specific detector does not have a formal certification may not result in your insurer not accepting it (it may that the detector is new and has not gained certification yet). Consult with your insurer – they may accept test data and similar as proof that a detector is effective. Conversely, a detector may have certifications but would not be effective in your application (see below on robustness of detectors).

Tip – more than any other area of fire/risk engineering new detection systems come to the market all of the time. The suppliers of these are naturally keen to sell their products. Beware being sold systems which are not appropriate for waste management use, or do not meet with your needs. Ask suppliers for proof that their detector is effective and reliable in waste management operations, and ask for references you can check on, such as another similar waste management plant where the detector has been installed and used reliably and effectively. Conversely, a new type or model of detector may be just what you need. Keep a balance between natural cynicism and being open to new ideas.

Factors when selecting fire detection systems

Specific assessment of potential fire scenarios and the environment detectors will be used in is required to determine the type of detector to be used, in what application, the locations of detectors etc. One size does not fit all here - different types of detector may be required in different areas of a site/plant, based on the need for speed of detection and what suppression and plant control system actions etc are required.

Robustness and reliability

Waste management operations often involve dusty, moist and other forms of extreme environment. Detectors used in waste management facilities need to be robust and reliable. If they are not, the outcome is likely to be either that they do not work effectively, or that they produce frequent false-alarms and detections.

Detectors such as beam detectors and standard 'smoke' type detectors may be suitable for offices and control rooms but are unlikely to be reliable or effective in most operational waste management applications because of dust, moisture and other factors. Experience is that many beam detectors are affected by dusts and similar and produce false alarms in waste management environments. This often results in operators turning-off beam detectors during operational hours and then turning them back on out-of-hours or using timers to achieve the same end. This is less than ideal.

In some applications protection for visual-type and similar detectors, such as UV/IR/triple IR/camera type etc detectors, may be required. For example, ‘air-shields’ may need to be fitted for reliability reasons (air shields blow clean air in front of the detector to keep it clean and effective). In other applications physical protection may be required, such as protecting a flame detector in a conveyor cover from ejected wastes. Another example would be frequent ‘blocking’ of tubes in an aspirating detection system because of moisture and dust. Frequent cleaning of tubes may be required, or the use of automatic cleaning systems which blow compressed air through the tubes to clear them. If an automatic system is used, the compressed air needs to dry to avoid moisture mixing with dust to produce an intractable block in tubes.

For some types of detector air-flow may be an issue. For example, locating an aspirating detector system near to roller shutter doors that are usually open may mean that smoke from a fire never reaches the detector (or is delayed) because of the air-flow from the open door. Likewise installing an aspirating detector in a ‘dead-air’ space in a roof void may also have the same effect, but for the opposite reason. This may be solved by careful consideration of location of the detector, or a different type of detector may be required.

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Speed of detection

In general detectors may be fast acting (such as IR/UV, triple IR and similar), medium acting (such as aspirating systems) or slow acting (such as some carbon monoxide and similar detection systems). What actions you want the detector to produce, and therefore the type of detector chosen, will be affected by how quickly you want these actions to occur. For example, a detector above a conveyor may be intended to stop the conveyor quickly – if it does not the speed of the conveyor may result in a fire being carried along the conveyor and so spread. There is little use fitting a slow/medium speed acting detector in this type of application as by the time it alarms the fire will have already spread. Conversely, for general area use a medium acting detector may be appropriate.

Consider life safety also when deciding on detection. Is a slow acting detector really appropriate to inform all on site quickly that a fire has started and that they may need to evacuate? You may need more than one type of detector to satisfy different needs, and in different parts of your plant.

Tip – this is not always the case, but often quick acting detectors tend to be directional (they look for a fire in one specific area), whereas slower detectors tend to be able to cover a wider area (such as one aspirating detector system covering an entire waste hall). There is often a balance here – think about what you want the detector to cover and how essential is its speed of reaction.

Interactions and blocks

It is not unusual for a large waste management sites/plants to have more than one type of detection system in place. For example, at a recycling plant there may be a dedicated deluge system over a shredder feed hopper, activated by an UV/IR detector (quick acting). Plus, an aspirating system for general alarm purposes covering the whole of the hall the shredder is in and, perhaps, to deploy lower-level deluges over stored wastes in bunkers in another part of the hall. A fire starts in the shredder, the UV/IR detector detects this quickly and the specific shredder deluge deploys extinguishing the fire. But there is still smoke in the air which two minutes later is detected by the aspirating system which deploys the general deluges over the stored waste bunkers. Where different detector types are used potential interactions need considering, to avoid suppression system clashes and unintended consequences (see consequences matrices below).

Interactions between detectors of the same type may also be an issue. For example, you may decide that to reduce the risk of false activations that you will install two visual-type detectors which activate a deluge system over a shredder, and that both detectors must activate to set-off the deluge (commonly, and incorrectly, called a ‘double-knock’ system). This is unlikely to be acceptable to your insurer. If one detector is blocked/dirty or faulty then the one remaining detector will not set-off the deluge as both are needed to do this. In this case three detectors would be more appropriate to ensure there are always two to activate the deluge.

In the same way as air-flow and dust can affect some types of detector, physical obstructions can affect others. For example, installing a visual-type detector looking at a pile of wastes in a reception area will be of little use if you routinely park a loading shovel in front of it, so blocking its 'view'. Likewise, for bunker walls, and for a visual-type detector mounted over a conveyor – it cannot 'see' under the conveyor of through the bunker wall. Think about physical blocks when considering detector location and the number of detectors required.

2.3. Summary table detector robustness and example applications

The table below gives general detector types, comments on their likely robustness and issues, and example potential applications. It is not intended to be comprehensive, and all detector applications require specific assessment. The below is simply a guide and is not intended as a set of strict rules.

Detector type	Robustness in waste management application	Speed of response	Potential example applications
Standard smoke detectors	Very unlikely to be robust enough for operational areas	Medium	Offices, control rooms and welfare facilities
Beam detectors	Can be affected by dust/moisture and experience is that often not robust in operational areas	Medium	Internal waste storage areas where dust and moisture are not an issue
Aspirating systems	Likely need to be harsh environment systems, and not placed in dead-air areas or where air flow such as from roller doors could prevent or delay activation	Medium	Internal waste reception areas, general detection in processing areas, internal storage areas, but only if dead-air or air flow issues are not relevant
Visual IR/UV/triple IR type detectors	May need protection such as air-shields in operational areas, and beware of their 'view' being blocked by obstructions	Fast	In process areas to activate deluges over conveyors, shredders and other specific items of plant etc, or above storage bunkers
Heat sensing/thermal camera type systems	'View' may be blocked by obstructions and often require 'programming' to specific situations. May not be accepted by insurers	Medium to fast	Internal waste reception and storage areas, such as bunkers and pits
Heat sensitive wires	Prone to damage and unlikely suitable for general detection	Medium to fast	Conveyor and similar, but speed of reaction may be an issue

Video smoke and similar detectors	Fairly new to waste management	Medium to fast	Potentially waste halls
Gas (carbon monoxide etc) sensing systems	Specialised and require specific assessment	Medium to slow	Storage silos used for treated wastes, enclosed waste treatment systems and similar

2.4. Detecting 'inside-out' fires – an unresolved problem

Waste fires in loose piles/stacks of waste, such as loose wastes in a bunker or an external store of piled wastes, tend to come in two types (see appendix 5 for more detail):

- Outside-in fires – where the fire starts on the surface of a pile of waste
- Inside-out fires – where the fire starts inside the pile, such as from self-heating or a damaged lithium battery buried in a pile of waste

Outside-in fires are 'easy' to detect – there will be flame, heat and/or smoke at the surface of the pile which can be detected. Inside-out fires are less easy to detect. There may be substantive levels of heat inside the pile, but little or no heat, smoke etc at the surface to detect. During phase 3 of the WISH fire tests (see appendix 5 for detail) various detectors were tested on inside-out fires. None was fully effective at detecting inside-out fires until the fire/smoulder was close to the surface of the waste and/or had broken-through to the surface. During one test internal temperature inside the pile was in excess of 600 degrees centigrade, but at the surface temperature was ambient with no visible smoke.

Note – inside-out fires only really occur in loose piled/stacked wastes. Baled wastes very rarely suffer from inside-out fires because of their density.

Note – problems with detecting inside-out fires in loose piles/stacks of waste depend on the particle size of the wastes and air gaps. For example, with whole or pre-crush wood waste there will usually be air gaps between the particles of waste. Heat, and smoke, from an inside-out fire within the pile will likely travel to the surface via these air gaps and can be detected. However, if particle size is small, and/or the wastes are flexible, these air gaps tend to disappear 'trapping' heat and smoke within the pile where they cannot easily be detected.

There are options which can be considered, but currently none of these are perfect, fully practical or fully effective at detecting an inside-out fire before it reaches or breaches the surface.

Thermal probes

These have been in use at green waste composting and similar operations for many years. A probe is pushed in the pile to measure internal temperature. However, there are issues:

- The waste needs to be 'soft' enough to allow a probe to be inserted. For example, attempting to push a probe into a bale of waste is likely to only result in damage to the probe
- Size/configuration of pile is also a factor. Most green waste composting windrows are fairly narrow, and long. A one or two-metre long probe can usually reach towards the centre of a pile. However, with a 20 metre by 20 metre pile of RDF or similar an excessively long probe (circa 10 metres) would be required, which would likely not be practical and difficult, if not impossible, to insert fully into the pile
- Research indicates that 'hot-spots' inside a pile of waste tend to move-around, likely as available oxygen/fuel is exhausted. It may be a matter of chance whether a thermal probe just happens to be inserted at the right place

Thermal probes may be a good option with some waste types in some stack configurations, but with many waste types and stack configurations they are likely not to be 100% effective and/or practical.

Thermocouples

During the waste fire tests an array of thermocouples was placed in piles of waste to monitor internal temperatures. 'Strings' of thermocouples can also be used in a similar manner – spread through a pile of waste to monitor internal temperature. In a test environment these were both effective ways of detecting internal temperature in a pile of waste. For operational use there is the obvious problem that such systems are sacrificial – whenever the pile is moved or worked on the thermocouples are destroyed. In addition, the thermocouples need careful placement if they are not to be damaged, which during normal waste operations is unlikely to be practical. In brief, this is an expensive and likely impractical way of solving the problem and uneconomic for most waste operations. It may be that thermocouples can be used for long-term storage of wastes where the wastes are left undisturbed, but this would be a matter for cost-benefit analysis to determine if such a measure was proportionate.

In summary, there is currently no 100% effective and/or practical and/or economic method of detecting inside-out fires in a waste pile before the fire/smoulder approaches or breaches the surface. This is not to say that detection systems and/or thermographic cameras should not be used at piles of loose wastes, simply that waste operators should be aware of their limitations.

Detection systems are the most rapidly changing and developing area of fixed fire systems, and it may be in the future that an effective and cost-effective method of detecting inside-out fires in advance of them breaking-out will be developed. If such occurs, this guidance will be revised.

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2.5. Maintenance, testing and cleaning

Whatever type of detectors you install, they also need to be accessible for maintenance, testing and cleaning. Mounting detectors in inaccessible places, or where routine maintenance requires the use of scaffold or an elevating work platform is likely to result in them not being maintained correctly. Think about access when deciding on detector location.

- Read the manual for the detector and ensure cleaning and maintenance occurs to the correct frequency, content and quality. Maintenance and cleaning requirements vary. For example, aspirating systems require the blow-out of their pipework to prevent build-up of dusts etc which may impair their effectiveness (dependent on the aspirating system this may be very specific and include the use of dried compressed air as a requirement)
- Maintenance and checking applies both to the detector, and its power supply, wiring to alarms etc – the whole system needs maintenance not just the detector itself
- Ensure detectors and their associated systems are tested and checked at the required intervals by a competent person, likely an external person

3. Fire alarm

3.1. Fire alarm introduction

The purpose of a fire alarm system is to inform all on site (and in some cases off site, such as a critical neighbour/receptor) that a fire may have started. This is to allow people to respond to a fire quickly, such as by evacuation or seeking to fight a fire.

Note – life safety is the first concern and response by employees to any alarm must be carefully considered with this in mind.

3.2. Alarm requirements

You should consider what you want to happen if a fire alarm is activated and based on this what are your requirements for the alarm system. In general:

- Fire alarms should be clearly audible across the whole of a site, including in offices, welfare facilities, weighbridges etc. This is likely to require multiple 'sounders'
- If your site/plant is a noisy environment, you may need visual back-up such as strobe lights or similar so that any person in a noisy area is aware that the alarm has been activated, including those in heavy mobile plant cabs which may be insulated from noise and persons who may be wearing hearing protection. This may include beacons on the outside of buildings

- If a fire starts out of working hours (and many do) and your site is not manned 24/7 who will hear the alarm? You may need to install an alarm system which is linked to a 24/7 responder, an automated call service, and/or your local Fire and Rescue Services direct
- If you are using detection systems which sense temperature rises prior to fire breakout you need to ensure that those involved have a clear understanding of how to react to this, and to actual fire break out, and when escape becomes a higher priority than continuing to try to control fire outbreak

3.3. Alarm and detection system plant interactions

It is not unusual for fire detection and alarm to be on one system and for plant control to be on a different separate system (such as a SCADA system). If you want your detection and alarm system to produce actions in your plant, such as shut-down, then these systems must be compatible. If you expect your employees to hear the alarm and then manually activate emergency stops or similar you run the risk of them not doing this exactly as you want – in extreme situations when under stress people rarely do what they are expected to do 100% of the time.

3.4. Manual alarm points

In addition to alarms activated by detectors, the majority of sites will also have manual alarm points, such as break-glass points. These need locating in clearly visible locations and according to relevant standards. As for detector systems, they need routine testing and checking to remain effective.

3.5. Wireless alarm systems

The use of wireless alarm systems can be attractive because they do not require extensive (and costly) hard-wiring. However, wireless systems need to be acceptable to your insurer, and can suffer from interference. They may be an option, but you should check with your insurer before fitting.



Left to right: Aspirating detector (red pipework) at a waste recovery site, visual type detector in external use overlooking a waste storage bunker, specialised gas detector at a wood chip storage silo, flame detector set in a waste bunker wall

4. Fire suppression/extinguishing systems

4.1. Suppression/extinguishing system introduction

Fire suppression/extinguishing systems are aimed at either extinguishing fires or suppressing them until the Fire and Rescue Services can attend. You should be clear what type of system you want. Do you want the system to extinguish a fire, or only suppress it? For example, for a system installed over a conveyor, shredder or similar it is likely you will want the system to extinguish a fire (and quickly), whereas for a storage area you may consider suppression to be appropriate. This is a critical decision and should be a key part of your design process (see above).

Note – you should ensure that you know what type of system you have: Suppression or extinguishing. There have been some large fires where the operator has assumed that a system will extinguish a fire, when all it was designed to do was to suppress a fire to allow other actions, such as by the Fire and Rescue Services, to be taken, with the obvious disastrous outcome.

Systems may be manual or automatic and may be for manual use or fixed. Examples of fixed systems would include sprinkler, deluge and foam systems. Examples of manual use systems would include manual water monitors (cannons), fire hoses etc. The sections below attempt to explain the differences between these, how they are designed and specified and how they may be applied to waste management sites. However, this is a very brief overview of what is a highly technical area and should not be considered in any way as being comprehensive or definitive. However, first it is useful to consider how fire suppression/extinguishing systems are specified, and what guidance is available on fire systems relevant to waste management.

4.2. Combustion properties of wastes, occupancy and effect on systems

One of the under-pinning factors in the design of any fire suppression/extinguishing system is the combustion property of the material which may catch fire. For example, a sprinkler system designed to suppress a fire in a warehouse storing steel motor components will need to provide less water than one designed to suppress a fire in the same situation where baled paper is being stored. The more energetically a material may burn and the more of it there is the more water (or foam etc) is required.

How energetically a material may burn is only one factor in what is often called ‘combustible loading’ (sometimes also called combustible occupancy). In brief, what is there in a building or area which can burn, how much of it is there and how energetically it will burn = combustible loading. This may seem obvious, but the more of a combustible material there is, and how energetically it will burn, is fundamental to the design and specification of fire suppression/extinguishing systems.

This fundamental issue affects the design and specification of sprinkler, deluge and similar systems. It also affects water monitors, hoses and overall water supplies. A standard fire hose which flows perhaps 100 litres of water a minute is unlikely to have much effect on a 500 tonne pile of waste on fire, and a water main capable of only providing 200 litres a minute to a water monitor is likewise unlikely to be sufficient for a large waste fire.

The standards used by fire/risk engineers to assess combustible loading typically use the system of 'commodity class'. Some wastes fit neatly into this system. But, for mixed wastes and waste products commodity class is less easy to allocate because of their variable composition. The commodity class of a material is a critical input into fire systems design.

For example, if a waste contains less than 5% by weight or volume of specified types of plastic it is likely to fall into 'commodity class 3'. If it contains 5% - 15% by weight or 5% - 25% by volume it would likely be 'class 4' (the higher the class, the more energetically a material burns). If it contains more than the above of specified types of plastic it would likely fall into a specialised 'high hazard class'. The design, specification and water flows required will vary significantly between the above three cases. As an illustration of the potential effect commodity class can have, a sprinkler system designed for a class 4 material may have twice the water demand as the same system for a class 3 material.

Note – different types of fire suppression system use different types of water supply measurement. For sprinklers and deluges a water 'density' such as mm/minute or litres/m^2/minute is typically used, but for hoses, water monitors etc a simple flow rate such as litres/minute is typically used.

How much (the amount) of a combustible material is present is dealt with by area of cover of a system. For example, a deluge system over a conveyor may be specified at a water density of 20 mm/m^2/minute 'over the whole area of the item to be covered'. Using this example, if the conveyor is 1.5 metres wide and 10 metres long, a water demand of some 3,000 litres a minute would be required. If you have five conveyors each with its own deluge the total water demand if all of the deluges are activated will be significant. For sprinkler systems the 'area' used is different because usually not all sprinkler heads will activate (see below).

Combustible wastes are the obvious combustible occupancy in waste management plants. However, there are other items which can also burn, such as rubber conveyors, electrical wiring insulation, wall panel insulation etc. These are likely to be considered when a fire suppression system is being specified. For example, you will not help yourself by installing combustible wall panels – think about this type of issue during building construction and design.

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In addition, dusts can be a significant issue and can affect combustible occupancy. For example, if a deluge system has been specified based on the type and amount of waste present it may be ineffective if you also allow dusts to build-up through poor housekeeping, because the overall combustible occupancy will be higher than the system was designed to cope with.

Avoiding ledges and other flat surfaces where dust can accumulate, by the installation of inclined or curved planes on such surfaces which dusts tend to 'run-off', can help to minimise dust build up.

Another issue which often affects waste management plants is that we change them… The original design for a plant may include that wood is stored in a specific storage bunker. Then after a few years this changes, and plastics start to be stored in the bunker. This would significantly affect the combustible loading (plastics being a much higher commodity class than wood). If a deluge, sprinkler etc system was specified over this bunker based on wood, it will very likely not be effective if asked to suppress/extinguish a plastics fire. Similarly, if you change the layout of storage bunkers/areas, their configuration etc, you may need to reassess your fire systems to ensure they remain effective. We know that we change our plants and sites – change is one of the only constant factors in waste management. Considering this it may be wiser when specifying fire systems to assume worst case, even if this costs more.

In addition to combustible occupancy and the amount (area) of material there is, other factors also apply in system design, such as building height for roof mounted sprinkler and deluge systems. These are included in the sections below on specific types of system.

4.3. Existing guidance on fire engineering for waste management

There are existing guidance and standards for the specification of fire systems, some of which are mention waste management (although the majority do not). Generally, these guidance/standards documents originate with insurers, although there are other sources:

- NFPA standards, ACE guidelines and FM data-sheets – technical insurance documents (beware these often need interpretation by competent risk engineers)
- EU EN and local standards – European and national standards
- National FPA (Fire Prevention Association) guidance produced by national fire organisations, and also from the CFPA-E (EU FPA association) and LPC (Loss Prevention Council)
- Industry guidance, such as this WISH guidance
- Regulator guidance, although this rarely includes technical fire engineering specific standards

Note – a list of commonly quoted standards, a summary of what each is and what they cover is given at the end of this appendix.

Some available technical fire/risk engineering guidance/standards tend to fall into two types (please note this is a generalisation and there are various standards such as EN and FPA standards which would not fit into the categories below):

- There are under-pinning technical design standards, such as NFPA13 on sprinklers, NFPA15 on deluges etc. These describe the process to design a fire system from scratch. They start with basic principles such as combustible occupancy and apply no matter the type of site or material considered. They also often include installation, construction and other standards
- The other type of guidance tends to be sector specific, such as NFPA850 guidance on power generation, WtE plants etc. These do not give the technical process required to design a system from scratch. Rather they give guidance and 'stock' suggested specifications for fire suppression systems. For example, NFPA850 is about power generation plants, but includes suggested specifications for fire systems for the storage of alternative fuels such as RDF

For the designer of a fire system it may seem easier to look at the sector specific guidance than to use the under-pinning technical design standard to design a system from scratch – the suggested specification is given to the designer 'on-a-plate' rather than having to go through the full technical design process. However, this approach may be flawed.

When writing sector specific guidance assumptions need to be made about the material involved, design of the building etc. Most sector guidance includes caveats that the suggested specifications given are just that, and that specific site situations need to be considered. These caveats may largely go ignored by some suppliers and designers.

For example, a suggested specification in sector guidance may assume that the waste being stored is mixed domestic wastes. But you may be storing plastics. Likewise, the sector guidance may assume a specific type of building design and height. But your building may be higher or of a different design. Beware designers who simply quote from an item of sector guidance.

- How old is the guidance? Knowledge of the combustion properties of wastes has developed significantly over the past few years, such as the recent WISH waste fire tests in the UK
- What assumptions have been made to arrive at the suggested specifications in any guidance? Are these assumptions compatible with your situation and plant?

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The suggested specifications given in general guidance may not be correct for your wastes and your site/plant. If you simply use these suggested specifications and do not do the specific assessments and calculations for your specific situation then you risk your fire systems being under-specified (or over-specified in some situations). You may end-up with a system which costs you a significant amount of money, but which fails to perform as expected in the event of a fire.

4.4. Basic types of suppression/extinguishing system

Manual and non-manual fixed systems

Fixed non-manual systems are those which are fixed in one place and do not require a person actually at the system to use it, such as sprinklers and deluges or automatic oscillating water monitors.

Fixed manual systems are those which while fixed in one place require a person actually at the system to use it, such as a manual fire hose, or a manually aimed water monitor (cannon). Manual-use systems require a person holding/operating the suppression/fighting equipment at the location for it to work (note – as hand-held fire extinguishers are not fixed to a structure they are not fixed systems, and as such are not covered in this section – there is plenty of other guidance on extinguishers if you require information on these).

Manual use systems have their potential problems. If a fire hose is in an area which is actually on fire, then there is little chance that anyone will be able to use it. Likewise, during a fire significant amounts of smoke may be generated. If a manual-use water monitor is in the path of this smoke a person will not be able to access the monitor to use it. There are some ways of potentially reducing this issue. For example, a simple half-wall may provide sufficient protection to allow a person to stand behind it and use a water monitor fixed to the wall (please note such arrangements **MUST** be immediately next to fire escape to the outside to allow a person fighting a fire to escape easily and must not be used at any risk to human life).

Conversely, manual systems are typically flexible and can be useful to tackle smoulders and small fires before they can grow and spread. For example, a loading shovel operative at the reception area of a recycling plant notices a small amount of smoke coming from a recently tipped load. They get out of their cab, un-roll a fire hose and drench the area so extinguishing the fire. Information from waste management company fire investigation reports indicates that this is just how many smoulders and small fires are dealt with, effectively and with little risk to human health.

However, relying completely on manual systems risks not being able to access these systems in the event of a larger fire, for reasons such as smoke and heat. Non-manual fixed systems may be more appropriate and effective in the event of a larger fire.

Care must also be taken with the water supply to some manual systems. For example, deluges and sprinklers etc operate at fairly high pressures (typically 6 - 10 bar). This is not suitable for a fire hose - the operator would be 'thrown all over the place' by the pressure. If fire hoses are supplied from a pumped water supply which is also used for deluges and sprinklers, then pressure reduction valves are likely to be required.

Note – if you expect your employees to use manual-use fire systems such as hoses then they **MUST** be thoroughly trained, and they **MUST NOT** use systems if there is any risk to their safety.

Note – this appendix does not cover hand-held fire extinguishers – there is plenty of guidance easily available on types and use of fire extinguishers. You should include hand-held extinguishers in your fire plan, but except for the smallest of fires you should not rely on them.

Manual activation and automatic systems

Fixed systems also fall into two general types: Manual activation and automatic activation systems.

Manual activation systems require a person to activate them. For example, a deluge system not linked to a detector which requires manual activation, such as by pressing a button in a control room. **Automatic systems** do not require any manual intervention, such as sprinkler systems or a deluge activated by a fire detector. In some cases, systems can be both manually activated and automatic. For example, a deluge system which activates automatically from a detector, but which can also be manually activated by pressing a button should the detector fail to activate the system.

Manual activation only systems are generally less reliable because human beings make mistakes and may panic in the event of a fire and so not activate the system. Conversely, a detector may have failed or have not detected a fire before it is seen by a person, and in such cases manual activation is useful. For some systems, such as deluges, both automatic and manual activation is the likely best option. If you have manually activated systems (or automatic systems which can also be manually activated):

- At least two manual activation points should be provided for each suppression system. For example, for a deluge system a button in the control room and a second button on a panel external to the building in a safe location. If a control room is full of smoke no one is likely to enter it to activate the system and an external activation point may be the only safe option
- Manual activation systems should be simple and obvious, such as a large, well signed red button in a convenient and obvious location. If an operative needs to access a computer programme, or press several buttons, or go to another room to activate a system the risk of failure will increase

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Automatic systems are those which activate automatically when a fire is detected by a detector, or in the case of sprinkler systems when a 'glass' bulb bursts. For sprinkler systems experience is over many years that activation is reliable. Heat reaches the sprinkler bulb, which bursts releasing water. However, for other systems such as deluges and automatic water monitors activation is via detector/s. These detectors must be reliable and located such that they can detect a fire quickly enough for the deluge, monitor or other system to activate reliably and effectively (see above on detector selection). The advantages of automatic activation systems are:

- They are more reliable than manually activated systems – this has been proven many times
- They work when no one is there to manually activate a system, such as out-of-hours, or if manual activation is via a button in a control room and no one is in the control room

Training, instruction and awareness are critical, and the more complex a system the more critical they become. Your operatives should understand your fire system and be trained in its use. For example, a complex plant may have ten separate deluge systems installed in conveyors, shredders etc. If a fire occurs, one or more of these may need to be activated manually. For example, a fire starts in one shredder, and the automatic detection system fails to activate the deluge over this shredder. If an operative is confronted by a control panel with ten buttons (one for each deluge in the plant), which they have not been trained in and are not clearly labelled as to which button activates which deluge the outcome is predictable. The operative will push every button they can, 'letting-fly' with all deluges. This may have operational consequences and reduce water supply to the deluge over the shredder (that is the one really required) to the extent that it is ineffective.

4.5. Specific automatic fire systems

There are many types of fire system. Typically, the most common ones in use at waste management sites are sprinkler systems, deluge systems and water monitors. Some sites also have foam systems and other specific systems. The sections below give an overview of these commonly used systems, and for sprinkler systems outlines some of the issues waste management sites may have with them.

Sprinkler systems

Sprinkler systems are networks of water pipes with 'spray heads' on them. The spray heads are equipped with heat-sensitive 'glass' bulbs. These bulbs burst when exposed to heat so releasing water. Sprinklers can be wet systems (where water is always in the pipework system), dry systems (where water is not in the pipework and only flows into it when a bulb/s burst) or pre-action systems (where water is not normally in the system, but is allowed to flow into the system via a valve if a fire detector detects a fire - that is the pipework system 'pre-charges' with water ready for potential use if a bulb/s bursts).

Activation of wet systems is obvious – when the bulb/s burst the water in the pipework comes out of the spray head/s. With dry systems if a bulb/s burst this causes an air pressure drop in the pipework system, which activates a valve allowing water into the system which fills the system and comes out of the spray head/s where bulbs have burst. For pre-action systems (assuming the detector has worked and allowed water into the system) activation is as for wet systems.

The difference between these types of system is speed of reaction to a fire. Wet systems are quickest as there is no time delay while water fills the system. With dry systems there may be a delay while water fills the system.

Wet systems generally require more maintenance and will need to be equipped with drain down points. Wet systems need to be trace heated/insulated if they are installed in external and unheated open areas, such as large open waste halls, where they may be a risk of freezing. Some systems are operated wet during the summer months, and dry during the winter months (sometimes called a semi-dry or alternate system). You should know what type of system your plant has, in which areas and have an awareness of the implications.

The specification of sprinkler systems is usually given as a water density as mm of water per minute (sometimes over an area such as per metre^2). The higher the density the more water delivered over any given area. The area given varies because of factors such as the differences in speed of reaction between dry and wet systems, and combustible occupancy. The speed of reaction is important: For dry systems it is assumed that a fire may have grown during the delay while water enters the dry system, so the area cover specification is higher than for wet systems.

In general, wet systems are preferred because of their faster reaction. But, in many waste plants wet systems may not be practical and dry and/or pre-action systems are more common.

Normally during a fire not all sprinkler bulbs will burst, only those exposed to sufficient heat (despite what is often shown in films). The specifications of sprinkler systems are based on this premise - that is the water flow calculations involved assume only some bulbs burst. However, in some cases the area specification is 'across whole area'. This is generally for smaller areas such as hydraulic power pack rooms where specific area specifications would not make sense.

Sprinkler systems must be ‘balanced’ to ensure that adequate water volume and pressure reaches all parts of the system. This is achieved during design by the use of ‘hydraulic calculations’. These hydraulic calculations must take account of other systems which may activate at the same time to ensure adequate water flow and pressure to all systems, and must assume worst case situations such as flows at the least favoured sprinkler head rather than most favoured (such as sprinkler head furthest away from the water supply rather than closest).

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Sprinklers have been proven over many years to be reliable. However, they do have some limitations. In particular for waste management sites: If there is a large vertical distance between waste storage/treatment and sprinkler heads then heat from a fire will take time to reach the sprinkler head and activation may be delayed, or not occur at all. This is an issue in high waste halls (see below).

This is not to say that sprinklers in this type of situation are not effective in terms of building protection - if sufficient heat to cause building damage reaches a roof then the sprinklers will certainly activate and are likely to help protect the building structure. However, in high waste halls sprinklers are unlikely to be effective in dowsing an open flame fire in the waste itself and may need supplementing by other systems, such as deluges and/or automatic water monitors.

Roof height and sprinkler systems: Sprinkler systems activate using frangible bulbs at the spray heads. When exposed to heat these bulbs burst causing the sprinkler to activate. Fundamental to sprinkler systems is that heat must reach the sprinkler head for the system to activate, and that only those heads where the bulbs burst will flow water.

Deluge systems are different (see below). They may look like sprinkler systems, but the spray heads are open and do not have bulbs. Deluge systems are activated by a separate detector, such as IR, triple IR etc. The detector sees a fire and activates the valves and pumps etc associated with the system. The same principle applies to other suppression systems such as automatic oscillating water monitors, which are activated by a separate detection system.

Because sprinkler system bulbs need to be exposed to heat for the sprinkler spray head/s to activate, the height of the building is a critical factor. The further away vertically from a fire a sprinkler head is the more time it will take for heat to reach the sprinkler head, and the longer the time delay before the sprinkler head will deploy. The longer the time delay before the sprinkler head deploys, the larger the fire will be before it deploys. The larger the fire, the more water will be required to suppress the fire. In brief, the greater the vertical distance between potential fire and sprinkler system, the greater the water density and flow required. There are other factors such as evaporation of water droplets, but time delay is the main issue.

Experience from fire/risk engineers is that vertical distances of more than around 6 or 7 metres between a fire and sprinkler head/s can result in unacceptable delays in sprinkler activation, or no activation at all (note – the 6 or 7 metres quoted above is not intended as strict guidance and will depend on specific situation and system).

Case study. A fire at a UK waste transfer station in 2015 illustrates this: The vertical height between the fire and sprinkler system was around 7 to 8 metres. Despite there being a substantial fire in the transfer hall for at least five hours only one sprinkler head deployed (the one directly above the fire). The water flow provided by this one sprinkler head likely had little effect. The fire was extinguished by the local Fire and Rescue Services, with no injury and minimal property damage.

In addition to the risk of delays in sprinkler activation, high waste halls can also pose water supply issues - the higher the hall the greater the water flow/density required, because of the likely delay in activation. For very high waste buildings this may result in unacceptable (or at least very costly) water demand requirements.

The above does not mean sprinklers are not suitable for waste management. Sprinklers have been proven over time to be effective. However, their use in high halls may need careful consideration.

Gantry level sprinklers and 'shaded areas: Another problem for roof mounted sprinkler systems is that many recycling/recovery halls contain a lot of obstructions such as plant and equipment (conveyors, screens, gantries etc). These will block (shadow) water from a roof sprinkler system.

For example, if a fire starts under a conveyor water from a roof sprinkler may not reach it - the water hits the conveyor and runs-off rather than hitting the fire. In these situations, gantry/low-level sprinkler systems should be considered to supplement roof systems. These are sprinklers located under or alongside conveyors etc. Gantry/low level sprinklers have two advantages:

- They overcome the shadow effect
- They are likely to be far closer to a fire and will activate more quickly

In general (codes/standards vary), where any gantry, conveyor, screen, conveyor etc is >1 - 1.2 metres wide gantry/low level sprinklers should be fitted. Careful placement of gantry/low level sprinkler systems is required to avoid pipework and sprinkler heads being damaged by plant movements, including mobile plant, and maintenance requirements should also be a factor to consider. This shadowing issue can also apply to roof mounted deluge systems.

Deluge systems

Deluge systems are similar to sprinkler systems, but they have 'open' spray heads rather than bulbs. Deluge systems activate when a fire detector detects a fire (the detector activates a valve which releases water into the deluge system). Unlike sprinkler systems, where water will only come out of the spray heads where the bulb has burst, for deluge systems water will come out of all of the spray heads in the system.

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Deluge systems can cover entire areas (such as a waste storage area) or specific items (such as a conveyor, a trommel screen or a shredder feed hopper). They can be roof mounted, or mounted at a lower level, such as wall-mounted above a waste storage bunker or above conveyors. Where a deluge covers an entire area, the detector cannot usually spot exactly where a fire is (most detectors simply detect a fire in an area rather than where exactly in that area the fire is). As a result, for deluges covering an entire area their specification is given as a water requirement across the whole area.

Where deluges are in conveyors, screens etc the same specification of across the whole area is given, but in these cases, it is the area of the specific item being protected (such as the area of the conveyor, shredder feed hopper, screen etc). This is because the detector/s are in/over the specific items and can detect much more specifically where the fire is. Note - detectors must be specific to items for this to be the case. It is no good having one in-item detector covering five conveyors. Most of this type of deluge system has 'legs' (also called zones), such as five legs covering five conveyors (one leg for each conveyor). In these cases, water calculations should take account of the worst-case scenario. For example, for a seven-leg system the worst case may be only that four legs would need to activate.

Deluges covering whole areas can have very high-water supply needs, because the detector does not know where the fire is and the whole system is activated. For this reason, deluges covering an area are often also split into legs/zones covering different zones in the area. Each zone has its own detector which only activates the deluge leg feeding the deluge over the specific zone. This reduces water supply requirements but requires multiple and/or complex detector systems.

The specification of deluge spray heads and number of heads should be such so that the whole area is covered. This will depend on factors such as distance from deluge head to item being protected etc. Of course, deluge systems are reliant on their detector/s, and in most cases a manual activation facility should also be provided (see above on manual activation).

Oscillating and non-oscillating water monitors

Automatic oscillating water monitors function like large garden sprinklers. They are normally activated by fire detectors (in the same way as automatically activated deluges), although manual activation can also be provided. The detector detects a fire and releases water into the oscillating monitor pipework system and so to the monitor spray head/nozzle. The hydraulic pressure of the water in the system also causes the monitor to oscillate from side-to-side so spraying the water over the area covered. In the case of a manually activated system a person activates the monitor by pressing a button or similar.

Non-oscillating water monitors operate in the same way, but do not move from side to side and rather provide a directed spray at a smaller area or specific point.

Where oscillating monitors are used, they must cover the entire area being protected with no 'blind spots'. If blind spots do exist, they should be covered by supplementary means, such as a deluge spray head under a monitor to fill a blind spot directly under the monitor where water from the monitor cannot reach.

The assumption when designing oscillating water monitor systems should be that one monitor may fail. For example, if two monitors are installed then the whole area must be capable of being covered by the remaining one monitor on its own. If four monitors are installed, then the whole area must be capable of being covered by any three monitors etc.

Water flow requirements for monitors are different than for deluges and sprinklers and are usually expressed simply as a total water flow through each monitor, or overall flow through all monitors in an area. This water flow is dependent on combustible occupancy, in the same way as water density is determined for sprinkler and deluge systems. As for deluges and sprinklers water volume and pressure/hydraulic calculations for monitors must take account of multiple suppression systems potentially being in use in any one area at any one time to ensure adequate water flow and pressure in all systems. And, that all monitors will receive adequate water flow.

Placement of oscillating water monitors should be considered in terms of maintenance requirements, potential damage from plant and equipment movements and to avoid any blocks (such as bunker walls or plant/equipment which may block the water spray from a monitor). As most oscillating monitors move from side to side design drawings often show the 'arc' of movement and water ‘throw’ - this should reach all parts of the area to be covered. Nozzle type used should also be considered - too tight a nozzle may produce a water stream which could 'blast' wastes around so promoting fire spread - wide area cover nozzles may be better for many waste management applications.

Foam systems

Foam fire suppression systems are not common in waste management plants but seem to be becoming more popular for reasons such as that they typically require lower water demand than equivalent water deluge, sprinkler or monitor systems. Typically, foam systems include a foam storage tank/vessel for the foam suppressant concentrate. A fire detector activates the system by pumping water into the system, which mixes with the foam concentrate, producing the foam which is sprayed onto a fire through spray heads/nozzles or similar.

Foam suppressants come in different densities and types, and foam ‘mix’ and delivery systems come in different types – this is a complex area and it is essential that the correct foam type and mix/delivery system is used for the specific application at your site.

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Foam systems depend on smothering a fire, so excluding oxygen, to work effectively. For piles/stacks of wastes the foam must cover the entire surface of the waste including any irregularities and dips, or the foam must ‘cling’ to sides of any pile to effectively exclude oxygen. This can be difficult to arrange in waste management applications. Foam systems were originally designed for liquid fires, and as a matter of physics liquids are always flat – this is not the case for most wastes.

In addition, another potential issue with foam is that large open-flame waste fires tend to generate lots of heat and thermal air turbulence, which may blow foam away and/or evaporate it.

Foam systems can also be used in enclosed conveyor systems, or with other similar enclosed recycling and recovery equipment. The foam ‘floods’ the enclosure to exclude oxygen. As for other uses, the density and type of foam and delivery system type used should be tailored to the application.

Foam suppression systems have been used in many industries to good effect and have been used in some waste management applications effectively. Set against this, they are typically more complex than simpler water fire systems and require detail design and tailoring to specific applications. The benefit is that they use less water, which on large systems may be a significant factor.

If you are considering a foam system you should consult with your environmental regulator as run-off from a fire may contain contaminants which require specific attention in terms of pollution.

Tip – some insurers have very specific requirements for foam systems, and some may not accept foam systems at all. You should liaise with your insurer to ensure that any foam system you are considering will be acceptable to them.

Water mist, gas, and aerosol etc suppression systems

The above are the most common types of suppression system found at waste management plants. However, there are other systems such as gas, water mist and aerosol systems. Typically, these may be installed where there is a perceived risk of damage to equipment being caused by the use of high-flow water fire systems such as sprinklers. For example, MCC (motor control) or electrical equipment rooms, or at hydraulic power-pack enclosures. Water mist, gas and aerosol systems, and other similar, require very careful and specific design – they are limited, and specialist applications and you would be well advised to consult with your insurer before considering such systems. They must be completely tailored to their application and environment. In addition, they are typically more complex and have higher maintenance and check/test requirements. They can be a valid alternative to high-flow water systems, but if you decide you need gas, water mist etc systems then you need to accept this likely higher design cost and complexity and higher maintenance resource. And, ensure that required maintenance is actually carried-out, or you risk the system becoming ineffective.

Tip – many insurers are not that keen on gas, water mist, aerosol etc systems, or they require some specific design criteria to be met. If you decide you want gas, water mist, aerosol etc then you should liaise with your insurer to ensure you do not end-up with a system your insurer will not accept.

4.6. Sprinkler, deluge, monitor, foam etc system design

Sprinkler, deluge, water monitor, foam etc suppression system designs are not generic. For example, the design of a sprinkler system can change based on factors such as the commodity class of the waste, the storage height of the waste and distance to the sprinkler heads, the storage configuration of the waste (where and how stored), the building height/clearance (distance between waste and ceiling). In addition, the area of operation of a sprinkler system can change based on factors such as whether the system is a wet, dry or pre-action system, roof slope etc. These factors are very likely to be different from site to site. This is a case of one-size-definitely-does-not-fit-all. Fire systems are not standard, and you should ensure that whatever system/s you decide to install are designed and specified for the wastes you store or process, the building they are in and the specific requirements and environment of your site/plant. And, if you change the types of waste you store or process, their storage locations, the layout of storage etc you will need to reassess your fire systems.

4.7. Summary table automatic fire systems, issues and example applications

The table below gives automatic system types, comments on their use in waste management, and example potential applications. It is not intended to be comprehensive, and all system applications require specific assessment. The below is simply a guide and is not intended as a set of strict rules.

Automatic system	Comments/issues	Example waste management applications
Roof level sprinklers	Robust and reliable, but if vertical distance between wastes and sprinklers is circa >6-7 metres may suffer delayed or no activation in high waste halls	Lower waste buildings where vertical distance wastes to sprinklers is less of an issue, above plant/equipment systems (where distance to sprinkler head is not an issue) and as building protection
Gantry level sprinklers	Removes problem of shaded areas under plant (conveyors, gantries etc) which water from roof level systems may not reach. May be prone to physical damage and may need protection	Under conveyors, access gantries, screens and similar which may block water from roof level systems

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Roof level deluges	As for roof mounted sprinklers but activated by detector. Delayed or no activation less of an issue. But water demand can be high (sometimes very high) leading to multiple deluges zones to reduce water demand and complex multiple detector systems to activate individual zones	General use waste halls, above wastes stored internally, waste bunkers etc
Lower-level deluges	Water demand may be less than for roof deluges, and may be easier to target specific areas, but multiple/complex detector issues may remain	At waste storage areas and bunkers, under conveyors and similar
Dedicated deluges	Deliver water direct to where it is needed, but can be difficult to arrange in some plant, and higher water demand may result in complex, multi-leg systems. Typically require fast detector systems to be effective	Above shredder input chutes, in conveyor systems, in/above trommel and other screens
Oscillating or fixed water monitors	May have lower water supply needs than equivalent deluge systems but must be capable of covering whole of area within their operating arc. Obstructions (plant, gantries etc) may block water stream from monitors, and nozzle type may need careful selection to avoid burning wastes being 'blasted' about promoting fire spread	Larger waste reception, treatment or storage halls/areas where roof sprinklers may not be effective and where obstructions from plant and walls is not an issue. Note – some oscillating water monitor systems are in use in outside applications and may be an option for external storage of wastes
Foam systems	Lower water supply needs than equivalent water sprinkler, deluge etc systems, but foam itself and systems may be costly. May not be effective if all of the waste cannot be 'enclosed' in foam, and may be affected by thermals from large fires ('blown away' or evaporated)	In-conveyor systems or other enclosed items of plant, applications where wastes are fairly 'flat' so that foam can enclose whole of surface
Water mist, gas, aerosol etc systems	Specialised, may be expensive and have expensive maintenance and check requirements. No standards in place and insurer acceptance critical. But, can pose less of a risk of damage to electrical etc systems when activated	MCC and electrical rooms, subject to insurer acceptance

Summary: There are multiple options when choosing fire suppression/extinguishing systems. The critical factor in choice must be effectiveness. But, other factors such as water demand and cost may also be valid. Beware any consultant or supplier who 'jumps' quickly to a single option without careful consideration of use, environment and other specific aspects of your site/plant.

5. Water demand, supply and water mains

5.1. Water demand, supply and water mains introduction

The principle aims of any water supply to a fire system are that the supply is reliable and adequate. Most fire suppression and fighting systems consume large volumes of water. Sufficient water supplies must be available on-site to fight a worst-case scenario fire. Dependent on various factors, insurance standards require on-site water supplies to last typically for 90 to 120 minutes (examples only and may be higher, or lower).

Some people ask why water supplies need to last for so long, stating that water supply would only be required until the fire brigade arrives. The average fire brigade tender only carries some 1,800 - 6,000 litres of water, depending on type of tender - enough to supply a reasonable size sprinkler system for perhaps a minute or two... Unless you have a water main, tank or alternative supply which can be fed into the Fire and Rescue Services vehicles and pumps they will be of limited use. In addition, and understandably, the Fire and Rescue Services may not want to enter a smoke-filled and hazardous building to fight a fire if life is not at risk.

In general water supplies can come from three sources:

- Water tank/s on site with pumps feeding a water main
- A non-tank fed fire/water main on site, such as from a commercial supply main
- Alternative water supplies such as a near-by river, canal, lake, lagoon etc (in some rare cases wells can be used, but their capacity and recharge characteristics must be adequate)



Left to right: Large foam system under test at a waste recovery plant, sprinklers in action at a recycling plant, manual-use water monitor at a waste site, under-gantry sprinkler head and pipework at a recycling plant

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Water supplies can be either pumped (typically from on-site water tanks or from alternative water supplies) or un-pumped (typically from site fire/water mains).

When calculating total water supply requirements for your fire systems the realistic worst-case must be assumed. Generally, this is all fire suppression/fighting systems in the highest water flow requirement area/compartment of the site being active at any one time. The exception would be for in-conveyor and similar deluge systems where a worst-case scenario may not include all of the legs/zones of the deluge. Plus, allowance should be made for manual hoses/monitors etc.

For example, the highest water flow requirement area of a site may have in place a sprinkler system, a seven-leg in-conveyor/screen deluge system and manual fire hoses/monitors and hydrants. Total water demand would be the flow requirement for the sprinkler system plus flow requirement for the worst-case number of legs in the deluge system (for example, four legs out of the seven) plus an allowance for the manual hoses.

For example, total flow requirement for the above sprinkler, deluge and hose system, might be as high as 10,000 litres of water a minute. If the supply needs to last for 120 minutes, this means that on-site water tanks (or other sources) would need a volume of some 1,200,000 litres. This is 1,200 m^3 of water, or 1,200 tonnes. Often the most expensive parts of any fire suppression system are the tank, pumps and water main required. In brief, fire suppression systems can consume very large volumes of water very quickly.

You should consult with your environmental regulator on this aspect. Using the above example, where will the 10,000 litres of water flow to if the fire system is activated? Containment of contaminated fire water is an issue you should consider carefully and in consultation with your environmental regulator.

5.2. Alternative water supplies

If alternative water supplies, such as from a nearby river, are to be used to supplement tanked or mains supplies, then these need to be capable of being accessed promptly. There is little point in assuming that a near-by lagoon/lake/canal can be used as part of water flow requirements if it would take three hours to arrange pipes and pumps to this lagoon/lake/canal (in these cases fixed pipes and on-site pump capacity may be required). Alternative water supplies also need to be reliable: Relying on a lagoon which is only half full or empty for part of the year may result in water shortage issues. In addition, the alternative water supply may contain grit, gravel, sediments etc and filter systems may be required to reduce the risk of blockages in pipework and hoses and damage to pumps.

Overall, alternative water supply requirements need careful thought - it is far better to do this in advance rather than wait for a fire and then run-out of water after a short period of time or be unable to access water quickly and effectively.

One source of alternative water supply is the recirculate water. For example, water from a deluge system may flow into a sump on site from which it can be pumped back into the deluge system, or water run-off from hoses may flow into a lagoon where it can be recirculated from. This sounds attractive as a way of reducing water storage requirements, but can have issues:

- Grit, gravel, sediment etc can be an issue, as for lagoons, rivers etc
- Recirculating fire water may concentrate hazardous substances and/or biological agents – the water will have passed through burning wastes, and the more times water passes through this cycle the more these may concentrate. This may pose health issues to those fighting the fire
- The eventual run-off water may be more concentrated in its contamination than water only used once, which may pose environmental damage issues
- How will you capture the water? For sites with sumps this may be easier, but otherwise there will need to be a method to channel 'used' fire water to where it can be accessed

If you are considering recirculating fire water, you should consult with your Fire and Rescue Services and environmental regulator. There may be compromises you can arrive at. For example, using recirculated water in fixed systems such as deluges but not manual systems such as hoses (that is not in systems where a person may be at the 'point of delivery' and so may be exposed to harm).

While there may be some small-scale exceptions, it is very unlikely that an un-pumped water supply, such as a commercial main, will be able to provide anything like sufficient volume or pressure to feed even a moderately sized fixed fire system.

5.3. Water mains and supply to fire systems

Large waste management plants will typically have a water 'fire main' to supply their fire systems, fed from a water tank or other reliable supply. This main may be a ring-main around the whole site, or a single main with branches. In most applications for large sites a ring-main may be better as water can be fed from both ends of the ring, so if a leak or block occurs water supply can be maintained.

For example, at a smaller site equipped with a sprinkler system and manual-use water monitors a single underground main from a water tank may be installed, feeding a manifold at the waste hall. Pipes from this manifold feed the sprinkler system and each monitor. In this type of arrangement, you may want to consider having two mains legs from the tank to feed the manifold from both ends. In the event of a leak in one leg, this leg can be valved-off to maintain water supply.

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For larger sites with multiple fixed systems an underground ring-main is more likely. From this ring-main, 'lead-ins' come-off the main to manifolds in the waste hall/s etc. Pipes from these manifolds feed specific fire systems. Between each lead-in off the ring-main an isolation valve (sectional valve) must be fitted. This is in case of a leak or other failure in the main or a lead-in - the affected section can be valved-off and water fed from the other end of the ring-main. Whatever system is used, valves and other parts of the system must be to fire engineering standards - normal water valves and other components are not good or reliable enough.

Water supplies can be pumped or un-pumped. Un-pumped supplies are unlikely to be able to supply the pressures required for sprinkler and deluge systems (6 – 10 bar often being required). Un-pumped supplies may be sufficient to feed hydrants and fire hoses, provided the flow is adequate. For sprinkler, deluge etc systems pumped supplies are very likely to be required.

Pumps must be able to supply adequate water volume and pressure for the systems they feed. In most cases two pumps are better than one, in case of failure. The more volume of water a pump provides the lower the pressure becomes. Fire pumps should have 'performance curves' provided by their suppliers showing the relationship between volume provided and pressure - maximum supply requirement must be within this performance curve.

Typically, water mains and lead-ins will be underground, with the lead-ins coming to surface to feed manifolds and systems. For above-ground pipes consideration must be given to freezing, and pipes either lagged or fitted with trace heating up to the point at which they become 'dry', if dry systems are installed (no water in the pipe in normal circumstances). Beyond control valves between wet and dry sections pipes typically do not need to be protected. However, drain-down points must be provided so that following tests of systems (or use) water can be drained out of dry sections to prevent freezing and pipe failure.

At a maximum one lead-in from a main should normally only supply up to five applications. One sprinkler system would be one application, one deluge is one application, one hose or hydrant is one application, one water monitor is one application (for multiple water monitors where one monitor is duty and one stand-by these may sometimes be considered in some situations as one application).

However, this is a maximum and good risk engineering should be used - having just one lead-in to a large sprinkler system may leave it open to failure. The number of lead-ins and number of applications on each requires risk assessment to prevent large sections of fire suppression equipment being impaired in the case of a leak or similar failure in the main and/or a lead-in.

Ideally, each application should have its own lead-in, but this is often not practical. One potential solution is to run above-ground pipes between manifolds where lead-ins split to feed systems. In this way a manifold can be supplied from both ends in the case of a leak or other failure.

All pipework, (and all fire system components) including feed pipes to sprinklers, deluges etc, must be to the appropriate standard, including their construction, materials used, joints etc. For example, the standards in NFPA for water pipes to supply fire systems. As above for sprinklers and deluges, all pipework must be hydraulically balanced to ensure adequate water flows. Valves and other pipework items must be to fire engineering standards - general water supply valves etc are not reliable enough for fire systems as a failure in just one valve can have severe consequences should a fire occur.

5.4. Supply to hoses and other manual systems

Manual systems, such as hoses, can be fed either from pumped water supplies, or non-pumped supplies such as a water main running around a site with hydrants located on it. The pressures in these different systems will be different. It is not possible to predict what water flow will be required for manual systems. This will depend on many factors, such as how many hoses are used both by site staff and/or by the Fire and Rescue Services if they attend a fire. As a result, water demand requirements for such systems are normally simply given as an 'allowance'. This allowance depends on factors such as combustible occupancy and requires calculation by a competent person.

Note - where hoses and manual-use monitors are both provided the calculated allowance should be provided for each system: For example, if the allowance is 2,800 litres/minute then this should be 2,800 for hose use and an additional 2,800 for manual monitor use.

Where required, on-site hydrants should be easy to access, clearly signed and typically spaced around buildings at no more than 75 metre intervals (dependent on site-specific assessment). And, any hoses kept on site should be long enough to reach all parts of the site from the nearest hydrant.



Left to right: Fire water tanks and pump house at a recycling plant, inside a pump house, foam storage tank and systems at a large waste recovery plant

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6. Other factors

6.1. Plant control actions

Detectors activate alarms and/or suppression systems. They can also instruct plant control systems, such as emergency-stopping conveyors to prevent fire spread. The specific plant actions required when detectors activate in the event of a fire is a matter for careful assessment. For complex waste management plants, it is critical that it is clearly understood what actions (fire system actions and plant actions) are produced by specific activations of detection systems. For example, for a fire detection in one area of a plant you may want conveyors in that area to stop, but for other parts of the plant to continue operating to clear wastes from adjoining areas to reduce the risk of fire spread.

For large and complex plants, a consequences matrix is one way of recording these actions. Typically, consequences matrices start by listing the detection systems in each compartment/area of the site/plant. Next to these is noted what alarm the activation of a detector produces, then what fire systems are activated and then what plant control actions occur when a detector is activated. This can provide a clear and concise view of what does what and what activation produces what actions.

Consequences matrices can also be:

- Used during plant and fire system design to ‘think-through’ detector activations and what suppression/extinguishing system and plant actions are required, and in what order
- Extended to include what actions are expected of employees for specific scenarios and detector and alarm activations, which can then be used as a training aid
- Used as a checklist to test actions for existing plants – for example, it may be expected that a detector activation in one area produces specific alarm, fire system and plant actions, but does it really? There are examples of waste management plants conducting checks using a consequences matrix only to discover that their suppression/extinguishing systems and plant actions do not occur as they expected

6.2. Life safety

In developing and designing a fire system you will need to ensure that an assessment and allowance is made for any situation where you have employees in an area where fire systems may activate, or who may be affected by the actions of automated fire systems. You will need to ensure that the automated responses aimed at containing and dealing with fire, smoke, and fire water run-off cannot inadvertently trap or delay the escape of personnel.

6.3. Electrical systems and fire systems

In developing and designing a fire suppression system you will need to ensure that consideration is given to the potential for water from fire suppression systems or fire water run off to interact with the plant electrical systems. Although the automated fire activation systems may isolate the electrical supplies to the area, where fire has been detected machinery can retain significant quantities of stored energy, especially where an emergency shutdown process has been executed.

Junction boxes and electrical panels within the arc of water monitors (especially cannons) need to be rated to resist the water they may be exposed to. Electrical systems should be at high level, or where unavoidably floor mounted, raised up on plinths to a level where they will remain clear of any fire water run-off. Critical systems may need further protection, both from fire and the actions of fire systems.

6.4. Commissioning, testing and maintenance

Fire detection, alarm and suppression/extinguishing systems are complex equipment, and in common with all complex equipment they need to be commissioned, tested and maintained.

- All newly installed fire detection, alarm and suppression/extinguishing systems must be commissioned to ensure that they function as expected and required. Commissioning testing will also allow the supplier/installer to issue a certificate for the system, which your insurer may want a copy of. Your insurer may also have specific requirements for commissioning and may want to witness commissioning tests – you should liaise with your insurer on this. For a simple detection and alarm system commissioning may be straightforward (a function test). For more complicated systems commissioning may be lengthy and complex

- All fire detection, alarm and suppression systems need regular maintenance, testing and checking. Detail of the timing and content of specific maintenance, checks and tests required should be provided by the supplier/installer. However, your insurer may also have specific requirements (see below on insurer requirements) which you should also include in your maintenance, testing and checking regimes. Maintenance, testing and checking should be recorded, and these records kept, as for any item of equipment. Systems should also be subject to defect reporting and repair regimes. In serious cases a defect in a fire detection, alarm or suppression/extinguishing system may mean that operations, or part of an operation, may need to stop until a repair can be made (and you should certainly inform your insurer of any such defects and consider additional temporary controls such as manual fire watches). You may wish to identify any such potential critical impairments in advance and plan for them

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Tip – for large complex sprinkler, deluge etc systems commissioning may involve live-testing of the system. This may be difficult to arrange or may pose a risk of damage, such as live testing of a wide area deluge which releases thousands of litres of water onto equipment (something you really only want to occur if there really is a fire). In these cases, a combination of air pressure testing of pipework to ensure no leaks, and volume testing of mains and lead-ins may be better. For example, discharge of water from a lead-in from a main into a tank rather than the actual system it feeds to assess water flow and pressure.

Experience is that in the event of a fire detection, alarm and suppression systems can fail, or not perform as expected, for a variety of reasons. This may be because the system is under-specified or unsuitable for the application and environment it is being used in. However, one of the most common reasons is that the system has not been maintained, tested and checked as it should have been. Or, that a defect in the system had been identified but not addressed.

6.5. Fire compartments and fire walls

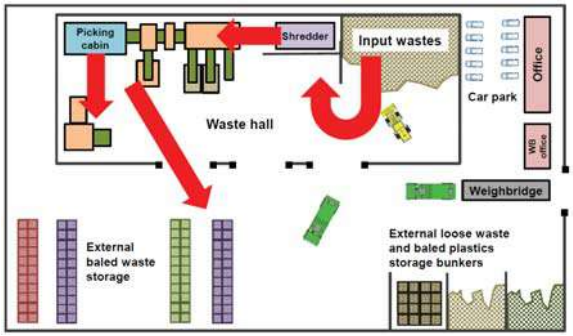
Compartments

The use of fire compartments is common in many types of building. For example, a large office building is likely to be split into ‘compartments’ separated by fire walls with fire doors. The aim of splitting buildings into such fire compartments include reducing the risk of fire spread, so reducing damage, allowing time for people to evacuate more safely, and allowing fire systems such as sprinklers time to do their job.

However, in many waste management applications fire compartments are difficult to arrange and may be impractical. This is usually because of a need to move materials (wastes) between sections of the plant/building. Using the illustration recycling plant given in the section above:

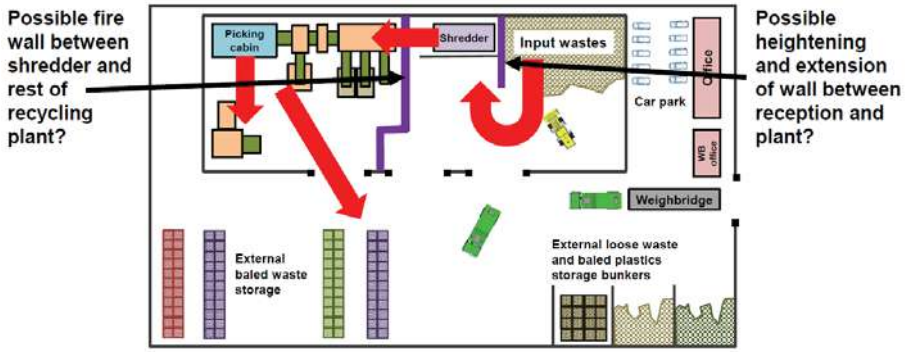
- Wastes need to be moved from the reception area to the input shredder of the processing part of the plant (in this case by use of a loading shovel, grab crane or similar)
- Wastes once fed into the shredder at the start of the process then need to travel via the shredder’s output conveyor into the rest of the plant for separation into recyclates
- Once separated wastes need to be moved to the baler, or to external storage

This type of practical requirement tends to mitigate against splitting waste management plants into compartments. However, this is not to say that compartments are impossible, or that the idea of splitting a plant to reduce the risk of fire spread should not be attempted. The illustration recycling plant diagram below shows possible required waste movements, as indicated by red arrows.



As noted in the section on design above, two of the main fire risks at the illustration recycling plant above are fires in the waste reception area (self-heating, hot and hazardous materials in input wastes etc), which could spread to the recycling plant, and fires in the shredder (gas cylinders, lithium batteries etc), which could also then spread to the rest of the recycling plant.

Using the illustration, it may be possible to install a fire wall between the shredder and the rest of the plant, splitting the building into two compartments. How practical this is will depend on mobile plant movements, structure of the building and other factors (and is likely to be easier at a new build than as a modification to an existing plant). If you are designing a new build plant, then extending the length of the shredder output conveyor will make installation of a fire wall easier – fire/risk engineering should be considered alongside process engineering in new builds. And, of course there will need to be a 'hole in the wall' to allow the output conveyor from the shredder to pass through to the rest of the plant (see below on fire shutters etc).



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While this would not split the building into 'true' compartments, consideration could also be given to raising the height of and extending the length of the push-wall between waste reception and the shredder to reduce the risk of fire spread (see below on fire walls at bunkers etc).

However, even if you can split your facility into compartments, there will very likely still be a need to move wastes between compartments, typically via conveyors, resulting in imperfect fire walls with 'holes' in them. Fire can spread through such holes by various mechanisms, such as:

- The conveyor itself may have combustible components, such as rubber belt conveyors
- While the conveyor may have been emergency stopped in the event of a fire, residual wastes may still be on the belt which can cause fire spread
- Hot combustion products, such as gasses, can transfer heat via any 'hole in the wall' igniting combustible materials on the other side, or radiative heat itself can breach the wall via the hole
- If the conveyor bed and carriage are steel, then this can heat-up in a fire carrying this heat through the fire wall by conduction

There are various options here:

- Fire shutters – these are typically 'hatches' which slide into place in the event of a fire blocking the hole in the fire wall. These may be difficult to arrange in waste management plants because of the irregular shape of holes required to pass conveyors – they may be impractical to fit and/or ineffective in use because they do not fit exactly in the 'hole'. Fire shutters also require routine cleaning (debris such as wastes can stop them closing) and maintenance. Shutters can be automatic and triggered via the same detector/s as deluge and other systems, or manual (automatic is usually preferred for the obvious reasons)
- Water curtains – these spray a curtain of water across the 'hole'. Some insurers do not accept water curtains as they have proven to be ineffective in some cases in stopping high levels of radiative heat passing through – and waste fires can be intense. Check with your insurer before you decide on the use of water curtains
- Deluges – typically arranged longitudinally along conveyors passing through holes. Obviously the longer the conveyor the longer the deluge array can be, and the more likely it is to be effective

If using deluges and/or curtains at holes in fire walls you should consider all of the potential mechanisms for fire spread. For example, deluges should be extended to under the conveyor, and may need to cover conveyor carriages etc to reduce the risk of heat transmission. You may also use combinations, such as a fire shutter backed-up by a deluge.

Note – the examples above assume that a conveyor is the potential issue. There are other mechanical transfer methods such as automated grab cranes, screw elevators and others. As for many other aspects of fire/risk engineering at waste management facilities, specific assessment is required if an effective outcome is to be achieved.

One area where compartments are often seen at waste management plant is with MCC rooms, hydraulic power-packs and similar. These are often in separate compartments (rooms, containers etc) protected by fire walls. For example, it may be practical, depending on your plant's layout, to locate MCC rooms and power-packs in steel containers/separate buildings (such as a brick outhouse) outside of the building: Why place such critical items in higher fire risk areas such as recycling halls unless you have to? If you do have to locate such items in waste halls and similar, protecting them by the use of compartments would likely represent good risk management.

Whatever their location, components such as MCC rooms and power-packs suffer the same 'holes' problem as conveyors, albeit to a lesser extent. They need to be connected to the plant, such as via cabling, hydraulic hoses and pipes etc.

These connections need protecting:

- All holes/breaches in fire walls need sealing, such as with fire resistant foams
- You may want to consider other protection to cables, pipework etc, and where you locate them to make them less prone to damage during a fire
- Hydraulic power-packs should be interlocked to shut-down and depressurise in the event of a fire, via link to your fire detection and alarm systems (non-flammable hydraulic oils may also be possible dependent on the technical specification of the power-pack)

One of the most common faults found during site fire inspections are holes 'drilled' in fire walls to allow cables, pipework etc to pass through the wall without any sealing or other protection being applied. In particular during the installation of plant and during new builds such faults should be high on your agenda during periodic inspections of works and 'snagging' lists.

Fire walls

There are set standards for fire walls, and you should consult with your insurer to ensure you have selected the correct standard. Typically, fire walls are 'rated' by how long they will resist fire spread, such as 30 minutes, 60 minutes, two hours etc. The more critical a component (or life safety aspect) the higher the rating of fire wall required. A 30-minute rated fire wall in an office likely would not be appropriate to protect an MCC room or other critical component.

Fire walls also formally need to be installed by accredited installers, as for other fire related systems. Again, your insurer should be able to advise you, and see the BRE website for information. Notwithstanding this, and on a practical note, a 300 mm thick concrete wall is likely to provide a good degree of fire resistance whether it has been installed by an accredited installer or not. To be effective a fire wall needs to be able to resist fire and not have any breaches in it which could result in fire spread. In addition to the issue of 'holes' in fire walls as noted above:

- Railway sleepers cannot be considered as fire walls – they are made of wood, which in itself is combustible, and have frequently been treated with flammable preservatives
- A bunker constructed of blocks may provide an adequate fire wall. But, concrete 'A' fames may not as there are likely to be gaps at the corners of the bunker where the 'A' frames do not meet exactly. Conversely, 'A' frames arranged in a linear wall to separate waste stacks, or waste stacks from a building wall, may be adequate because there are no corners to contend with
- Steel walls may resist fire, but they will heat-up during a fire and may transfer heat. As such their use may be limited. For example, steel walls between a series of waste bunkers may not be effective as a block to fire spread. However, if the bunker is stand-alone then while heat may radiate from the external face of the steel wall this may be acceptable (this type of application requires specific assessment)
- Recently, some flexible 'curtain' fire wall materials have been brought to the market. If you are contemplating such you must discuss with your insurer as they may not accept these

One of the most common use of fire walls in waste management is in storage bunkers (and reception areas etc), both internal and external. In addition to the points noted above on fire walls, in general:

- Bunkers in waste halls and similar (internal use) do not result in fire compartments – they are open-topped and cannot be considered as compartment walls
- Fire walls in bunkers and similar are of little use if wastes are piled above their height, or if wastes spread-out beyond the wall ends. In general, at least 1 metre 'freeboard' should be left between waste height and wall top to account for flame height in a fire. You will need to control waste height and spread in bunkers and similar as part of your site rules and their enforcement
- Construction of bunker walls should be appropriate to their use as fire walls (see above), and maintained to ensure damage such as by mobile plant does not degrade effectiveness

One use of fire walls is to reduce the need for separation distances between waste storage stacks. For example, in the illustration plant used above plastic bales have been stored in a bunker. Provided that the walls of this bunker are appropriate and waste height and spread is being controlled this can be a good method to reduce the need to separate waste stacks by distance, so maximising site area. However, this type of use needs consideration – see main body of this guidance under storage.

6.6. Smoke vents

Smoke vents are openings located in the roof and/or upper walls of buildings. Their aim is to vent smoke and hot combustion products during a fire, so removing heat and energy from the fire and allowing better vision of a fire when fighting it. Vents may be:

- Fixed open – in such cases vents are normally located in the upper walls of buildings rather than the roof to prevent obvious problems such as rain ingress
- Automatic – vents which open in the event of a fire automatically, such as hydraulic or electric opening linked to the building's fire detection and alarm systems (usually with a back-up manual activation point in a safe location, as for deluges etc)
- Manual – vents which are opened manually, such as by pressing buttons in a control room and external panel in a safe location

Smoke vents can be the topic of debate, and some insurers and Fire and Rescue Services may have negative views of smoke vents (this is one area where you should consult with your insurer and local Fire and Rescue Services before you install). They can also have other problems:

- By venting smoke and heat vents may prevent heat from reaching sprinkler bulb heads, so preventing them from activating or delaying activation, and may also prevent smoke from reaching detection systems such as aspirating systems so preventing or delaying activation
- Vents may promote air-flow (chimneys) so encouraging a fire rather than helping

This is not to say that vents should not be installed – in some situations they have been proven to be beneficial. However, you should seek competent advice, and consult with your insurer and Fire and Rescue Services before fitting them.

6.7. Insurer requirements

Many insurers have specific requirements for fire alarm, detection and suppression/extinguishing systems. If you fail to meet these specifications and requirements your insurance may be invalidated. The basic rule here is: **TALK TO YOUR INSURER FIRST**.

- Certification/standards for fire detection, alarm and suppression/extinguishing equipment. Many insurers require specific certifications for fire systems, such as LPCB (Loss Prevention Certification Board) or FM (Factory Mutual). If you install a system which is not certificated to your insurer's requirements, they may not accept it and you may need to start again

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- Certification standards for installation and design of fire detection, alarm and suppression/extinguishing systems: As for the equipment itself, your insurer may insist that systems are designed and installed to specific standards. These may be design standards such as NFPA and FM standards, or they may be standards for installation, such as installers being certificated to LPCB standards. Again, if the designers of any system do not design it to your insurer's required standards and/or if installation is not by a certificated/approved installer then your insurer may not accept the system
- Standards for commissioning of systems: As above, your insurer may have specific requirements for the commissioning of fire systems
- Standards and conditions for maintenance, testing and checking of fire systems. These are often included in property insurance policies as conditions. For example, that sprinkler systems, fire pumps etc should be tested and checked to given timescales and standards. In the event of a fire you may be asked to prove that you complied with these conditions and requirements – if you cannot your insurance may be invalidated
- Impairment of fire detection, alarm and suppression systems: It is common for property insurance policies to include a condition that you must inform your insurer if any part of your fire system is impaired, such as faulty, damaged, not operational etc. You should inform your insurer if any part of your fire system/s is not working for whatever reason. Your insurer may require you to take specific action, for example if a detection system is faulty that you commence a dedicated fire-watch (you may want to anticipate such actions in advance – this would be good risk management in any case). If your system is impaired and you have not informed your insurer, in the event of a fire your insurance may be invalidated

You should read your property insurance policy (and any schedules and variations) carefully to ensure you are aware of conditions and requirements for testing, maintenance, impairments, certifications etc. If you are in any doubt you should contact your insurer for advice.

Tip – extract fire system requirements and conditions from your insurance policy. Then list these, and incorporate them into your operating procedures, testing, checks and maintenance regimes. Then ask yourself: 'in the event of a fire could I prove I complied with these conditions, such as by producing records?' If you cannot, you may have a problem making a claim.

Tip – many insurers require installers and maintainers to be accredited to the 'BRE red book'. Search the internet for 'BRE red book' to access the BRE web site, which includes lists of approved installers etc. But, check with your insurer first as they may have different requirements.

6.8. Summary on technical fixed systems

Fire system engineering is a complex and technical area. For example, the NFPA document NFPA13 on sprinkler system design is more than 440 pages long. For all but the simplest of fire detection, alarm and suppression/extinguishing systems competent external advice will very likely be required. Most waste management companies simply do not have the competency in-house to design sprinkler, deluge etc systems. However, be careful when selecting external advice - a local fire engineering company may not be aware of the issues associated with waste management plants and may recommend and install a 'standard' system which may not be effective at a waste management site. Ultimately, you should ensure that your specific needs are assessed and that your fire detection, suppression, fighting and alarm systems are adequate to and effective for the specific risks, situation and environment of your site.

6.9. Notes from the phase 3 WISH waste fire tests

The phase 3 WISH waste fire tests were primarily aimed at assessing the effectiveness of different fire-fighting media (water, water with wetting agent and foams) and FRS (Fire and Rescue Services) techniques against waste fires. However, two issues are worth mentioning in this appendix on fixed technical systems.

- Water with a wetting agent added proved most effective when fighting waste fires with FRS fire hoses. It may be possible to use wetting agents in fixed systems, such as deluges and water monitors. However, the addition of a wetting agent to water in these systems requires careful thought as this may change the characteristics of the system and may pose problems with pumps, valves and similar. This is an area where further research is required before any firm recommendations can be made
- Various types of detection system were tested during the phase 3 tests. In general, all of the detection systems tested were effective at detecting a fire at the surface of a waste stack. However, none were effective in detecting a deep-seated fire within a waste stack when the waste type in storage was of a small particle size or the waste type was flexible leading to little in the way of air spaces within the pile. For larger and more rigid waste types, such as pre-crush wood, air circulating through the pile allowed heat and smoke to escape, which could be detected. However, for RDF and similar air circulation is limited, if present at all, and none of the detectors tested could detect a smouldering fire buried deep with the pile until the fire breached the surface of the pile

For more detail see appendix 5 of this guidance.

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7. Commonly quoted standards

7.1. Introduction and scope

This section is an overview of a selection of standards and similar commonly used or of relevance to the waste management industry. Not all of the standards and similar deal directly with waste or waste sites, but all contain information, specifications and criteria etc, which can be useful for dealing with fire safety on waste management and processing sites.

This guide only highlights a selection of key standards and similar that might be of use to waste site operators. The list of included documents is not intended to be all-encompassing and other codes, standards etc should always be consulted when required or more appropriate for the matter at hand. There is no intention for this guide to give direction or advice on fire safety, to advise on the suitability of one standard over another or to be used as a complete reference to fire safety standards. This document is a brief overview of certain key standards and similar and how they might be of relevance.

7.2. List of commonly quoted standards and brief summaries for each

The below lists commonly quoted standards and similar. However, for ease of use first below is an ‘index’ of the standards included. The summaries following this ‘index’ are in the same order as the index, and in alphabetical and then number order.

Index of standards included

ACE Technical Risks: Energy from Waste – Fire Systems
BS 7974:2019
BS 8110-2:1985
BS 8489-1:2016
BS 9999
BS EN 710:1997+A1(2010)
BS EN 1992-1-2:2004
BS EN 12845
BS EN 12845
BS EN 14243-1
BS EN 14243-2
BS EN 14243-3
BS EN 15357
BS EN 15359

NEN 6060
NFPA 12:2018
NFPA 13:2016
NFPA 15:2017
NFPA 18:2017
NFPA 18A:2017
NFPA 20:2019
NFPA 22:2018
NFPA 25:2017
NFPA 750:2019
NFPA 850:2015

ACE Technical Risks: Energy from Waste – Fire Systems

The ACE Technical Risks Engineering Information Bulletin Guidance Document: Energy from Waste – Fire Systems Document.

Discusses general fire safety but with specific reference to the requirements of Energy from Waste sites and so covers topics such as waste site-specific fire separation recommendations and such like. This guidance document is no longer supported by ACE Group but can still be found in use regardless. A general document covering many aspects of fire safety systems in Energy from Waste sites, parts can be used with respect to waste processing and transfer sites. Please bear in mind that some of the standards referred to may be previous editions of current standards or superseded altogether by new documents. In brief, useful, but not supported anymore and may be out of date in some areas.

BRE 187 2nd Edition (2014)

External fire spread – Building separation and boundary distances

General guidance document covering fire spread between the exteriors of buildings. Particularly of use during the design stage of building works. This is a guidance document widely used throughout fire engineering for calculating whether external fire spread from a building elevation is a risk. Used alongside WASTE 28, can be used to determine whether a building is at risk of external fire spread from nearby waste piles/bale storage.

BRE 368

Design methodologies for smoke and heat exhaust ventilation

General guidance document for smoke and heat exhaust ventilation systems covering the design of such systems for use in large spaces. Has a fast/ultra-fast fire growth category that can be broadly applied to waste fires but is generally aimed at atria spaces and car parks rather than warehouse-type buildings and does not have any industrial occupancy groups. Useful as a guidance document when designing a SHEV system but has no specific, relevant categories for waste sites.

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BS 476-3:2004

Fire Tests on Building Materials and Structures – Classification and Method of Test for External Fire Exposure to Roofs

General standard covering tests for fire penetration of a roof by external fire and capacity for flame spread on the exterior surface of a roof. Defines fire test methods and criteria. Primarily useful for during the design stage of a building. Nothing high hazard/risk factor or otherwise categorically specific. To be used as a general document as required for ascertaining the standard to which materials and roof systems have been tested when designing for building works and specifying roof construction and materials.

BS 476-4:1970

Fire Tests on Building Materials and Structures – Non-Combustibility Test for Materials

General standard covering the British Standard test for determining whether a building material can be classified as non-combustible. Defines the fire test method and test criteria. Nothing high hazard/risk factor specific. To be used as a general document to support decision-making and discussion around building material choices when designing for building works and specifying material requirements and choices.

BS 476-6:2009

Fire Tests on Building Materials and Structures – Method of Test for Fire Propagation for Products

General standard covering the test methods for testing fire propagation. Usually used to test materials intended for use as internal wall and ceiling linings. Defines fire test method and criteria. Nothing specific to high hazard/risk factor or other similar categories. Useful as a general document for clarity and supporting information when designing building works, specifying material requirements and making material selections.

BS 476-7:1997

Fire Tests on Building Materials and Structures – Method of Test to Determine the Classification of the Surface Spread of Flame of Products

General standard covering the fire test method and criteria for measuring lateral flame spread along the vertical surface of a material. Nothing specific to high hazard/risk factor or similar categories. Recommended for use for clarification and supporting information when designing building works, specifying material requirements and selecting suitable materials for fire safety purposes.

BS 476-10:2009

Fire Tests on Building Materials and Structures – Guide to the Principles, Selection, Role and Application of Fire Testing and Their Outputs

General standard covering the basic principles of fire tests, the inputs and outputs of the BS 476 series of tests, the equivalent ISO and EN (International and European) tests. The standard also covers which tests suit which purpose, and how the output of each test defines what it can be used for and its role in the test suite.

This document is not specifically relevant to waste sites, however the standard is broadly useful for helping with the understanding of which tests can be used to give which classifications, and what material characteristics are quantified by each test. This is helpful when designing building works as it allows for a better understanding of what should be given as the fire safety specifications for materials in order for them to provide the required performance.

BS 476-11:1982

Fire Tests on Building Materials and Structures – Method for Assessing the Heat Emission from Building Materials

General standard covering the test method for determining the heat emission from a material. Defines the test method and criteria. Nothing high hazard/risk factor specific. To be used as a general document in support of designing building works, particularly when deciding on heat emission requirements and identifying suitable materials.

BS 476-12:1991

Fire Tests on Building Materials and Structures – Method of Test for Ignitability of Products by Direct Flame Impingement

General standard covering the British Standard test method and criteria for the ignitability of materials when in direct contact with flame. Usually referred to during the design stages of building works. Nothing high hazard/risk factor specific, useful during the design stage of building works as a supporting document to help in determining suitable performance requirements and finding qualified materials for fire safety purposes.

BS 476-13:1987

Fire Tests on Building Materials and Structures – Methods of Measuring the Ignitability of Products Subjected to Thermal Irradiance

General standard covering the British Standard test method and criteria for the ignitability of materials when exposed to thermal irradiance. Has nothing specific to high hazard/risk factor or similar purpose groups or categories. Useful for understanding test criteria and results to aid in specifying fire safety performance requirements and then selecting appropriate materials during the design stages of building works.

BS 476-20:1987

Fire Tests on Building Materials and Structures – Method for Determination of the Fire Resistance of Elements of Construction (General Principles)

General standard detailing the British Standard fire test method and criteria for quantifying the fire resistance of elements of construction.

General document with nothing specific to categories such as high hazard of high-risk factor. Useful during design stages to support decisions regarding fire resistance requirements and then suitable materials.

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BS 476-21:1987

Fire Tests on Building Materials and Structures – Methods for the Determination of Fire Resistance of Loadbearing Elements of Construction

General standard covering the test methods for the British Standard test to determine fire resistance for loadbearing parts of construction. Gives the requirements for specimen selection, and design as well as equipment, procedures, criteria and test conditions. Applies to beams, columns, floors, walls and flat roofs. To be used in conjunction with BS 476-20. Nothing specific to categories such as high hazard or high-risk factor. Most useful during the design stages of building works to give an understanding of the BS test, how it works, what it tests for and what elements can be tested. Helpful when specifying fire resistance requirements or selecting appropriately resistant materials.

BS 476-22:1987

Fire Tests on Building Materials and Structures – Methods for Determination of the Fire Resistance of Non-Loadbearing Elements of Construction

General standard detailing the British Standard test for measuring the fire resistance of elements of construction not intended to bear loads. Details the test methods, conditions and criteria. Used in conjunction with BS 476-20. Nothing high hazard/risk factor specific. Most useful during the design stages of building works to give an understanding of the BS test, how it works, what it tests for and under what conditions. Helpful when specifying fire resistance requirements or selecting appropriately resistant materials.

BS 476-23:1997

Fire Tests on Building Materials and Structures – Methods for Determination of the Contribution of Components to the Fire Resistance of a Structure

General standard covering the British Standard fire test procedures for quantifying the contribution made by a component to the total fire resistance of a structure or assembly. Details specimen selection, design and construction, specimen edge conditions, test equipment, procedures and criteria. Applies to suspended ceilings protecting steel beams as well as intumescent seals used with fire resisting, single-action, latched timber door assemblies. Used in conjunction with BS 476-20. Nothing specific to categories such as high hazard or high-risk factor. Most useful during the design stages of building works to give an understanding of the BS test, how it works, what it tests for and what elements can be tested. Helpful when specifying fire resistance requirements or selecting appropriately resistant materials.

BS 476-24:1987

Fire Tests on Building Materials and Structures – Methods for Determination of the Fire Resistance of Ventilation Ducts (AKA: ISO 6944-1985 Fire Resistance Tests – Ventilation Ducts)

General standard covering the British/International Standard test method and criteria for when determining the resistance of ventilation ducts under given fire conditions. Details specimen selection, design and construction, test conditions, equipment, procedures and criteria.

General document that contains nothing high hazard/risk factor specific. Most useful during the design stages of works to aid with the specification of fire resistance requirements and with the selection of suitable products to meet said requirements.

BS 476-31.1:1983

Fire Tests on Building Materials and Structures – Methods for Measuring Smoke Penetration Through Door sets and Shutter Assemblies – Method of Measurement Under Ambient Temperature Conditions

General standard detailing the British Standard test method and criteria for measuring smoke penetration through door sets and vertical shutter assemblies. Measures smoke control performance, but not fire resistance performance. Has nothing specific to high hazard/risk factor or similar categories. Most useful during the design stages of building works for clarifying what smoke control classifications mean, what safety requirements are needed, and which products fit those requirements.

BS 476-32:1989

Fire Tests on Building Materials and Structures – Guide to Full Scale Fire Tests Within Buildings

General standard providing guidance concerning the British Standard tests simulating building fires through full scale experiments. Details specimen selection, design and construction, test conditions, equipment, procedures and criteria. Has nothing specific to high hazard/risk factor or similar categories. Most useful during the design stages of building works as clarification and supporting information to help with determining fire safety requirements and suitably qualified products or commissioning test works in order to quantify the performance of a fire engineered solution.

BS 476-33:1993

Fire Tests on Building Materials and Structures – Full-scale Room Test for Surface Products

General standard covering the British Standard full-scale room test. Details the test principles, method, conditions, equipment and criteria. Nothing high hazard/risk factor specific, helpful as part of the design stages of building works as clarification and supporting information to help with determining fire safety requirements and suitably qualified products or commissioning test works in order to quantify the performance of a fire engineered solution.

BS 5306-0:2011

Fire Protection Installations and Equipment on Premises – Guide for Selection of Installed Systems and Other Fire Equipment

A mostly general document covering various types of fire-fighting media, such as water and foams, as well as various types of fixed system such as sprinklers or hydrant systems, the use and control of these systems and the identification fire hazard categories and selection of the optimal system to account for such hazards. Has an appendix giving some clarification regarding suitable fire systems for different hazard categories. However, this appendix is quoted from BS EN 12845 and is thus not included here. Otherwise, is useful as an overview of the various fire suppression options available under the British Standards for fire protection.

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BS 5306-1:2006

Code of Practise for Fire Extinguishing Installations and Equipment on Premises – Hose Reels and Foam Inlets

A general standard covering the design, installation and maintenance of hose reels and foam inlets. Contains nothing regarding high hazard/risk factor categories. To be used when required as a general standard where such systems are proposed, under design or installed.

BS 5306-3:2017

Fire Extinguishing Installations and Equipment on Premises – Commissioning and Maintenance of Portable Fire Extinguishers – Code of Practice

A general standard covering the initial commissioning of portable fire extinguishers as well as their subsequent maintenance. Also covers dealing with obsolete extinguishers which no longer have standard maintenance schedules. Contains nothing regarding high hazard/risk factor categories. To be used when required as a general standard where portable extinguishers are proposed or installed.

BS 5306-4:2001+A1(2012)

Fire Extinguishing Installations and Equipment on Premises – Specification for Carbon Dioxide Systems

A general standard dealing with the design, installation and maintenance of carbon dioxide suppression systems. Contains nothing regarding high hazard/risk factor categories. To be used when required as a general standard where such systems are proposed, under design or installed.

BS 5306-5.1:1992

Fire Extinguishing Installations and Equipment on Premises – Specification for Halon 1301 Total Flooding Systems

A general standard covering the characteristics, design, installation and maintenance of halon 1301 total flooding fire suppression systems. Contains nothing regarding high hazard/risk factor categories. To be used when required as a general standard where such systems are proposed, under design or installed.

BS 5306-5.2:1984

Fire Extinguishing Installations and Equipment on Premises – Specification for Halon 1211 Total Flooding Systems

A general standard covering the characteristics, design, installation and maintenance of halon 1211 total flooding fire suppression systems. Contains nothing regarding high hazard/risk factor categories. To be used when required as a general standard where such systems are proposed, under design or installed.

BS 5306-8:2012

Fire Extinguishing Installations and Equipment on Premises – Selection and Positioning of Portable Fire Extinguishers – Code of Practice

A general standard covering suitability and positioning of portable fire extinguishers. Contains nothing regarding high hazard/risk factor categories. To be used when required as a general standard where portable extinguishers are proposed or installed.

BS 5839-1:2017

Fire Detection and Fire Alarm Systems for Buildings – Code of Practice for Design, Installation, Commissioning and Maintenance of Systems in Non-domestic Premises

General standard detailing the planning, design, installation, commissioning and maintenance of fire detection and alarm systems. Contains nothing regarding high hazard/risk factor categories. To be used when required as a general standard where fire alarm and detection systems are proposed, under design or installed.

BS 7974:2019

Application of Fire Safety Engineering Principles to the Design of Buildings.

Document covering the methods and applications of fire engineering for building design, a general fire safety code for all hazard types and risk factors, helpful for when fire engineered solutions are required.

Nothing high hazard/risk factor or otherwise categorically specific. To be used when required as a general standard for such systems.

BS 8110-2:1985

Code of Practice for Concrete for Special Circumstances.

While still mentioned on occasion, has been superseded by BS EN 1992-1-1:2004 below. Refer to BS EN 1992-1-1:2004 instead.

BS 8489-1:2016

Fixed Fire Protection Systems – Industrial and Commercial Watermist Systems

Code covers water mist systems overall, under a range of hazard types. Covers most aspects of designing, installing and maintaining a water mist system, detailing the requirements of such a system and how to meet them. Very relevant where water mist systems are installed, under design or proposed. It should be noted that this standard is based on providing proof that the water mist system will work on a specific fire load density. The manufacture of the system will therefore be required to provide test evidence as specified in the standard. It is therefore recommended that this test data is provided at the enquiry stage of a project. For most waste sites the High Hazard category excerpts will be of immediate interest. The rest of the document covers the either lower hazard or the general aspects of water mist systems.

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BS 9990:2015

Non-Automated Fire-fighting Systems in Buildings – Code of Practice

A general standard giving guidance and recommendations on the design, installation, commissioning and maintenance of systems such as wet and dry fire-fighting mains, private hydrants and other water supplies and supply pumping. To be used in conjunction with parts BS 5306 parts 1, 3 and 8. Nothing high hazard/risk factor or otherwise categorically specific. To be used when required as a general standard where such systems are required, proposed, under design or installed.

BS 9999

Fire Safety in the Design, Management and Use of Buildings – Code of Practice

General standard covering fire safety as a whole and applying to most non-residential buildings. Particularly useful during the design stages of any building works. This is primarily a code of practice that addresses life safety issues and elements of its recommendations may not be acceptable to insurers or the Environment Agency in particular with regard to the relaxation of structural fire resistance and the duration of the water supply for the suppression systems. Note, regarding sections 6.2 – 6.4: where piled or stacked waste is over 50% plastic by volume, the fire growth rate should be classed as category 4, and the resulting risk factor then A4. Under BS 9999, an A4 risk factor is unacceptable unless moderated by a suppression system or sprinklers. See Table 4, particularly footnote A in the standard for further guidance.

BS EN 710:1997+A1(2010)

Safety Requirements for Foundry Moulding and Coremaking Machinery and Plant and Associated Equipment

Document covering the risks and management thereof relating to machinery and plant in foundries. Largely irrelevant except for the select reference included here. Makes select references to the usage of plant in high-heat environments, as occurs when plant is used to remove burning waste from storage and transfer sheds. In particular, the risk of hydraulic fluid ignition.

BS EN 1992-1-2:2004

Eurocode 1, Part 1-2: General Actions – Actions on Structures Exposed to Fire

Supersedes BS 8110-2:1985. Follows on from BS EN 1992-1-1 and parts 1 and 2 of BS EN 1991-1. General document covering the overall principles and rules regarding the effects of fire on concrete. To be used when required as a general standard regarding concrete subjected to fire loads. The below section, and the rest of section 5.4, however, may be of particular use in the design of partition walls separating stockpiles or acting as thermal barriers.

BS EN 12845

Fixed Firefighting Systems – Automatic Sprinkler Systems – Design, Installation and Maintenance

General document covering automatic sprinkler systems, the requirements for these systems and how to meet those requirements. Very useful where sprinklers are proposed, under design or installed. For the majority of sites, the High Hazard category will be the most appropriate, and those excerpts are included below. For non-hazard specific or lower hazard aspects, refer to the rest of the code.

BS EN 13501-1:2018

Fire Classification of Construction Products and Building Elements – Classification Using Data from Reaction to Fire Tests

A general document covering the method and criteria for categorising the reaction to fire of construction products. Has no specific high hazard/risk factor content. Helpful as part of the design stages of building works as clarification and supporting information to help with determining fire safety requirements and suitably qualified products in order to achieve adequate fire reaction performance.

BS EN 13501-2:2016

Fire Classification of Construction Products and Building Elements – Classification Using Data from Fire Resistance Tests, Excluding Ventilation Services

A general document covering the method and criteria for categorising the reaction to fire of construction products. Has no specific high hazard/risk factor content. Helpful as part of the design stages of building works as clarification and supporting information to help with determining fire safety requirements and suitably qualified products in order to achieve adequate fire reaction performance.

BS EN 14243-1

Materials Obtained from End of Life Tyres. General Definitions Related to the Methods for Determining Their Dimensions and Impurities.

Provides definitions for sample collection and preparation for when determining the dimensions and impurities of end of life tyre materials. Useful for providing additional clarity when working with BS EN 14243.

BS EN 14243-2

Materials Obtained from End of Life Tyres. Granulates and Powders – Methods for Determining the Particle Size Distribution and Impurities, Including Free Steel and Free Textile Content.

Provides test methods for determining the particle size distribution and the impurities of granulates and powders derived from end of life tyres.

Allows for standardised testing, categorisation and description of end of life tyre materials.

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BS EN 14243-3

Materials Obtained from End of Life Tyres. Shreds, Cuts and Chips – Methods for Determining Their Dimension(s) Including Protruding Filaments Dimensions

Provides test methods for determining the dimensions of shreds, cuts and chips derived from end of life tyres. Allows for standardised testing, categorisation and description of end of life tyre materials.

BS EN 15357

Solid Recovered Fuels – Terminology, Definitions and Descriptions.

Standardised definitions of various terms relating to SRF. Useful if needing additional clarity when using standards dealing with SRF.

BS EN 15359

Solid Recovered Fuels – Specifications and Classes

Gives standardised classifications and specifications for SRF and the principles for those classifications and specifications. Useful for additional clarity as to what standards might consider SRF or not and how to classify SRF for use with other standards.

End-of-Life Vehicles Regulations 2003 + Amendments (2010)

The End-of-Life Vehicles (Amendment) Regulations 2003 No. 2635, 2010 No. 1094

Regulations dealing with the storage and disposal of end-of-life vehicles (ELVs). General regulations not dealing with fire or waste sites specifically but does contain one clause dealing with fire which may be of use to waste sites dealing with ELVs.

FPP Guidance

Guidance – Fire Prevention Plans: environmental permits

(Retrieved 19/06/2019 from https://www.gov.uk/government/publications/fire-prevention-plans-environmental-permits/fire-prevention-plans-environmental-permits). *Guidance provided by the EA to help waste site operators achieve compliance with FPP requirements. Provides information about what the FPP requirements means in practical terms and advice on how to meet these requirements. A targeted document aimed at helping waste operators manage fire risk and damage on site and compile a suitable FPP for compliance with EA requirements.*

Guidance on BATRRT and Treatment of WEEE 2006

Guidance on Best Available Treatment, Recovery and Recycling Techniques (BATRRT) and Treatment of Waste Electrical and Electronic Equipment

Provides guidance on treating, recovering and recycling WEEE safely and in accordance with the WEEE Directive. A general document, there is some mention of fire precautions. Relevant to most waste site operators as many sites deal with WEEE to an extent.

NEN 6060

Dutch standard covering Fire Safety of Large Fire Compartments.

This standard isn't available in English, but for operators with interests in the Netherlands, this standard could be of use and operators should be aware of it.

Most waste transfer and processing sheds are classed as large compartments, and so this standard would apply.

NFPA 12:2018

Standard on Carbon Dioxide Extinguishing Systems

General standard covering the design, installation and maintenance of carbon dioxide suppression systems. Nothing high hazard/risk factor or otherwise categorically specific. To be used when required as a general standard where such systems are proposed, under design or installed.

NFPA 13:2016

Standard for the Installation of Sprinkler Systems

General standard covering the design, installation and maintenance of automatic fire sprinkler systems. Does not cover water mist systems. For the majority of sites, the High Hazard category will be the most appropriate. For non-hazard specific or lower hazard aspects, refer to the rest of the code.

NFPA 15:2017

Water Spray Fixed Systems for Fire Protection

General standard covering the design, installation and maintenance of water spray suppression systems. Nothing high hazard/risk factor or otherwise categorically specific. To be used when required as a general standard where such systems are proposed, under design or installed.

NFPA 18:2017

Standard on Wetting Agents

General standard covering the usage of wetting agent in automatic water suppression systems. Covers the usage of foams. Nothing high hazard/risk factor or otherwise categorically specific. To be used when required as a general standard for such systems. Often used in conjunction with NFPA 18A.

NFPA 18A:2017

Standard for Water Additives for Fire Control and Vapour Mitigation

General standard covering water additives and their usage in automatic water suppression systems. Covers the use of surfactants. Largely contains nothing high hazard/risk factor or otherwise categorically specific bar a few select paragraphs. To be used when required as a general standard where water additives are proposed or in use. Often used in conjunction with NFPA 18.

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NFPA 20:2019

Standard on Stationary Pumps for Fire Protection

General standard covering the design and installation of water supply pumps for fire protection systems. Nothing high hazard/risk factor or otherwise categorically specific. To be used when required as a general standard for such systems.

NFPA 22:2018

Standard for Water Tanks for Private Fire Protection

General standard covering the design, installation and maintenance of water supply tanks for fire protection systems such as the supply tank for sprinkler systems. Does not define hazard groups or make any reference to high hazard groups or risk factors etc., but, makes a singular reference to hazards greater than Ordinary Hazard Group 2.

NFPA 25:2017

Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems

A general standard applicable to sprinkler, standpipe, hose, fixed water spray, water mist and foam water systems as well as private fire hydrants. Covers inspection, maintenance and testing of these systems and how to update systems to account for changes in occupancy or processes etc. that impact the fire safety of a site. Has no high hazard category defined but does make a few select mentions to special hazard systems and is also of use as a general standard that applies to most fire suppression and protection systems.

NFPA 80A:2017

Recommended Practice for Protection of Buildings from Exterior Fire Exposures

General guidance on preventing fire spread between building exteriors through use of suitable separation distances. Makes no reference to high hazard groups or high-risk factors but does account for varying severities of fire load. The severe fire load category may be more relevant to waste operators depending on site characteristics.

NFPA 750:2019

Standard on Water Mist Fire Protection Systems

General standard covering the design, installation and maintenance of water mist suppression systems. The High Hazard category has been removed from this revision of the standard (as of 01/05.2019), and the lower hazard categories do not apply particularly well to waste transfer and processing, so this is now to be used when required as a general standard for such systems.

NFPA 850:2015

Recommended Practise for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations

Standard covering fire protection systems for electric generating plants with specific reference to plants generating from alternative fuels including RDF and rubber tyres. Covers fire protection and fire suppression systems generally as well as specific measures for plants using RDF, rubber tyres or other alternative fuels. Applies to a degree to many waste sites, even if just the fuel-specific sections. Useful, in particular as a standard more directly focussed on waste sites and applicable to general fire safety. Note -the generic water density figures quoted may not apply to specific waste types and may result in under-specification and is somewhat out of date when compared to the WISH fire tests data.

Appendix 5: Non-technical summary waste fire tests

WASTE FIRE BURN TRIALS

Summary non-technical report

This document provides a non-technical summary of waste fire burn tests conducted in 2015, 2016 and 2017 – the 'phase 1, 2 and 3 tests'. It is aimed at providing underpinning and background information for readers of the WISH waste fires guidance and to waste operators in general.

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3. Summary of findings phases 1 and 2
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   - 3.3 Phase 1 and 2: Burn temperatures
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   - 4.4 Phase 3: Other findings

1. Introduction

Prior to the publication of the original 2014 WISH 'reducing fire risk at waste management sites' guidance (WISH 28 fires guidance) a thorough literature search was made by the HSL (Health and Safety Laboratories), and the authors of the guidance. The aim was to identify any existing waste fires guidance, research and similar information on the combustion properties of wastes from across the world. Very little relevant information was found. This weakness was noted in the consultation process for the 2014 WISH waste fire guidance.

In the absence of comprehensive detail information on the combustion properties of wastes, and with an urgent need at the time in 2014 to provide the waste industry with guidance on waste fire risk management, what information sources which could be found were used for the 2014 WISH guidance. Sources included buildings fire research, caravan fire research, information from standard insurance industry codes and other similar sources. WISH was not alone in this approach. Various other waste management fire guidance and similar documents from other bodies also being based on the same or similar, and generally non-waste, information sources. The flaws of this approach were noted in the 2014 WISH fire guidance, which stated: *"As knowledge on the burn properties of specific wastes improves, experience of real fires accumulates and as better information becomes available, revisions of this guidance will be made to keep it up to date."*

Specifically, on waste storage the consultation letter accompanying the 2014 WISH fires guidance (included in the guidance as an appendix) stated: *"There is little available fire testing or science specific to wastes to provide a firm under-pinning for the available information on stack sizes and separation distances – most of the current information is based on operational and fire-fighting experience. There is data on raw materials. Much of this indicates that the separation distances in table 1 in appendix 1 are conservative and separation distances in excess of those currently available for wastes may be required at sites with no fire prevention measures. For example, data on virgin, raw paper and plastics suggests separation distances between 10 - 11 metres and 18 - 27 metres respectively – that is well in excess of those distances quoted in table 1 of appendix 1. Whether this data for raw materials can be applied direct to wastes is not known - real testing on wastes is required."*

To address this gap in knowledge, in late 2015 and throughout 2016 and 2017 a series of waste burn test were conducted. In late 2015 smaller scale laboratory type testing was conducted at the FPA (Fire Protection Association) research premises. These 'phase 1' tests provided baseline data on parameters such as burn rates and thermal outputs. However, some of the results obtained from this laboratory type testing did not reflect the experience of the Fire and Rescue Services (FRS) when actually tacking waste fires. In brief, for some parameters the laboratory type testing was missing some factor or factors relevant to actual large-scale waste fires.

In 2016 larger-scale waste burn trials were conducted at sites in Yorkshire and Essex (the phase 2 tests). These tests involved much larger volumes of waste and aimed to replicate as closely as practical 'real life' waste fires. The results of these tests matched much more closely the experience of the FRS when fighting real waste fires and revealed some of the different mechanisms at play during waste fires. Both phase 1 and phase 2 tests were conducted on a variety of wastes such as loose and baled wastes, plastics, paper and board, rubber, wood wastes, waste derived fuels such as RDF and SRF and others.

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These phase 1 and 2 tests provided a much better understanding of how wastes burn, and firmer fire science on which to base guidance on issues such as waste storage stack separation distances. The tests also provided useful additional information, such as on the interlacing of stored waste bales as a potential method of reducing chimney effects. The results of the phase 1 and 2 tests were used in part as the basis for the revision of the 2014 WISH guidance. Revised WISH guidance including the outputs from the phase 1 and 2 tests was issued in April 2017. To accompany this revised 2017 WISH guidance a non-technical summary of the phase 1 and 2 tests was also released.

However, the phase 1 and 2 tests did not provide all of the information required. It was always anticipated that a phase 3 series of tests would be required, in particular to test the effectiveness of different fire-fighting techniques and media on waste fires. These phase 3 tests were conducted at the National Fire Training College in Gloucestershire in late 2017.



Above: General views from phase 1 and phase 2 waste burn tests.

2. Phase 1, 2 and 3 tests and methods used

As noted above, the waste burn trials were conducted in three phases:

- **Phase 1:** Smaller scale laboratory type waste burns, conducted at the FPA (Fire Protection Association) research facility in Gloucestershire
- **Phase 2:** Larger scale waste burns tests, conducted at Pollington in Yorkshire and Barling in Essex
- **Phase 3:** Specific tests aimed primarily at testing the effectiveness of different fire-fighting techniques and media, conducted at the National Fire Training College

Phase 1: Smaller scale laboratory type tests

Nine types of waste were tested:

1. Baled cardboard
2. Baled LDPE plastic
3. Baled HDPE plastic
4. Baled RDF (refuse derived fuel)
5. Baled SRF (solid recovered fuel)
6. Loose tyre crumb
7. Loose screened wood chip
8. Loose pre-crush wood
9. Loose wood fines

Sample size varied from 42 kg to 1,350 kg. This being largely conditioned by the configuration of the wastes tested: Bales of waste were impractical to split and would have defeated the object of the tests on baled wastes, representing the top end of these weights. Loose wastes represent the lower end. Loose wastes were contained in a mesh 'cage' for the purposes of testing. Bales were burnt whole.

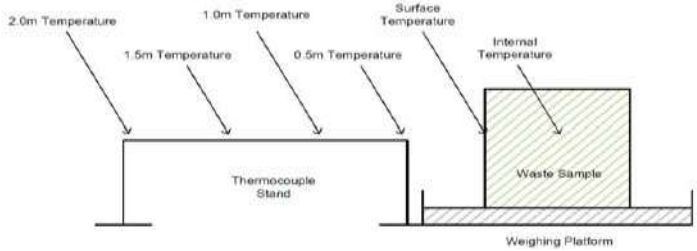
All samples were burnt on the same test rig. This rig included load cells to allow weight loss during burning to be measured, thermocouples to measure temperatures within the waste sample and at the surface, and heat sensors at various distances from the samples.

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A diagram of the test rig is shown below. Ignition of the samples was via the use of domestic firelighters, supplemented in some cases by the use of petrol as an accelerant (some wastes proved difficult to ignite). Samples were not allowed to 'burn-out' but rather were extinguished once steady state burning had been achieved.

Heat flux sensors were used to measure heat outputs, and fumes emitted during tests were captured via a 'smoke hood' allowing measurement of carbon monoxide concentration. A summary of the findings from the smaller scale tests is given in section 4.

Diagram 1: Test rig used in smaller scale tests



Phase 2: Larger scale tests

The larger scale phase 2 tests were aimed at replicating actual conditions experienced during waste fires. Thirteen waste types were tested:

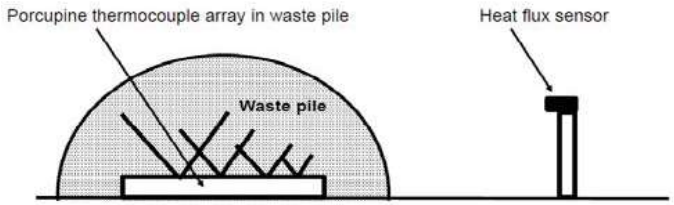
1. Loose untreated (raw) wood waste
2. Loose un-screened pre-crushed wood
3. Loose screened pre-crush wood
4. Loose wood fines
5. Loose RDF (refuse derived fuel)
6. Baled RDF (refuse derived fuel)
7. Loose SRF (solid recovered fuel)
8. Baled SRF (solid recovered fuel)
9. Baled high-density plastic
10. Baled low-density plastic

11. Baled paper and card
12. Loose frag fluff (plastics, foams etc from dismantling of end-of-life vehicles)
13. Shredded rubber (tyre)

The phase 2 tests were conducted externally (in the open-air). This was the only practical option but did result in restrictions associated with preventing environmental nuisance.

For loose pile waste burns a thermocouple array (the 'porcupine') was embedded in the waste piles allowing temperature measurement at varying depths through the pile. This was obviously not possible with baled waste burns. Temperature measurement at the surface using external sensors was conducted for all burns.

Diagram 2: Test arrangement used in larger scale tests on loose waste pile stacks



Ignition for surface (outside-in) burns was via use of a 'blow-torch', or in some cases for bales domestic firelighters. Ignition for deep (inside-out) burns was via domestic firelighters introduced to the centre of piles. Unlike the smaller scale phase 1 tests, wastes were allowed to 'burn-out', with the exception of loose plastics, which emitted large volumes of black smoke and was extinguished before burn-out occurred.

Weight of waste burnt varied, for the same reasons as above for the smaller scale tests. Maximum weight in any one burn was circa 10 tonnes. Multiple burns on some waste types were used to check test methods and repeatability. The most burnt wastes being pre-crushed wood waste and RDF. A summary of the findings from larger scale tests is given below.

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Phase 3: Fire-fighting tests

The primary aim of these tests was to determine the effectiveness of different fire-fighting techniques and media on waste fires. Much of the value of these tests accrues to the Fire and Rescue Services (FRS), and is not of primary, direct interest to waste operators.

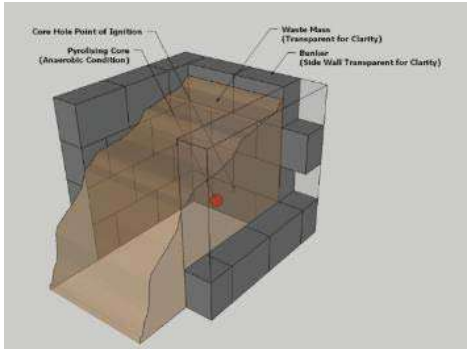
The phase 3 tests took place at the National Fire Training College in Gloucestershire. Different fire-fighting techniques, such as where hose streams are aimed at, were tested, and different fire-fighting media, in particular:

1. Water (by far the most common media used against waste fires)
2. Foams ('CAFs') as an alternative to the use of water on its own
3. Water + wetting agent, aimed at reducing surface tension and enhancing water penetration into wastes which are on fire

While the phase 3 tests were primarily aimed at fire-fighting, the opportunity was also taken to clarify and confirm some of the results of the phase 1 and 2 tests, in particular:

1. Effectiveness of interlocking block walls and bunkers against fire spread
2. Practical test of the modelled free-air separation distances from phase 2

Diagram 3: General arrangement of bunker tests



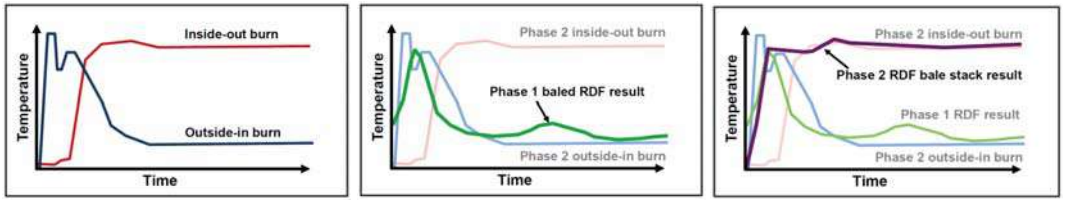
3. Summary of findings phases 1 and 2

Note: All of the graphs in this section are indicative only. They are aggregates or examples from data from the various waste burn tests conducted. Lines on the graphs are relative to each other, but no units have been given on axis scales (see text). Please note in particular than vertical axis scales have been set to allow best presentation of the data. The graphs are illustrative and provided for ease of understanding rather than as absolute data.

3.1 Overview

The primary aim of the phase 1 and 2 waste burn trials was to provide underpinning science on which to base waste stack separation distances for the 2017 revision of the WISH fire guidance. The original 2014 guidance distances having been based typically, and in common with much other similar guidance, on non-waste data. However, other outcomes were expected to be of benefit to current knowledge on how wastes burn. This summary simply presents the results of the tests without interpretation or indication of their application. The use of these results will be in their application over time.

The smaller scale phase 1 tests provided much useful data. However, they often did not reflect Fire and Rescue Services (FRS) experience of real-life waste fires. It became obvious during the tests that the phase 1 trials were sometimes missing one or more factors at play in real-life waste fires. The phase 2 larger scale tests aimed to rectify this by replicating as closely as practical the conditions of real-life waste fires.



Some of the graphs used in this section are 'sequential' with following graphs showing lines from previous graphs as tints. This is for illustrative purposes and to allow an easier view of the information in the text of this section

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3.2 Burn mechanisms and other factors

Industry and Fire and Rescue Services (FRS) experience is that waste fires often do not behave in the same manner as fires in other materials. With loose waste stacks/piles, sometimes a smouldering, slow fire with fairly low heat outputs occurs, while in other cases fires in loose waste stacks are energetic with higher heat outputs. For baled waste stacks rapid spread of fire is often noted across the stack, and fires are typically energetic and have high heat outputs. One desired outcome of the waste burn trials was to try and explain these differences, and why they occur.

Baled wastes phase 1 smaller scale tests

For baled wastes during the smaller scale phase 1 laboratory type tests the typical pattern observed for fire development was: Initiation of the fire followed by a rise in surface temperature once the fire 'caught'. However, after a fairly short period of time surface temperature then fell to a steady state burn at lower temperatures than expected, and lower than often experienced by the FRS when tackling real-life waste bale stack fires.

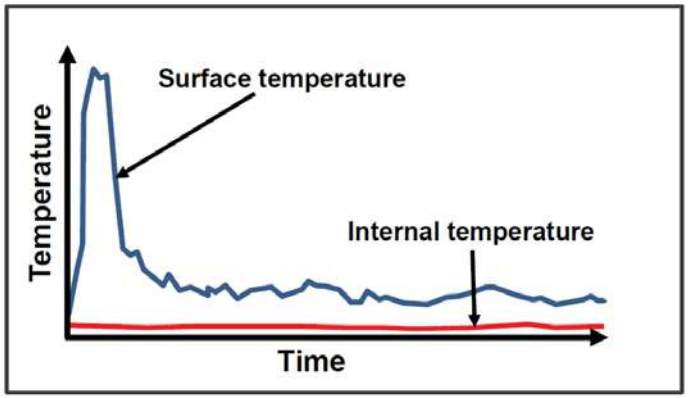
Fire penetration into the baled waste samples was not high, likely partially the result of poor air-flow within the bale and relatively high density. In addition, typically a 'char' layer formed on the surface of the bale restricting fire penetration, and so access for the fire to new fuel. This is illustrated by the differences observed between surface and internal temperatures in baled wastes during the phase 1 burns (see example of baled SRF in graph 1 below). Examination of bale samples post-burn also showed 'charring' at the surface, but little or no fire penetration into the bale.

As an observation from the baled waste tests, many bales were difficult to ignite requiring substantive heat inputs before a fire occurred. This would tend to mitigate against casual arson as a major cause of fires in baled wastes – a determined attack is likely required.



From left: Baled RDF pre-burn, baled LDPE plastic pre-burn, during burn and post-burn (note bale post-burn showing relative lack of fire penetration leaving the bale largely unburnt)

Graph 1: Phase 1 illustrative baled SRF burn internal and surface temperatures



Loose wastes phase 1 smaller scale tests

Conversely, for most loose wastes a different pattern was observed: As for baled wastes, surface temperature rose rapidly once the fire 'caught', but surface temperatures remained higher, and internal temperature also rose (see graph 2 loose pre-crush wood).

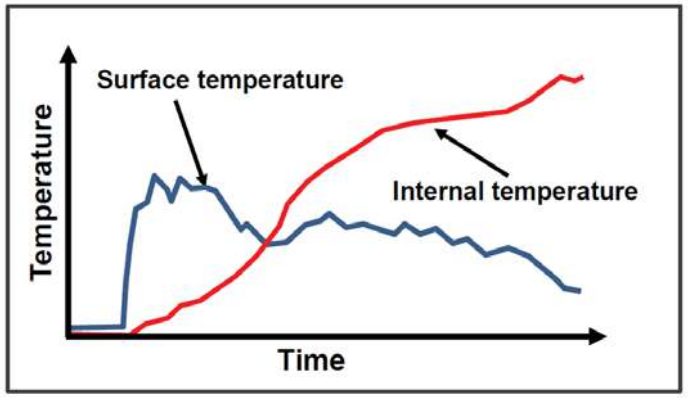
The lower densities and more open structure in the smaller loose waste samples in phase 1 laboratory type tests seems to have allowed more air-flow into the waste, better fire penetration and a 'cleaner' burn. As for baled waste phase 1 burns, this is often not the experience of the FRS when tackling actual loose waste storage stacks where 'smouldering' type burns have been noted. Unlike baled wastes, examination of most smaller loose waste samples post-burn during the phase 1 tests revealed much more complete combustion, with little unburnt waste.



From left: Loose pre-crush wood waste pre-burn (note retained in mesh 'cage'), in initial phases of burn, during steady state burn and post-burn (note much more complete combustion than for baled wastes)

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Graph 2: Phase 1 illustrative loose pre-crush wood internal and surface temperatures



Issues with phase 1 smaller scale tests

As noted in section 3, the weight of samples used in phase 1 varied significantly (42 kg to 1,350 kg). Using the examples of pre-crush wood and baled SRF as above, approximate densities of samples were: Baled SRF 0.5 tonnes/m^3, and for pre-crush wood 0.14 tonnes/m^3. In addition, the more open structure of larger sized loose wastes, with typically more 'rigid' particles, allowed more air-spaces in the sample promoting a more complete burn.

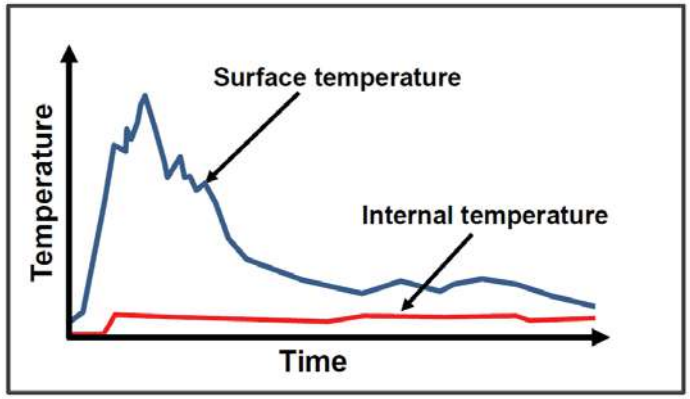
For baled wastes densities are realistic – they are as presented in baled wastes. For loose wastes the smaller sample size results in densities which do not completely replicate real-life storage conditions: Loose wastes stored in real life will compact to a degree under their own weight because of the qualities stored. In addition, any air spaces may be degraded. These factors were missing in the phase 1 tests (although see below on raw wood and other very large particle size wastes, which may not compact as much).

Issues such as sample size and an inability to replicate real-life during laboratory tests are not that unusual. For example, and while outside of the waste burn trials conducted in 2015 and 2016, laboratory tests to determine any self-heating properties for various waste types suffer from the same effect: The densities and sample size which can practically be achieved during small scale laboratory testing do not replicate real-life, and the results of such small scale laboratory tests need to be viewed with caution.

Phase 2 loose waste larger scale tests and checking scalability

To check the scalability of phase 1 tests on loose wastes, one of the first tests conducted in phase 2 was a large-scale loose pre-crush wood stack burn. This large-scale test provided different results to the small-scale laboratory type test on the same waste type (see graph 3 below). The pattern shown being more like that for baled wastes than for the small-scale loose waste tests conducted in phase 1, although less distinct than for baled waste.

Graph 3: Phase 2 illustrative large scale burn loose pre-crush wood



Also, as for baled wastes a 'char' layer formed at the surface of the pile on most of the larger loose waste storage piles, restricting fire penetration, and resulting in a more prolonged 'smouldering' type burn once the initial phase of burn had declined. This pattern replicates more closely typical FRS experience when tackling some loose waste pile fires.

This is not to say that the results obtained from phase 1 smaller scale burn tests are not useful. However, because of scalability issues some of the results need to be treated with caution as they may not replicate real-life.

'Inside-out' and 'outside-in' mechanisms with loose waste stacks

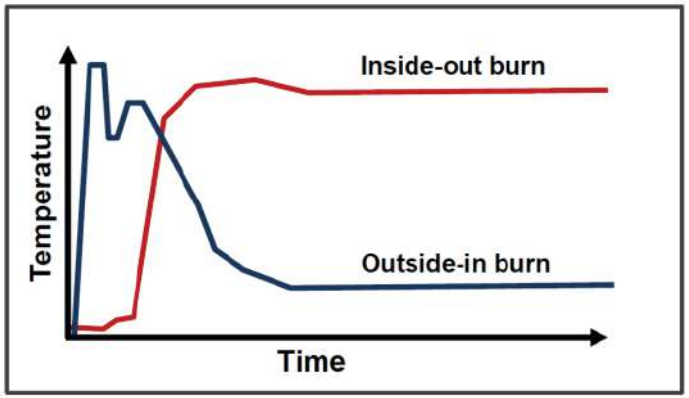
All of the burns conducted during phase 1 smaller scale tests and the above loose pile larger scale burns were ignited at the surface of the pile or bale. This replicates some of the known causes of waste fires, such as discarded smoking materials, arson, direct heat, hot-works, open flames etc. However, not all waste fires start at the surface.

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A significant number of waste fires start within the waste stack, such as from self-heating or hot/hazardous items buried in the waste. In particular, for loose waste stacks/piles such causes are significant (see below for baled wastes).

To replicate such 'inside-out' burns during phase 2 tests on loose waste stacks domestic firelighters were used, placed down a tube leading to the centre of a loose waste stack, and the tube then sealed to prevent air ingress. This resulted in quite different results than those identified during 'outside-in' burns where ignition is at the surface of a loose waste stack (see typical outside-in and inside-out burn results in graph 4 below).

Graph 4: Illustrative loose waste stack outside-in and inside-out burn temperatures



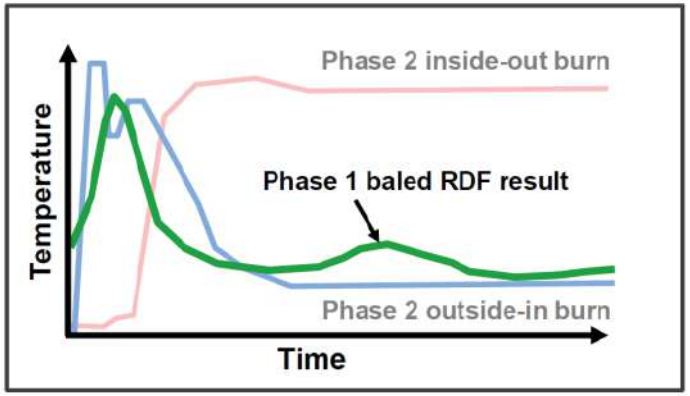
During inside-out burn tests fires took longer to develop. Probes within the loose waste stacks (the 'porcupine') show the build-up of a 'super-heated' bed within the waste stack. This slowly burns outwards, and then breaches the surface as a fully developed and energetic fire. This inside-out mechanism results in sustained higher temperatures, rather than the dying-back of temperatures observed during loose waste stack outside-in fires.

These two mechanisms for loose waste storage stacks (inside-out and outside-in) agree with FRS experience of fighting actual loose waste stack fires. In some cases, a smouldering type fire is experienced (outside-in mechanism), whereas in other cases a vigorous and energetic fire is experienced (inside-out mechanism).

Phase 2 larger scale baled waste stack tests and 'chimney' effects

As stated above, the results obtained from phase 1 smaller scale tests for baled wastes do not reflect FRS experience when fighting real baled waste stack fires. In general, the results of phase 1 testing on baled wastes show a burn pattern similar to an outside-in fire with loose wastes (see graph 5 below). This type of 'smouldering' fire is not what is typically experienced in real-life with baled waste storage stacks, where the typical experience is of intense and energetic fires with sustained high heat outputs.

Graph 5: Illustrative outside-in and inside-out burn temperatures compared with an example smaller scale baled waste test result



Inside-out burns are relevant to bales of waste, but there are problems with this inside-out mechanism. Self-heating for some waste type bales, such as SRF and RDF, is an issue, but is likely to be less so for other waste types such as bales of plastics. Inside-out fires caused by hot/hazardous items in wastes is also less of an issue for baled wastes. Baled wastes are typically made of processed wastes, such as having been sorted by mechanical and/or manual means. Hot/hazardous items are more likely to have been removed during such processing (this may not be the case all of the time for some waste types such as 'crude' RDF which has not had extensive processing applied).

In addition, an inside-out burn in a bale would not account for the rapid and energetic spread of a fire across a baled waste storage stack, as is often observed in real-life.

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Part of the phase 2 tests on multiple bales in a storage stack was to identify any mechanism not identified by the phase 1 tests on single bales which may be at work to produce the intense fires and rapid spread of fire often experienced by the FRS when tackling waste bale storage stack fires.

The phase 2 larger scale bale burn tests used 'simulated' baled waste storage stacks containing multiple bales. It was not practical to build stacks containing 100s of bales. For most phase 2 baled waste tests six bales were used, arranged as two columns. These were placed against a concrete bunker wall to replicate a wider stack, and for safety reasons related to stack collapse risks.

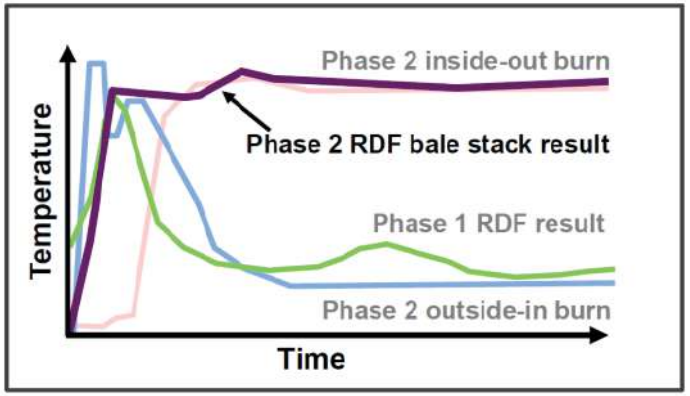
Ignition of the phase 2 larger scale bale waste fire tests was at the surface of the waste, as for phase 1 tests. Initially the fire progressed as for phase 1: Temperature rose, and a 'char' layer started forming reducing the fire's ability to access new fuel, until the fire reached the vertical gaps between the bales. At this point energetic air-flows (chimney type effects) were produced in these vertical gaps resulting in accelerated fire growth and an energetic burn which was sustained. Fire at these gaps was energetic enough to 'strip' any char layer from bales allowing the fire to access new fuel more readily. As a measure of how energetic the burns were fire 'vortices' were observed at the tops of vertical gaps between bales and between bales and supporting bunker walls (see photographs below).

Graph 6 below shows surface temperatures over time during phase 2 baled waste tests using RDF bales as an example. Compared to the phase 1 tests for the same waste, the larger scale phase 2 tests identified a much more energetic burn with higher temperatures sustained throughout the burn.



From left: Development of fire vortex behaviour during bale burn tests, visible fire vortex at top of gap between bales during bale tests, development of fire spread in gaps between bales, leading rapidly to a fully developed fire (see bale comments above)

Graph 6: Illustrative comparison with bale stack burn test temperatures



These chimney effects seem to be the likely cause of the energetic and sustained fires with rapid fire spread across baled waste stacks often experienced by the FRS when fighting baled waste stack fires.

Phase 2 baled waste tests burn temperature differences

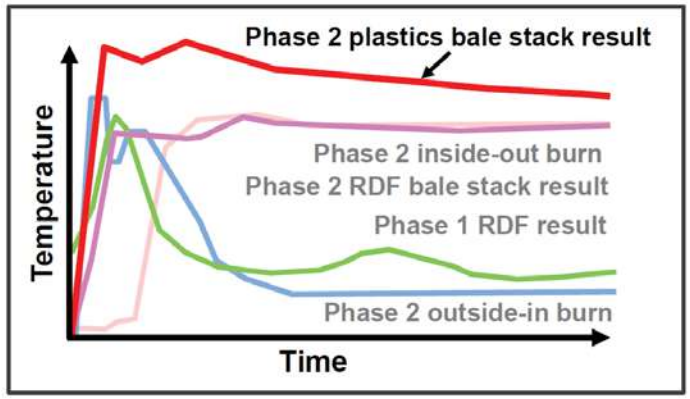
Burn temperatures are discussed in more detail below. However, it is worth noting the results of the phase 2 baled waste tests on baled plastics. As for other baled stack tests the fire accelerated once it reached the vertical 'chimneys' between bales. In the case of baled plastics, temperatures rose to 1,200 degrees centigrade, or higher (the sensors used were calibrated to 1,200 degrees). These high temperatures were sustained and resulted in a melted data-logger and blistered paint on a porta-cabin located 25 metres away from the fire.



From left: HDPE bale burn during phase 1 smaller scale tests, and same post-burn showing relatively intact bale. Compared to larger scale simulated plastics waste bale stack burns

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Graph 7: Illustrative comparison between plastics and other typical other wastes during bale stack burn tests



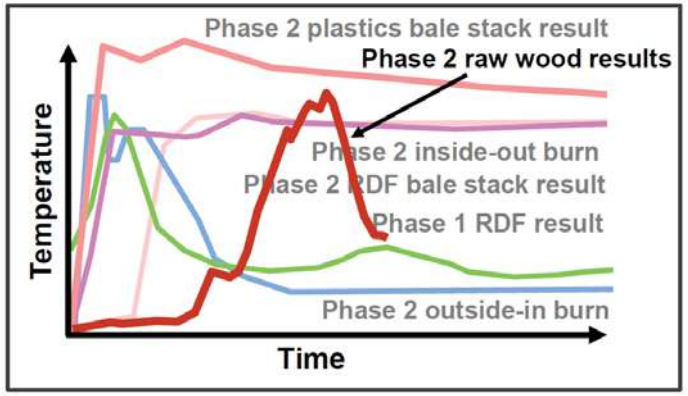
These results largely support FRS experience during fire-fighting of plastic waste bale stacks where temperatures were such that access to fight the fire was, at best, problematic.

Large particle size, 'rigid' waste types in loose piles

One exception to the above inside-out, out-side in and bale stack test results was raw wood waste. This waste type comprises larger particle size items, such as parts of pallets, discarded furniture and similar. In addition to be larger, these particles are also rigid and less prone to compaction when placed in a loose waste storage stack/pile.

Smaller particle size wood wastes (approximately 25 mm – 60 mm particle size), exhibit observed air-gaps when stacked of less than 10 mm. In the case of these smaller particle sized wood wastes fire penetration was limited to 50 mm – 150 mm before a smouldering burn set-in. This was not the case with larger particle sizes such as in raw wood waste where air gaps were larger, allowing fire penetration to the interior of the pile. Peak temperatures during burns of these larger particle size wastes were achieved and sustained as a steady state burn, the decay of which was linked to the available fuel being exhausted. In brief, the burn was similar to what would be expected from a 'bonfire'. This different burn progress is shown in graph 8 below, compared to other burns.

Graph 8: Illustrative comparison with raw wood (large particle size)



Raw wood is not the only larger particle size waste with rigid particles. Bulky hard plastics wastes (such as from discarded garden furniture, plastic pipes and larger children's toys) and whole tyres also have large particle sizes and are fairly rigid. These waste types were not tested, and direct comparisons cannot be made. However, industry knowledge is that bulky plastic wastes have been involved in serious and energetic fires.

3.3 Burn temperatures

Various factors, such as the mechanisms outlined above, affect the burn temperature of wastes. For external stacks weather can also have a role to play, such as wind direction and strength. In practical terms there is no realistic method to 'choose' the type of waste fire which may occur, or what weather conditions may be if a fire occurs. The typical or 'realistic' worst case scenario needs to be used.

For many of the types of waste tested maximum burn temperatures occurred in a roughly 100-degree window, between 840^{0}C and 950^{0}C. There was then a roughly 200-degree gap to the maximum burn temperatures of plastic and rubber wastes (1,127^{0}C to 1,200^{0}C). Please note that at the top-end this maximum of 1,200^{0}C may have been more as the heat sensors used were only calibrated to 1,200^{0}C. Taking account of the variability in wastes and how they are presented and the test results, in practical terms this allows wastes to be placed into two 'bands' for the purposes of calculations for issues such as stack separation distances.

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Table 1 below shows maximum burn temperatures for the various wastes tested. The shading applied indicates the two rough bands as described above.

Table 1: Summary burn temperatures for different waste types

Waste type	Surface temperature (typical maximum)
Pre-crush wood waste (un-screened)	840^{0}C
Raw wood waste	850^{0}C
Paper/ card baled	850^{0}c
Pre-crush wood waste (screened)	860^{0}C
Refuse derived fuel (RDF) loose	900^{0}C
Refuse derived fuel (RDF) baled	900^{0}C
Solid recovered fuel (SRF) loose	950^{0}C
Solid recovered fuel (SRF) baled	950^{0}C
Shredded rubber	1,127^{0}C
Plastic HD baled	1,200^{0}C
Plastic LD baled	1,200^{0}C

Note: Some wastes, such as RDF and pre-crush wood, data based on multiple burn tests, whereas for others based on a lower number of burns. Temperatures should be treated as summary – various factors can affect as noted above.

Subject to the information provided by the waste burn tests on various the burn mechanisms and factors outlined above, these results are perhaps not surprising. Some waste types are 'single stream' such as wood and paper wastes. These are likely to burn in a similar manner to raw materials of the same type, if presented in the same form and configuration and subject to the same burn mechanisms as their waste counterparts. Other wastes are mixtures, such as RDF and SRF. Also subject to form and configuration and burn mechanism considerations, the results above align with systems such as the commodity class system on which sprinkler and similar equipment specifications are based (at its upper end this commodity class system is largely based on the amount of specified plastics in a material).

3.4 Mass loss/burn rate

During the smaller scale phase 1 tests the rate of mass loss during burns was measured via load cells underneath the test rig on which wastes were placed. This was not practical for the larger scale phase 2 tests. Mass loss during phase 1 burn tests was measured during the initial stages of burning, at steady state burn and peak burn. These mass loss results from phase 1 are summarised in table 2 below.

Table 2: Summary rate of mass loss data from phase 1 smaller scale tests

Waste type	Rate of mass loss (grammes/second)		
	Initial burning	Steady state burning	Peak burn rate
Baled cardboard	59.5	3.5	63.3
Baled LDPE plastic	87.3	NA*	184.3
Baled HDPE plastic	39.0	66.4	106.9
Baled RDF (refuse derived fuel)	32.8	12.8	33.6
Baled SRF (solid recovered fuel)	20.2	10.7	37.7
Loose tyre crumb	17.6	5.7	17.6
Loose screened wood chip	6.2	2.8	10.9
Loose pre-crush wood	32.1	3.5	32.6
Loose wood fines	5.3	0.5	8.3

** NA. LDPE extinguished early as a result of the ferocity of burn for safety reasons*

Ignoring the very low steady state mass loss for wood fines, lowest mass loss rate was 2.8 grammes/second (loose screened wood chip at steady state burn), and highest 184.3 grammes/second (baled LDPE at peak burn). In more practical terms, these lower and upper figures being 0.01 tonnes per hour, and 0.66 tonnes per hour respectively. All of these results were obtained from tests involving the surface ignition of wastes and do not account for some of the burn mechanisms outlined above.

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As noted above, in many respects the smaller scale burn tests did not replicate fully Fire and Rescue Services (FRS) experience of real waste fires, or in some cases the results of the larger scale phase 2 burn tests. However, the mass losses noted at peak burn temperatures obtained during the smaller scale tests indicate that for many wastes burn-out times are likely to be extended. There are variables here, and the data cannot be directly applied to real life waste fires, but it does give an indication.

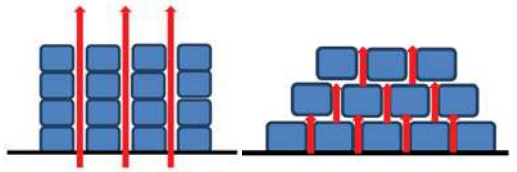
This may have implications if a 'controlled burn' strategy is pursued by the FRS, such as for reasons of reducing potential contaminated fire-water run-off. Even for smaller waste storage stacks, burn-out times are likely to be measured in days rather than hours.

3.5 Other findings: Interlacing bales and carbon monoxide

The above represents the main outcome of the waste burn trials. However, two other outcomes are worth noting:

Interlacing of bales to reduce chimney effects

As noted above chimney effects during the larger scale burns on baled wastes are a significant factor in fire spread and how energetic a waste stack burn will be. This prompted consideration of alternative bale stack configurations which may reduce these chimney effects. For one burn test bales were interlaced – placed as bricks in a wall rather than stacked vertically on top of each other. The aim being to break-up the vertical gaps.



Far left: Standard bale storage, and left: Interlaced bales. Red arrows indicate potential air flows

The results of this test revealed that once the fire was fully developed peak temperatures were not affected. As such interlacing bales would not, for example, be a reason for shorter separation distances between stacks aimed at reducing fire spread risk. What was affected was the rate of fire growth in its initial stages. Interlacing bales roughly doubled the time required for the fire to develop fully. This may allow a bale stack fire to be fought more effectively in its early stages, so preventing its development into a full fire. However, this was only one test and the results should be treated as indicative. Future waste burn tests aimed at proving this theory have been suggested.

Carbon monoxide (CO) emissions in phase 1 tests

The phase 1 smaller scale tests were conducted on a test rig, including an air extraction hood and system located over the rig. This allowed CO concentrations during burns to be measured using a flue-gas analyser. CO concentration is an indicator of inefficient combustion. The results obtained were generally as expected: Smouldering fires produced the highest CO concentrations, whereas 'cleaner' burns exhibited lower concentrations. However, as the phase 1 tests in many cases failed to replicate real-life waste fires there are few conclusions which can be applied to such real-life situations.

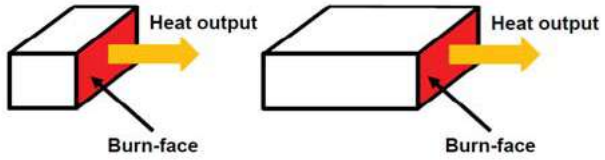
3.6 Application of phase 1 and 2 tests to WISH waste fires guidance

One of the primary aims of the phase 1 and 2 waste burn trials was to provide data from which waste storage stack separation distances information to reduce the risk of fire spread could be calculated. In this respect the trails were successful, and the separation distances information in the revised 2017 WISH waste fires guidance is based on the results of the tests. This was to address the acknowledged gaps/flaws in previous guidance which are often largely based on non-waste data.

The waste burn trials also aimed to provide data on which maximum stack sizes information could be based. In this respect the results were more mixed. Modelling using the data from the waste fire tests to determine stack separation distances did reveal that such distances seem to be relatively insensitive to overall stack size/volume. Two overall stack sizes were used in the modelling: A 450 m^3 stack and a 750 m^3 stack. The differences in modelled separation distances using these two stack sizes was less than 1 metre, and for all but one waste type less than 0.5 metres. This would indicate that overall stack volume is not a highly significant input to determining separation distance. This is not to say that stack size is irrelevant to fire management, only that overall volume does not seem to affect separation distance significantly.

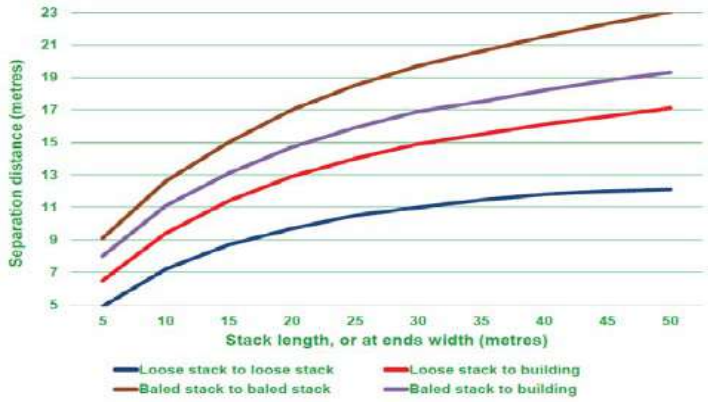
However, modelling of the results did indicate that stack configuration, or more accurately stack length and 'burn-face' area, did have a significant effect on separation distance. When a stack of waste is on fire it will emit heat. If the separation distance between the stack and another combustible object is insufficient then this heat may cause the second object to ignite. However, the amount of heat emitted in any one direction will depend on the dimensions of the 'burn-face' of the stack facing the second object, and not primarily its overall volume.

The diagram below illustrates this. The two waste stacks shown are of different volumes, but the burn-faces are the same dimension, and the heat output (represented by the amber arrows) in any one direction will likewise be largely the same.



Separation distance is largely a function of the amount of heat emitted per unit of area of a burn-face, and the dimensions of the burn-face. As noted above, wastes can practically be split into two categories: General wastes such as wood, paper, RDF etc which exhibit maximum burn temperatures of some 850 - 950 degrees centigrade and plastics and rubber wastes with temperatures of up to some 1,200 degrees centigrade. The revised 2017 WISH fires guidance provides a maximum stack height of 4 metres, for practical fire-fighting reasons. This leaves stack length as the variable to determine separation distance.

As a result of the above, the data from the waste burn trials can be modelled to provide separation distances as graphs showing a 'sliding scale' between stack length and separation distance. An example graph of this for general wastes (850 – 950 degrees' centigrade burn temperatures) is shown below.



To produce this modelling various assumptions needed to be made, such as angle of repose for loose waste stacks. A summary of these assumptions is given in appendix 1 of the 2017 revised WISH waste fires guidance.

Other results and outcomes of the phase 1 and 2 waste burn trials were also used in the revised 2017 WISH fires guidance, such as on interlacing bales in stacks as a potential method for reducing initial fire growth. As further fire research and testing is undertaken on wastes the outcomes will be included in future iterations of the WISH fires guidance.



General views of the phase 3 fire-fighting tests – see section 4 below for detail

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4. Summary of findings phase 3

Note: All of the data and information given in this summary are averaged and summary based on multiple burns of wastes to ensure a reasonable level of consistency. As with all of the tests, the variability of wastes, weather conditions and similar mean that results should not be taken to the 'last decimal point'. However, they are indicative and from multiple tests.

Most of the detail results of the phase 3 tests were aimed at informing the Fire and Rescue Services (FRS) regards effective means of fighting waste fires. These results will be included in National Operational Guidance for fire brigades. However, the tests are also of interest to waste operators. The sections below give a summary of the tests, and points of interest to waste management site operators and other interested parties.

Note: Some or the information below is firmly aimed at the Fire and Rescue Services. It is **NOT** the intent of this section to encourage or inform waste operators on fire-fighting techniques for their own operatives. Fighting fires is a specialist area requiring training, specialised equipment and clothing, and experience – waste operatives should **ONLY** attempt to fight any fire if it is safe to do so.

4.1 Fire-fighting media and techniques

Two configurations of stored wastes were used in the phase 3 tests:

- Piled loose stacks of waste in interlocking block bunkers
- Baled waste tests in 'open-yard' conditions

These configurations were chosen to replicate as close as practical typical fire scenarios encountered by the Fire and Rescue Services (FRS) at real waste site fires.

Three types of fire-fighting media were tested on these two waste storage configurations:

- Water on its own
- Water plus wetting agent
- Wet class A CAFS (foam)

Piled loose waste tests in bunkers

Bunker bays were filled with circa 17 tonnes of RDF (refuse derived fuel) and ignited via lance inserted in a pipe to middle of the pile to simulate an 'inside-out' burn. Thermocouples to monitor internal temperatures were installed within the waste piles. Fire were allowed to breach the surface and develop, and then attacked with the three fire-fighting media. Not all inside-out fires developed fully during the tests, although test results and conclusions were not significantly affected by this.

Water: Use of water jets knocked the visible fire down but had little effect on the internal temperature recorded by thermocouples only 1 metre below surface of the piles. That is temperature within the piles was largely unaffected. From observation, penetration of water into the piles was only circa 0.2 metres, accounting for the lack of significant effect on below-the-surface temperatures. The application of copious amounts of water did not result in lower internal temperature – the water simply ran-off without significant effect, other than posing a potential environmental risk.

Foam: The use of foam also resulted in visible flame being knocked-down, but quicker than was the case with water. Sub-surface temperatures at 1 metre below surface level were more affected than with water. Foam also seemed more effective at preventing burn-back than water (that is flames knocked-down by the foam tended not to reappear).

Water plus wetting agent: As with water on its own, jets knocked the visible fire down. However, penetration into the waste was much better at 1 – 1.5 metres, and sub-surface temperature was even more affected than with foam, down to 2 metres below surface level. As with water on its own the application of copious amounts of water plus wetting agent did not result in any further reduction in internal temperature – the water plus wetting agent simply ran-off the pile with little or no further effect.

Re-ignition: Following the fire-fighting tests water plus wetting agent was 'injected' into the piles via the pipe used to ignite the wastes. This was continued until water was seem running out of the joints between the interlocking blocks of the bunkers and the internal temperature of the piles was at ambient. However, after some 12 hours, the internal temperature of the piles had risen again. In summary, the waste had re-ignited despite there being no external signs of a fire. Excavating the wastes and dousing them being the only effective method of preventing this re-ignition.

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The results of these tests are of more direct use to the FRS. However, in summary:

- Water plus wetting agent proved the most effective, followed by foam, and then water on its own. However, in all cases penetration into the wastes was insufficient to fully extinguish the internal fire
- Continuing to apply water/foam/water plus wetting agent after visible flames had been extinguished provided no additional benefit, and poses the risk of environmental harm from contaminated water run-off
- Re-ignition of piled wastes is a significant risk, with excavation and dousing being the only practical method of extinguishing internal fires

Practical applications of the information above will require further consideration. For example, it may be of value for waste site operators to hold an IBC (intermediate bulk container) of wetting agent on site for use by the FRS in the event of a fire. Further consideration of this type of application is required before definitive advice can be given. Waste operators should consult with their local FRS on this aspect before taking any action.

It should be noted that the tests were on RDF, which has a relatively small particle size and is non-rigid – that is air spaces within the stack are negligible. The behaviour of the three media used is likely to be different with larger particle size and/or rigid wastes such as pre-crush or raw wood wastes, as media penetration into stacks of such wastes is likely to be much higher. These piles behave like a 'bonfire', of which the FRS has extensive experience already.

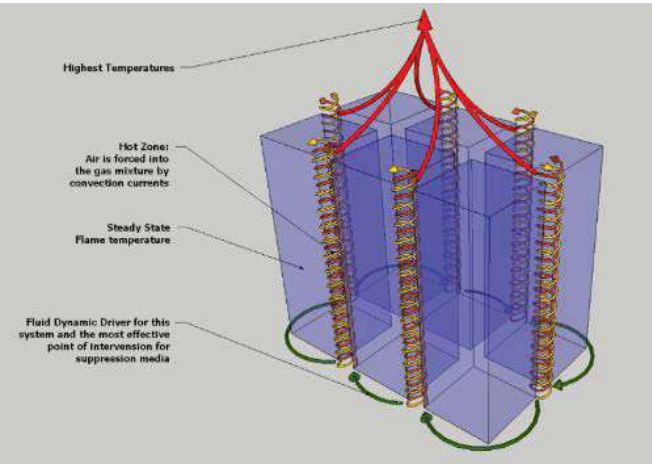
Note: While not tested, the use of inert materials such as soil or sand to 'entomb' a fire has been used effectively in the past on waste fires. However, this technique does not extinguish internal fires and gradual excavation and dousing would still remain the only practical option to extinguish a fire completely.

Baled waste tests

Mixed waste plastic bales were assembled into a 'mini-stack' three bales wide and long and three bales high (total of 27 bales). Waste plastics were used because of their higher burn temperatures (worst case scenario). Ignition was on the up-wind side of the bale stack producing an outside-in fire (inside-out fires are rare in bales because of their density). From ignition to full involvement of the stacks in the fires was less than 4 minutes.

As for the loose wastes in bunker tests, the three different fire-fighting media of water, foam and water plus wetting agent were then used to attempt to extinguish the fires. In addition, different fire-fighting techniques were used, such as directing jets from hoses into the gaps between bales and at the base of the fire. However, this type of information is likely of more use to the FRS than waste operators.

General arrangement of bales used in tests (only six bales shown)



Note: The diagram above incudes graphic representation of the chimney effects seen in baled waste fires, as discussed elsewhere in this report.

Water: Two 45 mm jets were applied to the fires (typical equipment used by the FRS when they first arrive at a site where a fire is occurring). Even after applying some 20,000 litres of water for 20 minutes the fire was not fully extinguished.

Foam: A class A wet solution CAF was used. This was significantly more effective than water and resulted in the fires being extinguished on average in 7 minutes. Run-off was also markedly less than for water on its own. However, it was also observed that the 'throw' of foam from hoses was less than for water, making fire-fighting more difficult.

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Water plus wetting agent: Two 45 mm jets were used, as for water on its own. Water plus wetting agent proved the most effective with fires being extinguished in on average 2 minutes, and with the least run-off.

Summary table of baled waste tests

Media	Detail	Volume water used	Time to extinguish
Water	2 x 45 mm jets at 7 bar	20,000 litres	20 minutes (not extinguished)
Foam	Class A wet solution CAF, 2 x 128 litre/minute jets	1,800 litres	7 minutes
Water plus wetting agent	2 x 45 mm jets at 7 bar, with wetting agent at 0.3% by volume	1,800 litres	2 minutes

As for the loose waste in bunkers tests, water plus wetting agent proved the most effective fire-fighting media, with foam second and water on its own last. Further consideration is required to make detail comment, and most of the information gained in these tests will be of most direct use to the FRS.

It is worth discussing the potential use of wetting agents in fixed fire systems such as sprinklers and deluge systems. To an extent, the design of systems with spray heads, such as sprinklers and deluges, relies on water droplet size. Wetting agents work by reducing water surface tension, and this may result in smaller droplet size so changing the behaviour of a sprinkler or deluge system. In brief, the use of wetting agents in sprinklers, deluges and similar is not currently recommended, and further research in this area is required.

However, the use of wetting agents in oscillating and fixed water monitors may be a valid option. Monitors emulate the action of hoses and are not as reliant on droplet size. However, there are variables here and the advice of a competent fire engineer would need to be sought, and effectiveness may well vary dependent on the design specifics of any system. In brief, this is unlikely to be as simple as adding an IBC of wetting agent with a proportionating valve in the water supply to a monitor system.

4.2 Effectiveness of bunkers in reducing fire spread

It is common for wastes to be stored in three-sided bunkers. The walls of these bunkers may be solid concrete, block construction, steel plate or other. For solid concrete and steel (fabricated, not A frames and similar – see the 2017 WISH guidance for this type of bunker construction) there are existing standards. It should be obvious that railway sleepers and non-interlocking blocks with gaps are unlikely to offer adequate fire spread protection.

However, one of the most common forms of construction for bunkers is the use of interlocking concrete blocks. The effectiveness of this type of construction in preventing fire spread has been the topic of debate, although some suppliers have had their products tested.

Three waste types were used in these tests: RDF (refuse derived fuel), loose plastic wastes and wood waste. For some of the bunker walls the interlocking blocks were left 'dry assembled', for others proprietary intumescent sealant was applied between the blocks. The fires lit in these bunker tests varied in timescale, with some bunker walls being subjected to 48 hours plus of fire exposure. In summary of the results:

- In general, the interlocking block walls performed well. The outside walls of the bunkers exhibited little thermal transfer, remaining 'cool' (or at worst only warm) to the touch throughout the tests, and heat damage to the blocks was not substantive
- Smoke and heat were observed escaping from between the dry-assembled blocks. The risk of fire spread from such escape would depend what is on the other side of the bunker wall, its location and combustion properties
- The block walls sealed with intumescent sealant performed better than those dry-assembled, and the sealant was still intact after the fires. The use of intumescent sealant would seem a cheap and effective method of enhancing the effectiveness of interlocking block bunker walls regards restricting fire spread
- The 2017 WISH guidance includes that a 1 metre freeboard should be left between waste height and wall height. This is to account for flame height in a fire. During the tests, even with this 1 metre freeboard flames were observed to be drawn-up and lick-over the bunker walls. Similarly, to the case for small gaps in interlocking block walls, the impact on fire spread would depend on what is on the other side of the wall. However, it is impractical to build bunker walls of an infinite height, and greater freeboard would likely only draw the flames up higher. A 1 metre freeboard is not perfect, but does provide a significant reduction in fire spread risk

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Note: The importance of considering what is on the other side of a bunker wall is critical. If what is on the other side of the wall is a free-air gap of sufficient distance or a non-combustible material then the protection any bunker wall needs to provide is lower than if a building, another stack of combustible wastes or similar is on the other side of the wall. This type of consideration should be part of site storage planning.

Summary table of interlocking block bunker tests

Material in bay	Duration	Max temperature	Comments
RDF (refuse derived fuel)	50 hours	400 – 500 °C	Slight heating through block, but still able to hold bare hand on the outside edge of blocks. Some flame penetration through gaps in blocks down wind of the fire
Loose plastic wastes	2 hours	1,100 °C	Slight heating through block, but still able to hold bare hand on the outside edge of blocks
Pre-crush wood	20 hours	950 °C	Post fire spalling of the inner face of block but remained stable

4.3 Practical test of separation distance

As described in section 3 of this report, the results of the phase 2 tests were used to model free-air separation distances required to prevent fire spread from thermal radiation and resulted in the separation distances noted in the 2017 WISH guidance. However, some readers of the WISH guidance have expressed a level of disbelief regards the often relatively wide separation distances included in the 2017 WISH guidance, compared to the separation distances included in some other documents on waste fires.

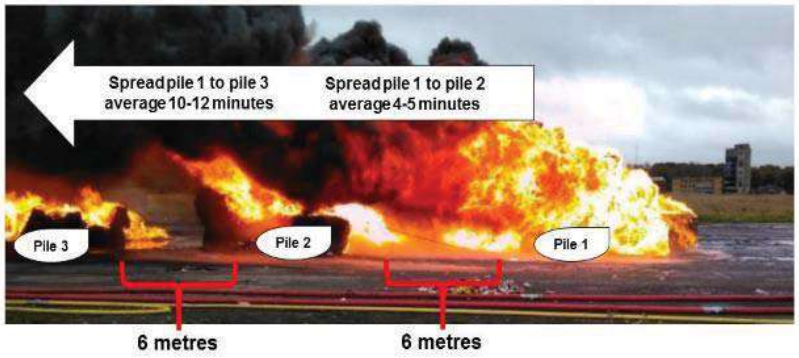
The opportunity was taken during the bale fire-fighting tests in the phase 3 tests to undertake an empirical test of separation distance. During these tests a main bale stack was constructed (as detailed above). Two further, smaller piles were also assembled, the first 6 metres from the first stack, and the second a further 6 metres away (see diagram below).

Fire spread between pile 1 and pile 2 occurred within 4-5 minutes, and all three piles were fully involved in the fire within 10-12 minutes. This test was repeated, with the same results.

Instinctively, the relatively wide separation distances in the 2017 WISH guidance may seem excessive, and the use of plastic wastes for the tests is a worst-case scenario because of their higher burn temperature. However, as these empirical tests indicate the WISH guidance distances are realistic. Certainly, relying on relatively narrow separation distances is unlikely to be effective in preventing fire spread.

Photograph with overlaid graphics of empirical test of separation distance

Photograph of actual tests. Note, bale stacks in partial collapse and extensive flames result in pre-burn distances not being clear in photograph. This test repeated four times to ensure consistency.



4.4 Other findings

During the phase 3 tests on bunkered wastes various fire detection companies took the opportunity to perform tests of their detection products, in particular of visual heat and smoke detection systems. In summary:

- All of the detector systems used detected fires once they had breached the surface and became open flame fires

- However, none of the detector systems tested were 100% effective in detecting sub-surface fires in the RDF used in the tests. This is likely the result of the lack of significant airgaps in loose stacks of RDF (or other smaller particle size/non-rigid wastes). This lack of air gaps means that heat and/or smoke cannot effectively escape from the stack, and as a result there is nothing for the detector to detect. This effect is likely to also apply to other small particle size/non-rigid wastes where any air gaps are likely small and/or insignificant
- For stacks of larger particle size/rigid wastes such as raw and pre-crushed wood waste, or stacks of bagged waste, the air gaps present in such stacks may likely allow hot air and smoke to escape so allowing better detection at the surface
- Obviously placing thermocouples through a pile of waste will detect heat, but this type of technique is likely only practical if wastes are being stored for longer time periods as the thermocouples are effectively sacrificial

Note: The thermocouples placed in the waste stacks used in the bunker tests allowed sub-surface temperatures throughout the stacks to be monitored. The sub-surface heat from internal fires appears to 'move around' in the stack and is often localised (heat is apparent in one part of a stack but not in another). The use of thermal probes to monitor for internal fires in waste stacks has been the topic of debate, in particular the practicality of pushing a thermal probe into some types and configurations of waste stack. The results of the phase 3 tests would indicate that the use of thermal probes, where practical, may be of use, but may depend on a level of 'chance' as to whether the probe hits a hot spot or misses.

As noted above, fires in loose waste stacks may re-ignite after the obvious surface fire has been extinguished, and that this re-ignition may take place many hours after apparent extinguishing of the fire. In addition, wastes and other materials which have been burnt may undergo chemical change which makes them more prone to re-ignition. Landfill is the most common disposal route for wastes from waste fires. Unless the waste is excavated and thoroughly doused before such disposal, landfill may not be a wise disposal route.

Appendix 6: Useful links and further reading

The list below is not comprehensive but does provide an overview of useful documents you may wish to consider. Other guidance is available – you should ask your competent advisor.

Health and Safety Executive, fire/explosion pages: http://www.hse.gov.uk/fireandexplosion/index.htm

Gov.uk, How to comply with your environmental permit:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/298102/LIT_7123_79744e.pdf

Environment Agency – Fire Prevention Plans: Environmental permits:
https://www.gov.uk/government/publications/fire-prevention-plans-environmental-permits

Contact details for your local fire and rescue service: http://www.fireservice.co.uk/information/ukfrs

Advice on fire risk assessment for factories and warehouses:
https://www.gov.uk/government/publications/fire-safety-risk-assessment-factories-and-warehouses

Other guidance on fire risk assessment: https://www.gov.uk/government/collections/fire-safety-law-and-guidance-documents-for-business

WISH (Waste Industry Safety and Health) Forum guidance: www.wishforum.org.uk

Environmental Services Association DSEAR guidance: http://www.esauk.org/esa_reports/index.html

For the full Regulatory Reform (Fire Safety) Order 2005:
http://www.legislation.gov.uk/uksi/2005/1541/contents/made

Spontaneous heating of piled tyre shred and rubber crumb – HSE:
http://www.hse.gov.uk/rubber/spontaneous.htm. FM (Factory Mutual) technical note 8-3 also includes information on tyre storage fire hazards.

BS EN 15188:2007 Determination of the spontaneous ignition behaviour of dust accumulations.

Building Research Establishment Information Paper: IP23/82. Spontaneous Combustion – isothermal test methods. BRE Bookshop.

SFPE Handbook 3rd Edition - Ch 2 Conduction of heat in solids - National Fire Protection Association – SBN: 0877654514

CIRIA Report C736, 2014 Containment systems for the prevention of pollution:
http://www.ciria.org/Resources/Free_publications/c736.aspx

Environmental Protection Handbook for the Fire and Rescue Service:
http://www.ukfrs.com/pages/research.aspx

Technical insurance standards under the FM Global Data Sheets are available as free downloads at: www.fmglobaldatasheets.com. However, please note that many of these are not waste specific, and the data in them may not be directly applicable. But they may provide good general information.

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Appendix 7: Glossary

Accident/emergency Plan	Part of a written management system that includes an assessment of fire risk on the site and what measures are in place to prevent, detect, suppress, mitigate and contain fire. Note – this is a term used in environmental permits/waste management licences. Other terms, such as emergency plan, fire plan etc, may be used in other regulator aspects. While outside of this guidance, you may also want to consider disaster recovery and business continuity planning
Brands/embers	Small items of material which are on fire, or smouldering which may blow or otherwise travel between stacks and similar and spread fire
Bund	A type of secondary containment. Usually an impermeable construction designed to hold polluting substances that leak, are spilt or run-off from a storage area
Combustible materials	In the context of this document, solid materials that can ignite and burn, such as textiles, wood and paper
Competent advice	Competent advice on fire safety and its technical aspects is critical to good fire control management. Competent advice sources may include: • In-house health and safety specialists – provided that they have sufficient knowledge and experience of fire management and the standards applied • Your local Fire and Rescue Services (FRS). Please note that your local FRS may be best being consulted after you have produced draft management processes, design of site etc • Regulators such as the Environment Agency, Scottish Environment Protection Agency and NRW (the Health and Safety Executive, but only for specific fire issues such as DSEAR). Please note that while such regulators can provide advice this is not their primary role • Insurers – your insurance company may have internal fire management specialists who you can call on at no or lower cost than going to an external consultant • External consultants – suitably competent external consultants. Please ensure that these are experienced and knowledgeable about fire management and standards Note – different stakeholders, such as insurers and regulators, may have different priorities and you may need to consult with more than one type competent advice to gain a full picture
Controlled burn	An operational fire-fighting strategy where the application of fire-fighting media such as water or foam is restricted or avoided, to minimise damage to the environment
Exemption	Low risk waste handling operations that don't require a permit or licence. Most exemptions need to be registered with the EA/SEPA

Protected habitat	Examples include: Site of Special Scientific Interest (SSSI), Area of Special Scientific Interest (ASSI), Special Area of Conservation (SAC), Special Protected Area (SPA), National Nature Reserve, Sites of international conservation importance – Ramsar site, Area of Outstanding Natural Beauty (AONB), National Scenic Area
Hazardous substances	Materials that can harm human health and/or damage the environment
Hazardous/special Waste	Wastes, specified in the European Waste Catalogue, that may be harmful to human health or the environment
Permit/waste management licence	A document issued by your environmental regulator that controls the environmental impact of your business activities. It has conditions which you must follow to prevent your business harming the environment or human health
Firewater run-off	Water that has been used to fight a fire, likely to be contaminated with the products of combustion and un-burnt materials that are washed off the site
Fire risk assessment	A structured and systematic examination of the premises/site/buildings etc to identify the hazards from fire. Once identified, a hazard is significant, identify who and/or what is at risk and whether the existing fire precautions are adequate so that the risk associated with the hazard is acceptably low. If the existing fire precautions are not adequate you must take additional action to minimise the risk either by removing or reducing the hazard or by providing adequate control measures
Flammable material	Materials that ignite easily and burn rapidly with a flame. Liquids and articles are usually defined as flammable if they possess a flash point of 60°C or lower
Flashpoint	The lowest temperature at which a liquid produces enough vapour to form an ignitable mixture in air
Foul sewer	Sewers or pipes that collect foul water (sewage and trade effluent) and convey it to a sewage treatment facility. They can be owned privately or by the local sewage treatment provider
Groundwater	Water that is below the surface of the ground in the saturation zone, and in direct contact with the ground or subsoil. The saturation zone is where all the cracks in the rock and all the spaces between the grains of rock and within the soil are filled with water
Penstock/shut-off valve	A sluice or gate valve fitted in a sewer or drain that can be closed automatically or manually to contain spillages or firewater
RDF/SRF	Refuse derived fuel/solid recovered fuel (various types of fuel derived from wastes using various treatment processes)

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Secondary containment	A structure such as a bund that surrounds a storage area, designed to contain pollutants in the event of a fire or spillage
Sensitive receptor	Human receptors include hospitals, nursing homes, schools, residential areas, places of work, transport networks. Environmental receptors include source protection zones, surface waters, potable abstractions, groundwater, protected habitats, fisheries
Stack	A pile of solid combustible materials. Any spaces within it will not allow free passage, or exceed one metre in width at their narrowest point
Surface water drain/sewer	Sewer or pipes that collect uncontaminated surface water only, from buildings, roads and yards, which usually discharges directly into rivers, the sea or groundwater
Spontaneous combustion	Combustion which occurs without an external heat or ignition source being applied
Tertiary containment	A device or structure such as a firewater lagoon, that provides additional containment should secondary containment fail






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