ATLANTIC WASTE ECOPARK PAVING PROJECT

CQA Plan

Report Number 1379r3v1d0615

Commissioned by
Atlantic Waste
Ty-To-Maen Farm
Newton Road
Rumney
Cardiff
CF3 2EJ

Prepared by
Geotechnology Ltd
Ty Coed
5 Cefn yr Allt
Aberdulais
Neath
SA10 8HE

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1 INTRODUCTION

Atlantic Recycling Ltd (Atlantic) operates a waste transfer station on land at Newton Farm, Rhymney, Cardiff. Its associated company Neal Soil Suppliers operates a soil and aggregates processing facility on adjacent land. The waste activities at Atlantic require significant areas of land to be provided with infrastructure to reduce the risk of pollution to the protected watercourses that run through the site. The environmental permit requires that areas used for storing specified waste should be provided with an impermeable surface with a sealed drainage system. Currently, significant areas of the site do not meet this requirement and large areas remain in need of paving.

This CQA Plan has been produced by Geotechnology Limited to communicate the design and specification for the impermeable surface for the area known as Field 1 at the Atlantic Waste Site. This Plan also identifies how the construction works will be carried out and sets out the quality assurance procedures that will be implemented to ensure that the finished paving meets the design requirements. The Plan concludes by identifying the records that will be maintained and presented to the waste regulator in the form of a Construction Quality Assurance Validation Report.

2 DESIGN BASIS

2.1 Design Principle

The impermeable surfacing comprises a layer of cement bound granular material laid over an unbound aggregate support layer. The ground is to be reprofiled prior to slab construction so that a general fall to the southeast is established. Planning conditions have dictated the slab levels and falls as well as the drainage system. Water passing over the slab will be directed to an integral reinforced concrete channel which runs along the lower (southeastern) edge of the slab. Water will discharge into Atlantic's existing dirty water system via an interceptor. The surface of the slab will be impermeable and collected water will be retained within a sealed drainage system, in accordance with Permit requirements.

2.2 Planning Considerations

The surfacing at Atlantic is to be laid to a configuration that meets the requirements of the Planning Consent for the site. Planning conditions dictate the extent of the surface, which has to maintain a specified standoff from the nearby reen system. Planning conditions also dictate the levels and falls that have to be achieved: the slab levels have to be circa 6.5m at the southern end have to profiles to a gradient of 1:100 to allow effective drainage. The approved proposal for a large building at the northern end of the paved area requires that the gradient is reduced in this area as it will ultimately lie largely within the building.

The drainage of surface runoff from the slab has also been considered in detail during the planning submissions. Surface water has to be collected in a drainage ditch at the southern edge of the slab from where it is discharged into Atlantics waste water collection system after having passed through an interceptor. The size and type of interceptor has been calculated by RPS, whose report on the detailed design for the drainage system for the site has been approved by the authority. The scheme also required an upstand at the southern edge of the slab to a level of 6.8m AOD in order to accommodate extreme flood events within the site. The planning consent drainage details are provided in Appendix 1, whilst details of the approved interceptor are provided in Appendix 4.

2.3 Design Objectives

Table S1.1 of the Environmental Permit requires that the areas used for the storage or treatment of non-hazardous wastes are covered with an impermeable surface. The Permit does not define "impermeable" but it is generally accepted to mean an unbroken robust surface normally comprising concrete but on occasion possibly asphaltic surfacing. The key aspect of the definition is that the surfacing must be "impermeable" to water. Both concrete and asphaltic surfacing has to be placed onto a resistant layer provided specifically to support the overlying surfacing material.

2.4 Design Approach

Paving large areas for industrial purposes is not uncommon and there are numerous sources of reference for ways in which the paving can be designed and constructed. Many of the design approaches are an evolution of detailed Department for Transport (DoT) guidance on the design of road infrastructure, though modification is required as the industrial paved areas are subjected to smaller numbers of passes of heavier axle loads than roads.

The available design approaches point toward currently widely used documents produced by DoT and also to current British and European Standards. As a niche area, design guidance is produced by interest groups formed by the companies that provide services and materials to industrial paving. Key design guides for this project include the BritPave document “The Design and Specification of Heavy Duty Paving”, the British Ports Association document “Port and Heavy Duty Pavement Design Manual” and the BritPave document “Guide to Roller Compacted Concrete”.

The design basis for heavy duty paving is the avoidance of excessive deflection in the pavement when traversed by heavy plant. The deflection is a consequence of point loading the surface and the response of the ground and the pavement structure to the load. The ground support conditions are an important element in this consideration and to avoid excessive deflection in the paving over weak ground the paving has to be strengthened or the ground improved to limit deflection. This can be achieved by a high strength reinforced concrete over a suitable unbound sub-base and capping layer or by the use of alternative designs based upon materials bound by cementitious or hydraulic road binders.

The design of industrial paving can be developed from first principles or from a series of published design guides, which have been published by various organisations to simplify the design process. Many of these design guides have been drafted by John Kennedy, a noted pavement design engineer of many years’ experience. Mr Kennedy is the author of many technical papers, reports and publications and is the UK expert for hydraulically treated materials on the BSI committee B510/4 and the European Standards Technical Committee CEN TC227/WG4 ‘Road materials’. Mr Kennedy has been commissioned by Atlantic to undertake the design of the slab/sub-base configuration. Mr Kennedys design calculations are provided in Appendix 2, and the design specification has been produced as a series of drawings on Figures 2 to 6.

3 CONSTRUCTION PROPOSAL

3.1 Existing Site Conditions

At this site there is a requirement for a significant area of impermeable surfacing to be provided and this area includes areas already covered with aggregates and subjected to plant loads, areas around existing fixed plant and yards and areas with natural ground surfaces exposed. Together with existing ground level variation and proposed surface profiles it is fair to say that the conditions across the site are highly variable.

Ground conditions are variable across the site. A programme of CBR testing has been undertaken in order to examine ground support conditions for design purposes. It has been found that the in-situ CBR varies from 0.8% to 20% demonstrating how variable the ground can be. In order to provide better support conditions, soft spots will be remediated and once an acceptable formation is achieved a layer of sub-base will be placed over the entire area to achieve a CBR of greater than 8%.

3.2 Slab Construction

The slab comprises 300mm of C8/10 cement bound granular material (CBGM) over 200mm of unbound compacted 6F2 placed over a prepared and re-graded formation. The slab has a fall of 1 in 100 toward the southeast over the southeastern half of the slab (see Figure 3).

The Slab contractor will jointly inspect the finished aggregate layer with the earthworks contractor and the CQA engineer. The acceptability of this will be recorded prior to slab construction. The slab will be produced by machinery that lifts the unbound aggregate, crushes it to 20mm down, blends it with cement and then water and finally lays it as a uniform layer. A second pass will blend reinforcing fibres into the top of the layer. When complete the layer will be compacted with vibrating rollers before the finish is achieved by power floating. The use of fibre, power floating and extra cement additional in the upper layers assures that a highly impermeable surface is produced. The CQA engineer will monitor the construction works, will ensure that samples are taken for strength determination and aggregate grading and will undertake an as-built survey of the surface. The slab is unjointed.

The 300mm thick slab is to be constructed from cement bound granular material in accordance with British and European standards. This is to be prepared by blending ordinary Portland cement with 20mm down recycled aggregate and water to meet the design specification. The materials will be mixed in-situ using specialist plant operated by a specialist contractor. The method statement for the slab construction is included in Appendix 4. Prior to mixing, the earthworks contractor will spread a 300mm thick layer of unbound aggregate over the entire area and this will be verified by topographic survey.

3.3 Drainage Channel Construction

The drainage channel is to be cast first. Prior to commencement the line of the channel will be set out and the earthworks contractor will provide a smooth dust blinding 200mm below the finished culvert level. The levels will be checked by the CQA engineer prior to shuttering being placed. The culver contractor will place the shuttering in 30m stretches and will then place the A393 anti-crack mesh onto 50mm chairs over a polythene membrane. C30 structural concrete will be poured over the full 30m stretch. Crack inducers will be placed at

10m intervals to control shrinkage cracking. The CQA engineer will monitor the pours and will see that concrete cubes are taken to verify the strength of the concrete delivered.

The channel will be constructed as a series of pours. The first pour will be the base and an upstand, the second pour will be the wall and the final pour will form the benching between the channel and the slab and will be completed after the slab is constructed. The joints between the pours will be reinforced with bars at 300mm centres. At the end of each 30m stretch of the channel an expansion joint will be fitted as shown on Figure 6. The CQA engineer will monitor construction and will survey the channel upon completion to produce as-built records.

Channel construction will extend 10m beyond the outfall and a temporary system will be placed to prevent runoff on the unfinished edge. The outfall will be cast around the 225mm drainage pipe which will be fitted with a closable gate valve. The drainage pipe will be laid to the discharge point in the site internal drainage system after passing through the interceptor. The CQA engineer will survey the pipe run and interceptor placement so that as-built drawings can be produced.

3.4 Phasing

Given the size of the area to be paved it is not practical to expect completion in a single phase. The proposed slab will therefore be achieved in two phases: Phase 1 will be the eastern half of the slab and will include the drainage channel, discharge pipework and interceptor (Figure 3). Once complete and cured for 28 days the RDF stockpiles will be moved onto the new slab, exposing the ground beneath Phase 2 for preparation and construction. The approximate line between Phases 1 and 2 is shown on Figure 3.

4 CONSTRUCTION QUALITY ASSURANCE

4.1 Existing ground

Existing ground is to be reprofiled to achieve the top of slab design levels minus 500mm. Figure 3 shows the finished slab levels; the works are to be carried out with excavators and dozers to achieve the final surface levels to a tolerance of 50mm. The works are to be set out using pegs positioned by dGPS and a spinning grade laser to achieve the required profile. The formation levels will be validated by independent survey. Levels shall be taken at a frequency of no less than 1 per $500m^2$ and the results will be tabulated to show the difference between the design level and the formation level.

4.2 Validation of Support Conditions

The finished formation is required to have an in-situ CBR of no less than 8%. Initially the entire area will be inspected jointly by the CQA inspector and the contractor to determine whether any soft spots are present. In the event of soft spots being identified they will be remediated by excavation and replacement. When the inspector has accepted the formation is free of soft spots provisional acceptance will be given and recorded.

A series of in-situ CBR tests will be undertaken by an independent testing specialist at a frequency of no less than 1 test per $1000m^2$. The results will be examined by the CQA inspector and only in the event that all are greater than 8% will the formation be accepted. At this point a detailed topographic survey of the formation will be undertaken and an as-built drawing will be prepared.

4.3 Unbound Layer

A layer of unbound 6F2 aggregate will be laid over the formation with an initial target thickness of 200mm. The layer will be compacted using method compaction as specified in the Manual of Contract Documents for Highways Works, Schedule 600. In order to meet these requirements the material grading will be established by laboratory testing on no fewer than 4 samples per aggregate source. The test results will be confirmed by the CQA inspector to meet a particular class of the SHW and will confirm the correct compaction regime has been used.

The thickness of the unbound layer will be determined at a frequency of no less than 1 measurement per $500m^2$. Upon completion of the layer a detailed topographic survey of the top of the unbound layer will be undertaken and an as-built drawing will be prepared. An isopachyte map will be prepared from the survey at formation and the unbound layer survey to illustrate the thickness of the layer. The layer shall meet the design thickness with a tolerance of 25mm.

Once the isopachyte plan has been prepared the CQA inspector will approve the unbound layer but only after a walkover inspection. Acceptance will be recorded.

4.4 Bound Layer

The bound layer will be the impermeable pavement and will be constructed using the mix in-situ technique. The layer will comprise recycled aggregate, Portland cement and water mixed to the design ratio. The construction of the layer will commence with a layer of loose aggregate being cast over the underlying unbound compacted sub-base. Cement will be applied to the surface with specialist machinery which delivers measured doses per unit area and the loose, dry components will be mixed together using a specialist mixer designed for in-situ mixing. After the first pass to blend the dry components a water spray bar will be passed over the surface and the blend will receive its final mixing. Upon completion of the mixing the low moisture content blend will be compacted with a vibratory roller to produce a finished surface.

The loose aggregate will be laid over the formation with an initial target thickness of 300mm. As the bound layer comprises aggregate which will be from a conventional recycled source, manufactured under a quality protocol, the amount of conformance testing required is small. A total of 5 conformance test results shall be taken and compared against the grading requirements of the specification. The aggregate shall only be accepted when the gradings reveal that it meets the specification. Testing on the cement component is not proposed.

The thickness of the bound layer will be determined at a frequency of no less than 1 measurement per 500m^2. Upon completion of the layer a detailed topographic survey of the top of the bound layer will be undertaken and an as-built drawing will be prepared. An isopachyte map will be prepared from the survey at the finished surface and the unbound layer survey to illustrate the thickness of the layer. The layer shall meet the design thickness with a tolerance of 25mm.

4.5 Concrete Strength

The design strength of the cement bound material shall be established with a series of cubes prepared during the works. The cubes shall be tested at 7 days and 28 days and all samples must reveal strength in excess of the strength class required. Cubes shall be taken at a frequency of 1 cube per 1000m2.

4.6 Surface Finish and Fall

The as-built drawing of the finished surface will be compared with the design drawing and a schedule of points shall be prepared to compare the two surfaces. The finished levels should be within 25mm of the required finished levels and the surface should have an acceptable tight finish.

4.7 Edge Details

The downslope edge will be a 1m wide 300mm deep gutter cast in reinforced concrete. The gutter will have an upstand of 800mm to achieve the required levels. The gutter will fall toward the drain sump at the required gradient so that all surface water arising within the slab area is collected and passed into the site drainage system.

The sides and rear of the slab will be provided with a contiguous upstand kerb to keep surface water within the slab area.

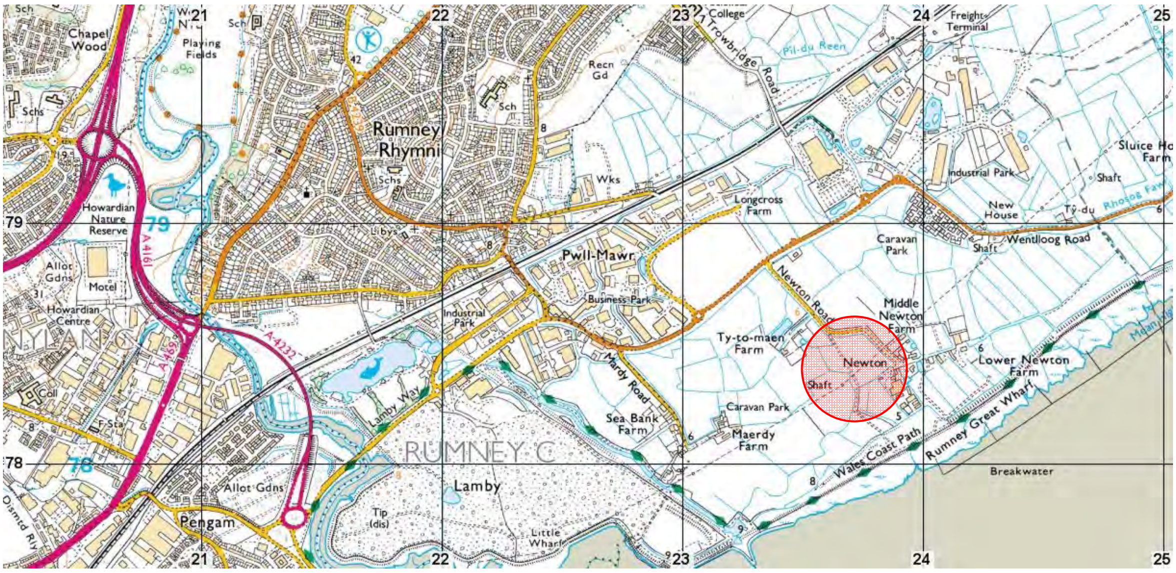
The drainage channel will be inspected by the CQA inspector upon completion to confirm that it meets the design requirements. Concrete cubes will be taken at a frequency of 1 cube per pour.

4.8 Construction Quality Assurance Validation Report

Before the paving is used for waste operations the CQA records will be forwarded to NRW for review in the form of a CQA Validation Report. The Report will contain as a minimum:

- Identification of parties
- Identification of CQA Consultant and CV of Inspector
- The Design Specification
- All test records obtained during the works
- All topographic surveys made during the works
- Isopachyte Plans and Thickness Measurements
- Compaction methods adopted and evidence for Compliance with MCDHW Schedule 600
- Correspondence with NRW
- The Approved CQA Plan
- Site Diary
- Progress Photographs
- A written account of the construction
- Identification of any non-conformances and rectification actions
- A Statement Validating the Construction

Figure 1 Site Location Plan



Reproduced from the Ordnance Survey Land Ranger Map
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Drawing Number 1379r3/2

NOTE

Rev	Date	Status/Ammendments

CLIENT
ATLANTIC RECYCLING LTD

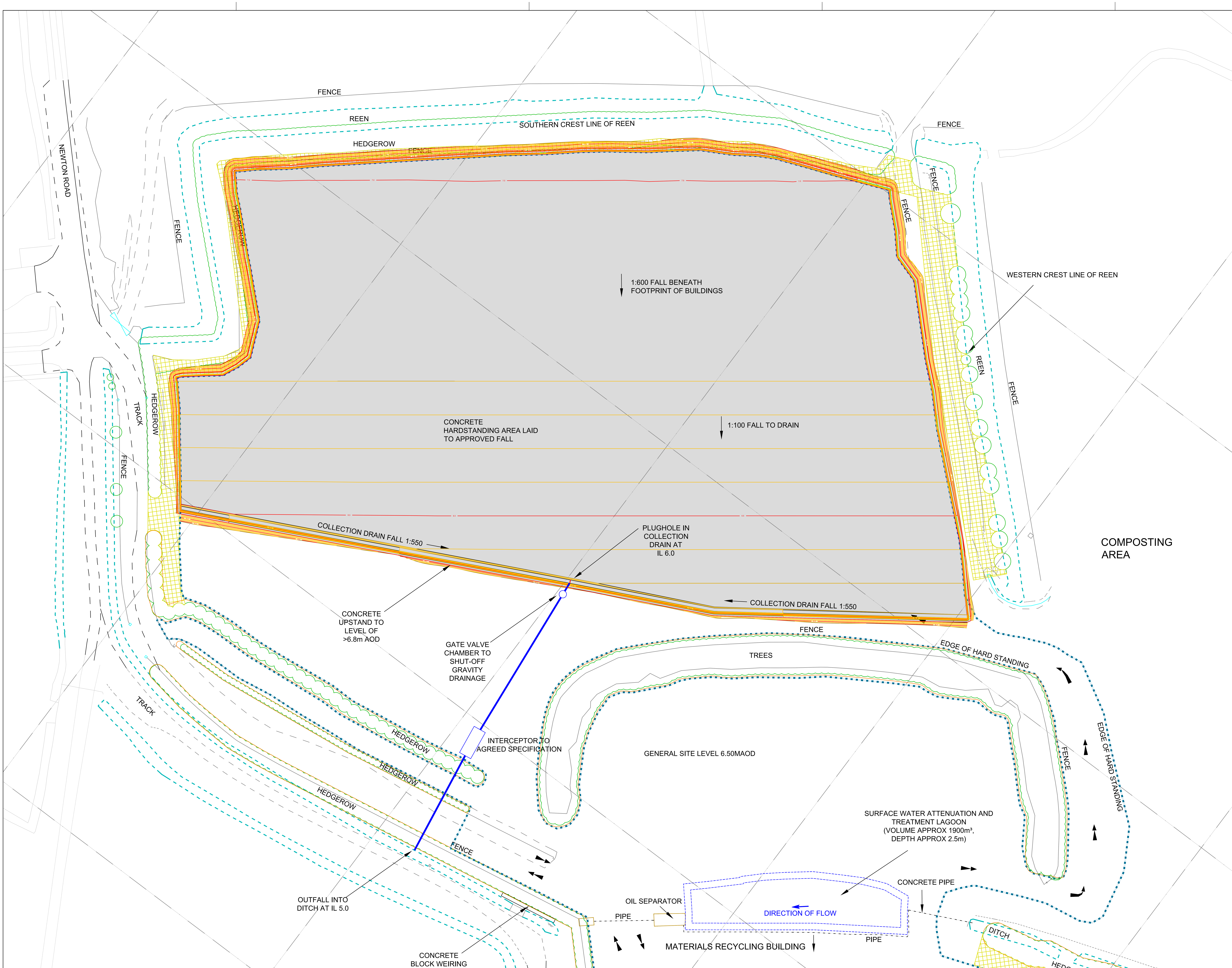
PROJECT
IMPERMEABLE PAVING SCHEME

TITLE
Site Topographic Survey

DRAWING NUMBER	REVISION
1379r3/2	0

SCALE AT A1	DATE	DRAWN	CHECKED
1:500	04.15	KT	

Geotechnology
Ty Coed, Cefn-yr-Allt,
Aberdulais, Neath
SA10 8HE
01639 775293
www.geotechnology.net



Drawing Number 1379r3/3

NOTE

Rev	Date	Status/Ammendments

CLIENT C:\Users\ewanthomas\Downloads\atlantic.jpg — ATLANTIC RECYCLING LTD

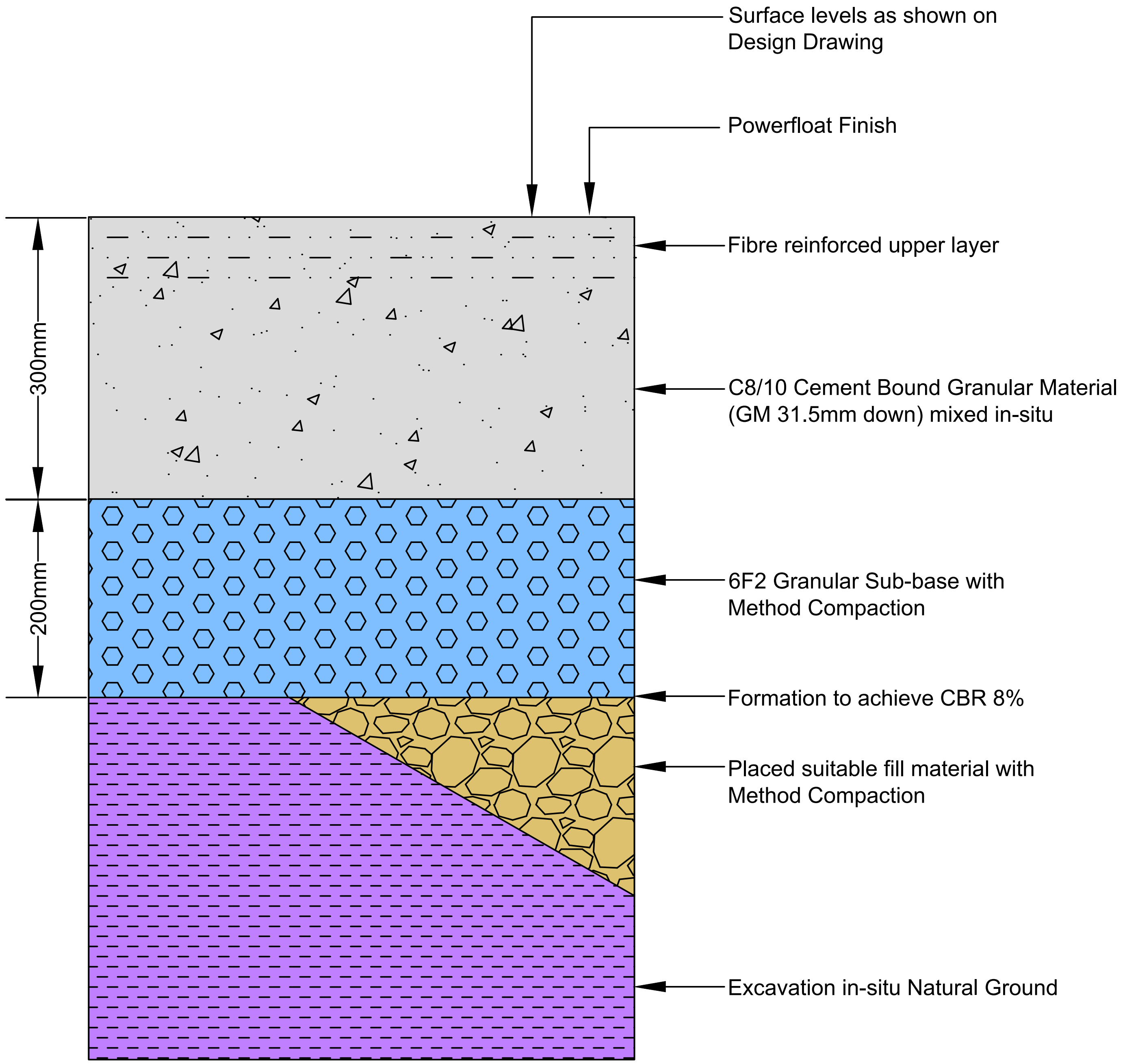
PROJECT
IMPERMEABLE PAVING SCHEME

TITLE
Plan of Proposed Impermeable Surfacing

DRAWING NUMBER	REVISION
1379r3/3	0

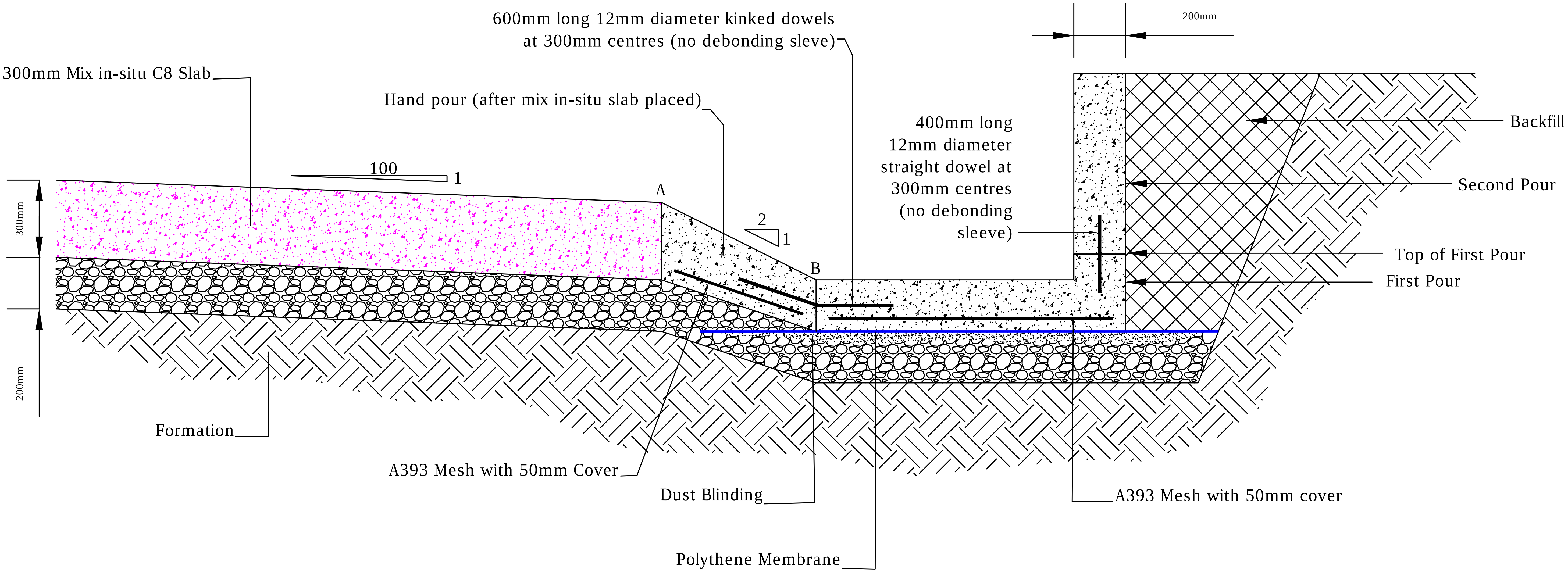
SCALE AT A1	DATE	DRAWN	CHECKED
1:500	04.15	KT	

Geotechnology
Ty Coed, Cefn-yr-Allt,
Aberdulais, Neath
SA10 8HE
01639 775293
www.geotechnology.net

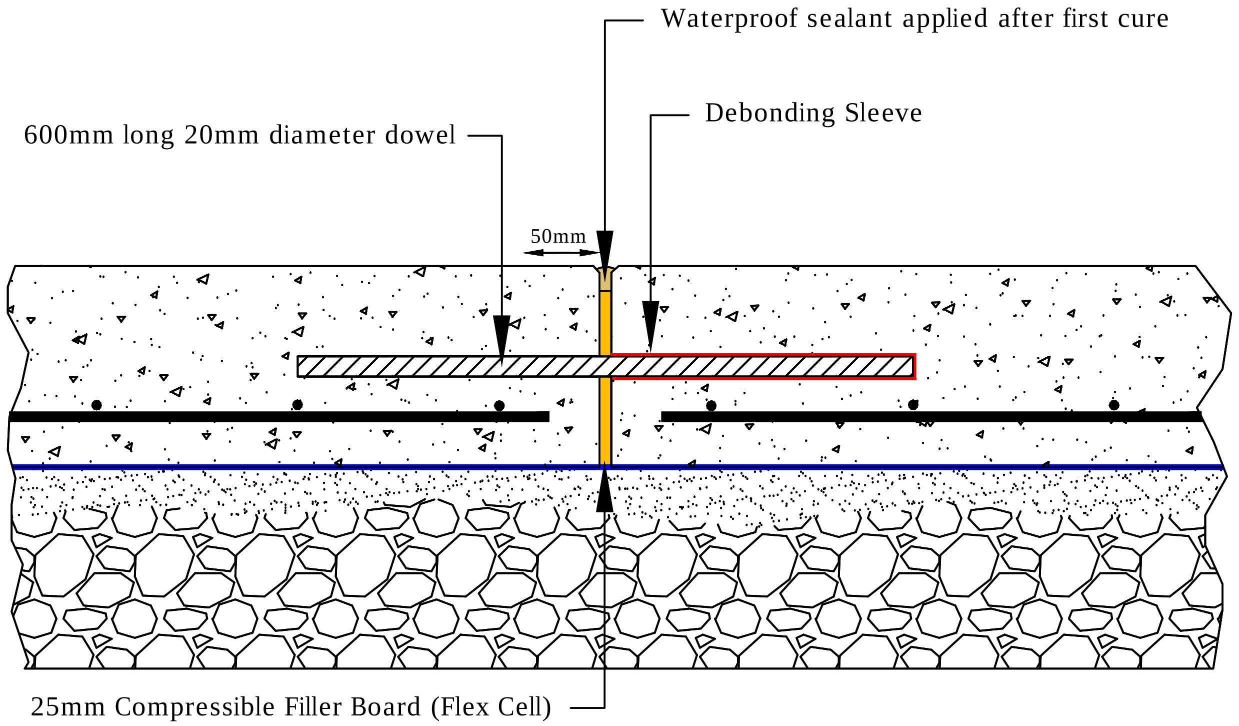


PROJECT	DRAWING NUMBER		
Atlantic Waste EcoPark Paving Project	1379r3 Figure 4		
	SCALE AT A4: NTS	DATE: 11.14	DRAWN: ET
TITLE: Paving Construction Details	NOTE		

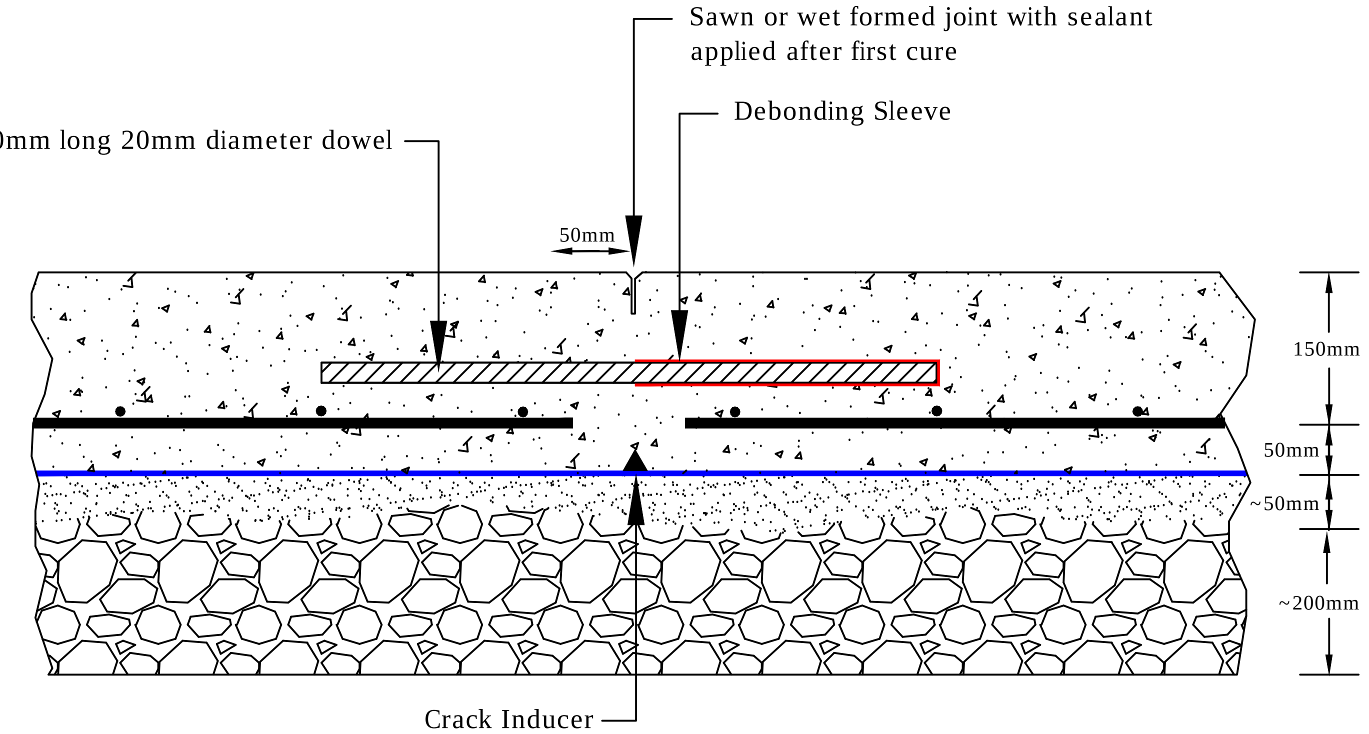
GEO TECHNOLOGY



Note: Height difference between point A and point B varies along eastern section from 300mm at plughole to 15mm at eastern edge to achieve required fall



Expansion Joint (30m centres)
Longitudinal Section



Dowelled Control Joint (10m centres)
Longitudinal Section

ATLANTIC WASTE ECOPARK PAVING PROJECT

CQA Plan

Appendix 1
Planning Consent Requirements

Report Number 1379r3v1d0615

PROPOSED ECOPARK: COMPOSTING AND MATERIALS RECYCLING FACILITIES IN THE VICINITY OF TY-TO-MAEN FARM:

CONSTRUCTION AND OPERATION PHASES SITE DRAINAGE SCHEME

On behalf of

Atlantic Ecopark Limited

Date: May 2014

Our Ref: JCD0170

RPS
Park House
Greyfriars Road
Cardiff
CF10 3AF

Quality Management

Prepared by:	Dr Paul Hardwick	
Authorised by:	Dr. Ahlim Hashm	
Date:	May 2014	
Revision:		
Project Number:	JCD0170	
Document Reference:		
Document File Path:		

Amendment Record

Revision No.	Date	Reason for Change	Authors Initials

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Drawings

Drawing 05 Proposed Development Location and Layout Plan 14.06.07

Drawing 004Proposed Materials Recycling Building Layout Plan 07.01.08

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Drawing JCD0170:34 Areas of Concrete 03/10/13

Drawing JCD 0170:16 Recycling Area Surfacing

Drawing JPCE 17 CQA REP 03   Extent of Contained Area. March 2012

Drawing JPCE ‘CQA Culvert’ Reinforced Concrete Culvert details December 2011

Drawing JBR1671 Flood extents

Drawing JPCE17 SWMP0: Plan of Proposed Surface Water Management System

Drawing JCD0170:49 Flood Storage areas 1 in 100 year event 20/05/14

Appendices

1 Introduction

1.1.1 This report is provided for the purpose of discharging Condition 13 of planning permission 08/00626 (Cardiff City Council, 2009) that states:

"*No development shall take place until a scheme for the drainage of the site (during construction and operation phases) and any connection to the existing drainage system has been submitted to and approved in writing by the Local Planning Authority. No part of the development shall be occupied until the scheme is carried out and completed as approved. Reason: To ensure an orderly form of development and to conserve and enhance the nature conservation interest of the Gwent Levels: Rumney and Peterstone Site of Special Scientific Interest'.*

1.1.2 This report:

1. Provides a general water environment review for the site and environs;
2. Reviews the original drainage scheme design;
3. Documents the changes to the original design for parts of the drainage infrastructure already completed and those parts of the infrastructure to be constructed in the near future; and
4. Discusses connectivity of the drainage system to the reen and field ditches that are part of the SSSI.

2 Background

2.1 Site Location

2.1.1 The Atlantic Ecopark Limited (and affiliated companies) waste management facilities occupy an area of circa 55 ha in the vicinity of Ty-To-Maen Farm in Rumney, east of Cardiff. The hamlet of Newton lies to the southeast with the Severn Estuary beyond. The existing Waste Transfer Station (WTS) is located at National Grid Reference 323796,178598.

2.2 Site Description

2.2.1 The location of the application site ('the site') is shown in the proposed Development Location and Layout plan (Drawing 05 dated June 2007). The outline detail of the proposed Materials Recycling Facility (MRF) to be located in the south of the site is shown on Drawing Number 004 dated January 2008 and the outline detail of the Composting Facility (CoF) to be located in the north of the site is shown in Drawing 005 also dated January 2008.

2.2.2 The objective of the development is to improve the surface water drainage system infrastructure of the existing WTS and proposed MRF and CoF.

2.2.3 In general, the proposed development is to comprise new areas of drained hardstanding and built form to replace the existing areas of bare ground, hardstanding, attenuation storages for surface runoff, and the process/grey water runoff storages.

2.3 Site Environs

Water Features

2.3.1 The Severn Estuary to the south of the site is the main hydrological feature in the area and is separated from the site by a sea defence between 30 m and 130 m in width, comprising an earth embankment as well as a salt marsh on the seaward side.

2.3.2 The site lies within the Wentlooge Levels, some 34 km^2 of reclaimed land along the Severn Estuary coastal fringe between the River Usk and River Rhymney. Much of the Levels is below the Mean High Water Spring level and is thus at risk of tidal flooding. The sea defence structures were constructed to protect the Levels and were most recently improved in the late 1990s.

Geology and Soils

2.3.3 The bedrock geology of the area comprises mudstones of the Mercia Mudstone Group. Superficial deposits comprising clays, silts and sands of the Quaternary tidal flats (marine alluvium) overlay the bedrock. The soils are mainly Newchurch 2 Association calcareous heavy clayey soils.

Rainfall, Evaporation and Evapotranspiration

2.3.4 The Flood Estimation Handbook (FEH) CD-ROM 3 indicates the value for Standard Average Annual Rainfall (SAAR in the period 1961-1990) for the site to be 979 mm.

Hydrology

2.3.5 Groundwater levels in the soils and superficial deposits are controlled by a complex system of drainage ditches known locally as ‘reens’. Water levels in the reens are controlled and managed by the Caldicot and Wentlooge Drainage Board (DB). Connecting drains (“field ditches”) on private land within the Levels are managed by the landowners. The reens and some of the field ditches are protected by the SSSI status of the Levels. A buffer zone around the reens acts as a level of protection against any contaminated surface runoff (overland flow) from the land.

2.3.6 Two sluice gates in the south west of the Levels controlled by the DB manage water levels in the reen network. The gates are closed in spring to increase the water levels for the summer months and opened in the autumn to lower water levels during the winter months. Excess water from the reens overflows to a holding lagoon which discharges into the Severn Estuary at low tide.

2.3.7 The River Rhymney is the other major watercourse in the vicinity of site. This lies circa 2 km to the west and flows south to join the Severn Estuary.

3 Site Drainage System-Original Design

3.1 Introduction

3.1.1 There is a network of interconnected reens and field ditches in the area and adjacent to the site, some of which are designated SSSI. The site naturally drains to the reens and field ditches network with the waters then discharging to the Severn estuary. Development of the site could lead to increases in runoff from the lower permeability built environment- leading to increased flood risk elsewhere. , and also to variations in runoff water quality (for example increased silt (suspended solids) and potential petroleum hydrocarbons) in comparison to the natural baseline.

3.1.2 Natural Resources Wales (NRW) (which combines the functions of the former Countryside Council for Wales, Environment Agency Wales and Forestry Commission Wales) require that surface water runoff is controlled as near to its source as practicable and ideally through a sustainable drainage system (SuDS) approach to surface water management. Where SuDS cannot be used, for example because on restrictions on available and/or suitable land, then attenuation can be provided through the construction of storage tanks or lagoons.

3.1.3 The replacement of bare ground with low permeability hardstanding as part of infrastructure improvements to the existing waste transfer station will generally lead to an increase in surface runoff. Environment Agency Wales previously advised (RPS 2007, section 3.11) that 440 m^3 of attenuation storage for surface runoff is required for every 1 ha of low permeability area (i.e. concrete or tarmacadam hardstanding) and that the maximum discharge rate from the development should be 3.5 l/s/ha which is the undeveloped (‘green field’) rate.

3.2 Outline Surface Drainage Design, July 2007

3.2.1 The following outline design for the site was submitted with the planning application.

Materials Recycling Facility

3.2.2 The proposed MRF area shown in Drawing 004 occupies approximately 8,625 m^2 (0.8625 ha) of which 0.7725 ha incorporates hardstanding (0.1825 ha), buildings (0.51 ha) and approximately 0.08 ha under a pond for attenuation of surface runoff. 0.09 ha of new vegetation in addition to the existing foliage (not accounted for in the area estimation above) to be created.

3.2.3 The proposed MRF area has an existing hardstanding cover of approximately 0.2285 ha. Therefore, the additional new hardstanding and buildings cover for which attenuation is required in accordance with NRW guidance above is approximately 0.464 ha excluding the pond surface area. The storage required for all the impermeable area of the MRF site is:

3.2.4 440 m^3 x 0.464 ha = 204 m^3

3.2.5 Building runoff (‘grey runoff’) to be stored in tanks and re-used in the operations on site with excess flow conveyed via an overflow into an underground drain leading to the attenuation pond.

Composting Facility

3.2.6 The proposed CoF area as shown in Drawing 005 submitted with the planning application occupies approximately 4.625 ha and comprises 3.07 ha of hardstanding, 0.53 ha of buildings and 0.98 ha of soft landscaping with 0.046 ha under open ponds or closed underground tanks for storage of process water and attenuation of surface runoff.

3.2.7 Some building runoff (‘grey runoff’) to be stored in tanks and re-used in the operations on site with excess flow conveyed via an overflow into an underground drain leading to the attenuation ponds.

3.2.8 Excess process waters and composting leachate to be intermittently removed and taken by tanker to an appropriate waste treatment and disposal facility.

3.2.9 Clean water attenuation storage is required for the new hard landscaped areas (3.6 ha of hardstanding and buildings). In accordance with the NRW requirement above, the CoF would require storage of approximately:

440 m^3 x 3.6 ha = 1,584 m^3

3.2.10 Waters to discharge from the clean water attenuation pond via an in line oil-separator and silt trap with a controlled release to the reen via an outfall incorporating erosion protection and an emergency shutdown to be used in the event of a spill. Discharge quality and the quality of the receiving reen system to be monitored.

3.2.11 Dirty water attenuation storage is also required from which water would be abstracted to either add to the maturating compost piles, or be removed by tanker to an appropriate licensed waste treatment and disposal facility, or with appropriate pre-treatment be discharged to the reen system via an engineered outfall under appropriate licensing.

3.2.12 The attenuation ponds to be designed to prevent bank collapse and infill using a suitable liner to prevent groundwater influx due to the high water table in the area, and surface water efflux.

3.2.13 Some building runoff (‘grey runoff’) to be stored in tanks and re-used in the operations on site with excess flow conveyed via an overflow into an underground drain leading to the attenuation ponds.

3.2.14 Waters to discharge from the clean water attenuation pond via an in line oil-separator and silt trap with a controlled release to the reen via an outfall incorporating erosion protection and an emergency shutdown to be used in the event of a spill. Discharge quality and the quality of the receiving reen system to be monitored.

4 Amended drainage scheme proposals September 2011

4.1 As Designed

4.1.1 As part of supporting works for an Application for Land Drainage Consent to discharge surface runoff from hardstanding areas through a culvert, it was proposed in RPS Infrastructure Improvements Assessment Report JBR1671 of September 2011 to revise the outline surface water drainage system for the MRF area shown on Drawing 004, described in the application as follows:

- Operational area to comprise two new low permeability hardstandings north and south of an east-west orientated 75.36 m long central spine culvert totalling 1.62 ha in area.
- Northern area of hardstanding to slope towards the spine culvert at 1:100.
- Southern area hardstanding to slope towards the spine culvert at 1:100.
- The culvert to be covered by grating, and designed to convey runoff from east to west.
- Surface water to be discharged from the western end of the culvert and conveyed into a water quality separator.
- Treated water to be discharged at the consented rate into a privately owned ditch within the local reen system at NGR 323762, 178565.
- The appropriate rate of discharge from the drainage system as discussed with the Drainage Board to be based on IoH 124 methodology and consequently the maximum allowable rate of discharge to be 4 litres/second/ha (i.e. 6.5 litres/second from the 1.62 ha site).
- 1 in 100 year storm event +20% allowance for climate change to be used when calculating storage volumes. A modelling exercise using WinDes drainage design software and a 3D CAD model of the hardstanding and drain indicates that the runoff generated from the worst case 1 in 100 year winter storm event + 20% climate change allowance) of ~1106 m^3 can be contained on site relative to the maximum discharge of 6.5 litres/second provided that the site has an impervious bund on all sides up to 6.15 mAOD, achieved by a bund wall and 'speed humps' on the access to the operational area.
- The maximum depth of flooding on the operational area is 0.36 m and the velocity is negligible as the water is effectively impounded. The flood hazard

rating of 1.18 is classed as “Danger for some- including children, the elderly and the infirm”.

- Beyond the discharge control orifice, the discharge water is passed to a catch pit sediment trap and then to a class 1 bypass separator (Klargester NSPB030 or similar designed to discharge a maximum 30 litres/second).

4.1.2 A discharge consent 2011/009 for construction of an outfall structure and discharge into Board’s network of reens was issued by Caldicot and Wentlooge Levels IDB on 14 December 2011.

4.2 As Built

4.2.1 Drawings JCD0170:16 dated 26th October 2012, JPCE 17 CQA REP 03 dated March 2012 and the Drawing ‘CQA Culvert’ dated December 2011 show the detail of the as-built surface water drainage system.

4.2.2 The hardstandings and drainage infrastructure were constructed during 2011 (JPCE 2011). The transfer station site now comprises 1.62 ha of impermeable concrete and tarmacadam surfaces draining to the approved surface water drainage system with consent to discharge to a settlement ditch and from there into one of the designated field ditches within the SSSI.

4.2.3 The operational surface is formed by two sections of impermeable surfaces that interlock together to form one larger, composite impermeable area. The impermeable surfaces are graded at 1:100 so that surface water runoff is conveyed into the central concrete open culvert with sealed base and sides raised at the edges to 6.30 mAOD such that water egress is only possible via the discharge point and in line treatment system at the western end of the culvert.

4.3 Storage capacity

4.3.1 During extreme rainfall events surface water storage is provided within the central culvert and also within the impermeable surface area of the operational site via raised bunds and increased road gradient on the access routes into and out of the operational area once the culvert has surcharged.

4.3.2 The culvert dimensions are 80.0 m (length) x 1 m (wide) x 1 m (depth) and it therefore potentially provides 80 m^3 of storage capacity. The soffit level of the culvert is at 5.800 mAOD. The invert of the control orifice at the west end of the culvert is set at 5.028 mAOD, 0.228 m above the culvert base. Therefore under normal circumstances the depth between the base of the culvert and the invert of the orifice will provide a sump in which sediments can be settled. The sump will therefore retain: 80 m x 0.228 m x 1 m = 18 m^3, and it can therefore accommodate 80 m^3 – 18 m^3 = 62 m^3 of runoff during flood.

4.3.3 The maximum on-site storage volume required for a worst case 1 in 100 year 2160 minute duration winter storm including a 20% allowance for climate change is 1,249 m^3. Some 62 m^3 will be stored within the culvert, leaving 1,187 m^3 to be stored on the impermeable surface.

4.3.4 A drainage model built for the site indicated that a volume of 1,200 m^3 of surface water can be stored on the low permeability surface and would generate a flood level of 6.17 m AOD (a flood depth of 0.380 m) under a maximum discharge rate of 6.5 litres/second. This is displayed graphically in Drawing JBR1671 001 dated 12 August 2011.

4.4 Flood hazard on site

4.4.1 The maximum water depth of 0.38 m is shin high on most adults. The maximum depth would occur over the culvert where site levels are at their lowest (approximately 5.8 mAOD). As the floodwater is effectively impounded, the flow velocity is negligible. Environment Agency guidance (Supplementary Note on Flood Hazard Ratings and Thresholds for Development Planning and Control Purpose May 2008) indicates a flood hazard rating of 1.175 is classed as a “Danger for some- including children, the elderly and the infirm” derived as follows:

4.4.2 The basic flood hazard is calculated from the equation:

HR= d x (V+0.5) +DF

Where HR = Flood Hazard Rating
d = depth of flooding (m)
V = velocity of floodwaters (m/second) and
DF = Debris Factor

Substituting the site data as above:

HR= 0.38 x (0+ 0.5) + 1

= 1.175

4.4.3 From the review above, it can be seen that all surface runoff from the site for the design storm event can be collected by the dedicated drainage system.

4.5 Water quality treatment

4.5.1 The culvert is covered by a 65 mm x 1020 mm aperture grating as an on-line primary filter, and collects runoff for discharge at its western end. The water discharges via an in line trash screen acting as a secondary filter through a 50 mm diameter orifice plate into a sealed catch pit and is then passed through a Klargester NSBD024 Class 1 bypass separator (reported as NSBD055 in the CQA Validation Report (JPCE 2011)) because of the risk of oil contamination arising from the site. The bypass separator is designed to discharge a maximum 24 litres/second. Under normal circumstances flows above 24 litres/second would be directed through the bypass and released as 'untreated'. However, with a maximum input to the separator of 6.5 litres/second the passing of untreated flow cannot occur and therefore the bypass separator will actually function as a Full Retention Separator, and will consistently achieve a high quality of discharged water as a purpose- designed Full Retention Separator.

4.5.2 Provided flows do not exceed 24 litres/second the NSBD024 separator could potentially provide full retention treatment to the volume of water generated over a much larger area (24 litres/second [/] 4 litres/second/ha = 6 ha) than the 1.62 ha presently serviced and is also fitted with an alarm to alert the site operator when it is full.

4.5.3 Discharge of treated water from the site at the consented rate of 6.5 l/s is via an engineered outfall culvert into a settlement ditch at NGR 323762, 178565 and an elevation of 4.90 mAOD that discharges into a privately owned ditch within the local reen system at NGR 323570 178643.

5 Proposed Hardstanding Extensions

5.1 Introduction

5.1.1 The hardstanding areas, drainage culvert and oil separator locations as constructed in 2011 are shown in Drawing JCD0170:16 dated 26th October 2012 and Drawing JPCE 17 CQA REP 03 dated March 2012. The 2011 as-built hardstanding comprises the '1.6 ha approx' area marked on Drawing JCD 0170:34.

5.1.2 Two additional areas are proposed for future hardstanding development as shown on Drawing JCD 0170:34.

5.2 Area 1

5.2.1 Area 1 will be an extension of the existing 2011 development with a 1 in 100 gradient hardstanding constructed on the present bare ground of Area B. Water flowing northward across Area B during flood will be confined by a perimeter bund along its east boundary with a northern boundary bund channelling flow into a 20 m extension eastward to the present 80 m long central spine drainage culvert. An increased road gradient would prevent runoff leaving the site via the access road from the east. Detail is shown on Drawing JCD0170:49. The maximum consented discharge at the greenfield rate of 4 litres/second/ha is 4 x 2.15 = 8.60 litres/second. Water will flow through the existing oil interceptor at the west end of the culvert before being discharged under existing consent to the watercourse/reen on the western side of the site).

5.2.2 Surface water storage is available within the central culvert and also the impermeable surface area of the operational site once the culvert has surcharged, retained by perimeter raised bunds and increased road gradients on the access routes into and out of the operational area.

5.2.3 The extended culvert will be 100 m long in total x 1 m deep and 1 m wide and will be level along its length. The invert of the orifice controlling flow out of the west end of the culvert is set at 5.028 mAOD, 0.228 m above the culvert base. The depth between the base of the culvert and the invert of the orifice will provide a sump in which sediments can be settled. The sump will therefore retain 100 m x 0.228 m x 1 m = 22.8 m^3, and during flood it can therefore temporarily accommodate 100 m^3 – 22.8 m^3 = 77.2 m^3 of runoff.

5.2.4 A runoff volume estimate for the area was made using WinDes for a worst case 1 in 100 year storm including a 30% allowance for climate change (assuming the development is present in 2115 (DEFRA 2011)) and a greenfield runoff rate of 4 litres/second/ha. The WinDes calculations are included in Appendix 1 and the flood depth estimations from a simple site geometry model (Microsoft Excel) are included in Appendix 2.

5.2.5 The maximum on-site storage volume required for a worst case 1 in 100 year winter storm on 2.15 ha is 2,360 m^3. The sump will store 77 m^3, and therefore 2,283 m^3 of runoff will be stored at the lowest part of the hardstand prior to discharge.

5.2.6 The lowest area of site is around 940 m long from the interceptor in the west to bund wall in the east and a maximum flood depth of ~0.495 m will occur from storage of the lowest area of Area 1 along the drainage culvert. The maximum flood extents will be ~49.5 m either side of the central culvert as shown on Drawing JCD0170:49 and in the spreadsheet model for Area 1 in Appendix 2.

5.2.7 Note that all the runoff will collect above the culvert, and hence a low permeability bund and highway speed hump or increased road gradient of at least 0.50 m height is recommended to prevent uncontrolled runoff from Area 1 into the reen drainage network via the road network into and out of the area.

5.3 Area 2

5.3.1 Area 2 will be a new 3.9 ha hardstanding located on the present bare ground Areas C and D north of Area 1 and with an independent drainage system. The hardstanding will be constructed with an engineered fall of 1:100 to convey surface runoff into an open ‘v’ shaped sealed concrete culvert 389 m long, 2 m wide and 1 m deep located along the western and southern boundary as shown on Drawing JCD0170:49

5.3.2 There is no consented discharge at present. The proposed discharge rate will be at the equivalent greenfield rate of 4 litres/second/ha (i.e. 15.6 litres/second for the 3.9 ha site). Water will flow through a discharge control (orifice plate or similar) and an oil interceptor before being discharged under consent to the settlement ditch that discharges to a field ditch on the western side of the site.

5.3.3 Surface water storage is available within the culvert and also on the impermeable surface area of the operational site once the culvert has surcharged, retained by bunds and reprofiled roadways to prevent them acting as channels.

5.3.4 The culvert will be 389 m long x 1 m deep x 2 m wide and triangular in section. The invert of the orifice controlling flow out of the south west corner of the site will be set above the invert level to provide a sump in which sediments can be settled.

5.3.5 A runoff volume estimate for the area was made using WinDes for a worst case 1 in 100 year storm including a 30% allowance for climate change (assuming the development is present in 2115 (DEFRA 2011)) and a greenfield runoff rate of 4 litres/second/ha. The WinDes calculations are included in Appendix 1 and the flood depth estimations from a simple site geometry model (Microsoft Excel) are included in Appendix 2.

5.3.6 The maximum on-site storage volume required for a worst case 1 in 100 year winter storm including a 30% allowance for climate change on 3.9 ha is 4,302 m^3. Some 389 m^3 will be stored within the drainage culvert, leaving 3,913 m^3 to be stored above and adjacent on the impermeable surface.

5.3.7 A maximum flood depth of ~0.46 m will occur above the drainage culvert and the maximum 1 in 100 year flood extents of around 18 m upslope from the culvert are shown on Drawing JCD0170:49.

5.3.8 Note that all the runoff will collect above the culvert at the west and south ends of the site, and hence a low permeability bund of at least 0.50 m height will be required adjacent to the culvert to prevent uncontrolled runoff from Area 2 into the reen drainage network.

5.4 Flood hazard on site

5.4.1 The maximum depths during flooding would occur where site levels are at their lowest. As the floodwater is effectively impounded, the flow velocity is negligible. Environment Agency guidance (Supplementary Note on Flood

Hazard Ratings and Thresholds for Development Planning and Control Purpose May 2008) indicates a flood hazard rating of 1.4 and 1.22 for scenarios 1 and 2 respectively. The basic flood hazard is calculated from the equation:

HR= d x (V+0.5) +DF

Where HR = Flood Hazard Rating
d = depth of flooding (m)
V = velocity of floodwaters (m/second) (i.e. 0.0 m/s for standing water) and
DF = Debris Factor

Substituting the site data as above:

- Area1:

  HR= 0.5 x (0+ 0.5) + 1

  = <u>1.25</u>

- Area 2:

  HR= 0.46 x (0+ 0.5) + 1

  =<u>1.23</u>

5.4.2 The Hazard Ratings indicate all the flood depths are classed as a “Danger for some- including children, the elderly and the infirm”.

5.5 Water quality treatment

5.5.1 The Area 1 culvert is covered by a 65 mm x 1020 mm aperture grating as an on-line primary filter, and collects runoff for discharge at its western end. The water discharges via an in line trash screen acting as a secondary filter through a 50 mm diameter orifice plate into a sealed catch pit and is then passed through a Klargester NSBD024 Class 1 bypass separator (reported in the CQA Validation Report (JPCE 2011)) because of the risk of oil contamination arising from the site. The bypass separator is designed to discharge a maximum 24 litres/second. Under normal circumstances flows above 24 litres/second would be directed through the bypass and released as ‘untreated’. However, with a maximum input to the separator of 8.6 litres/second no passing of untreated flow will occur.

5.5.2 The Area 2 culvert will be open, and collect runoff for discharge at its south central end. The water will discharge via an in line trash screen acting as a secondary filter through an appropriately designed orifice plate (87 mm orifice plate or equivalent) into a sealed catch pit and then will be passed through a Klargester NSBD024 Class 1 bypass separator because of the risk of oil contamination arising from the site. The bypass separator is designed to discharge a maximum 24 litres/second. Under normal circumstances flows above 24 litres/second would be directed through the bypass and released as ‘untreated’. However, with a maximum input to the separator of 15.6 litres/second no passing of untreated flow will occur.

5.5.3 Provided the discharge water at each location is of acceptable quality (based on weekly testing). It will be discharged from the site at the consented maximum rate of 4 litres/second/ha via an engineered outfall culvert into a settlement ditch that discharges into a privately owned ditch within the local reen system at NGR 323570 178643. If the water quality was not compliant with the current recommended values, the water will be collected at the point of discharge and tankered off site to an appropriate facility for disposal.

6 Connectivity to the wider reen network

6.1.1 The treated water of an acceptable quality from the expanded low permeability hardstanding and surface water drainage system should continue to be discharged at the consented rate of 4 l/second/ha.

6.1.2 For the existing hardstanding area the point of discharge will be the existing consented discharge location into the privately owned ditch within the local reen system at NGR 323762, 178565.

6.1.3 For the proposed extension of hardstanding in the north (Area 2) the point of discharge will be via a separate constructed outfall and consented discharge.

7 Conclusion

7.1.1 It has been demonstrated that an adequate volume of water can be safely stored on site during extreme flood conditions.

7.1.2 Provided that water testing results (currently carried out weekly) indicate the quality is suitable for discharge to the reen drainage network, then discharge from Areas 1 and 2 will occur at the agreed rate under the present discharge consent and future proposed discharge consent respectively. Otherwise the stored runoff will be tankered off site to an appropriate waste water treatment facility.

8 References

Cardiff City Council 2009 Permission for Development Application No. 08/00626/E 29 October 2009.

Caldicot & Wentlooge levels IDB 2011. Notification of Consent, No. 2011/009.

DEFRA 2011. National Standards for sustainable drainage systems- Designing, constructing, operating and maintaining drainage for surface runoff DEFRA December 2011.

Environment Agency 2008. Supplementary Note on Flood Hazard Ratings and Thresholds for Development Planning and Control Purposes- Clarification of the Table 13.1 of FD2320/TR2 and Figure 3.2 of FD2321/TR1. May 2008.

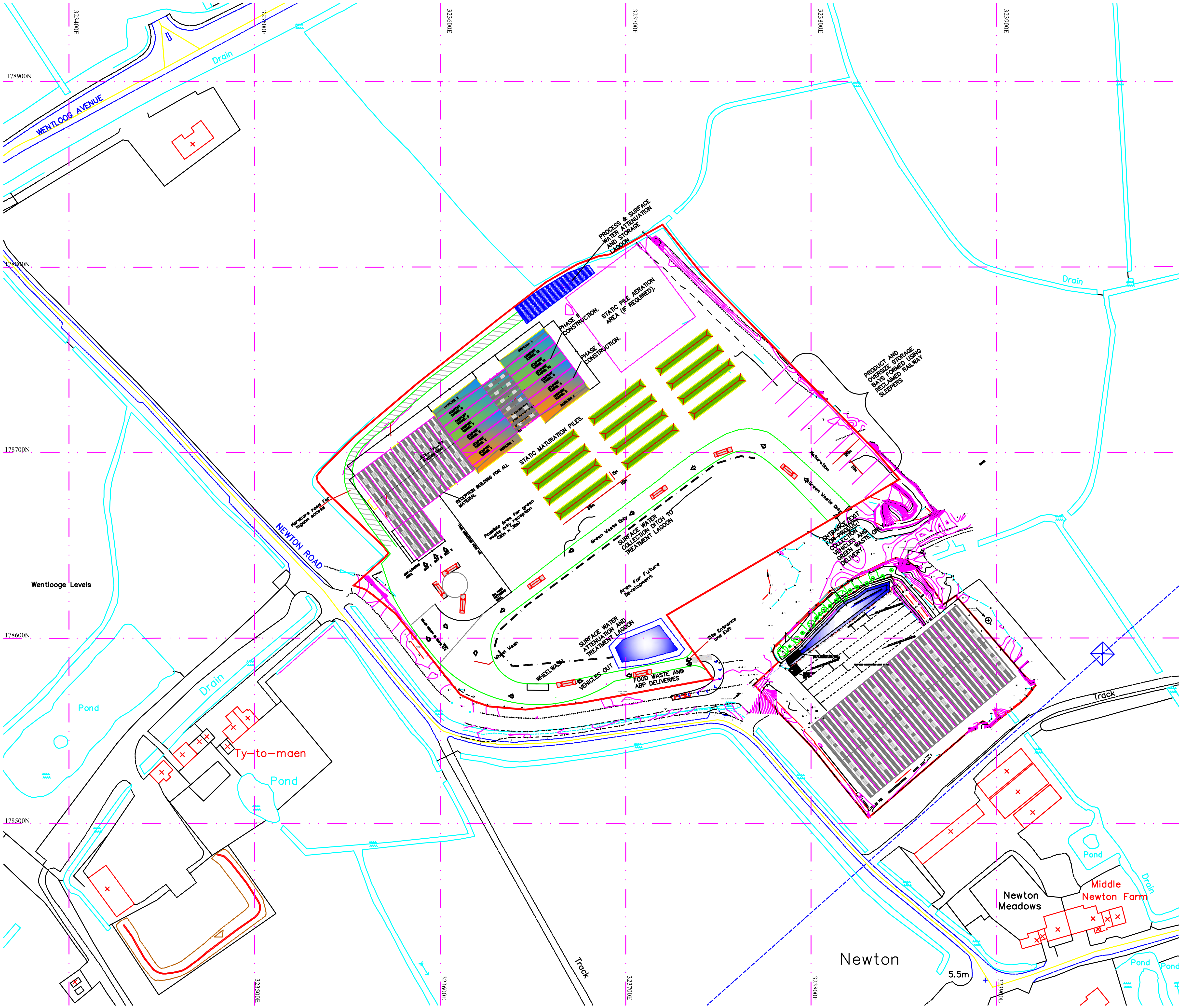
JPCE 2011. CQA Validation report for the construction of concrete and tarmac surfaced yards for a material recycling facility at Newton Road, Wentlooge, Cardiff CF3 2EJ. For Atlantic Recycling. J Perkins Consulting Engineer December 2011.

RPS, July 2007. Flood Consequences Assessment, Atlantic Ecopark Limited.

RPS 2011. Application for Land Drainage Consent Supporting Information. Report JBR1671 27/9/11. Atlantic recycling Ltd.

Drawings

O:\documents\JCC61xx\JCC6190\Final Draft EIA Chapters\CD\ES Appendices\Appendix 17\JER3731-FCA-005.dwg



Legend

Site Boundary

Rev:	Date:	Amendment:	Name:	Checked:
-	-	-	-	-

Drawing Based Upon: -

Status: Final

Notes: Contractors are not to scale from this drawing. All dimensions to be checked on site and any discrepancies, ambiguities and/or ommisions between this drawing and information given elsewhere must be reported to this office. If in doubt, ask.

RPS

Conrad House Beaufort Square Chepstow Monmouthshire NP16 5EP
T 01291 621821 F 01291 627827 E rpssw@rpsgroup.com W www.rpsgroup.com

Client: Neal Soil

Project: Eco Park

Title: Proposed Development Location and Layout Plan

Date: 14.06.07 Scale: 1:2,000 Original Paper Size: A3

Drawn: KR Checked: AC Job Ref: JER3731-FCA

Drawing Number: 05 Rev: 0

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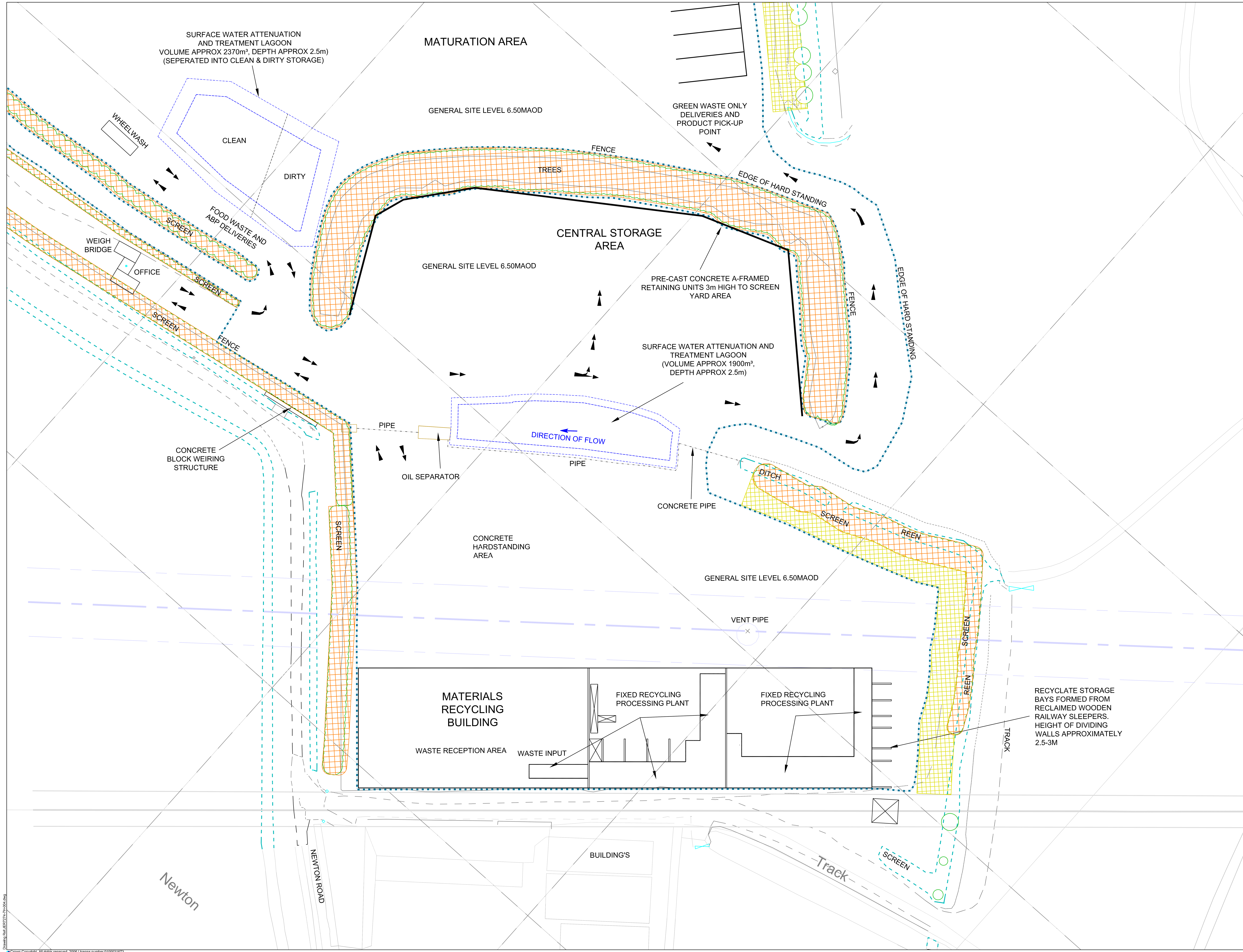

LEGEND

- PROPOSED BUILDINGS
- EXTENT OF PROPOSED HARD STANDING
- PROPOSED SURFACE WATER ATTENUATION AND TREATMENT LAGOONS
- PROPOSED SURFACE WATER ATTENUATION AND TREATMENT PIPES
- EXISTING OVERHEAD CABLES
- APPROXIMATE LOCATION OF EXISTING SEWER AND 10m EASEMENT
- EXISTING REEN LOCATIONS
- APPROXIMATE LOCATION OF EXISTING TREES
- APPROXIMATE LINE OF EXISTING TREES/SCREENS
- APPROXIMATE EXTENT OF EXISTING FOLIAGE TO BE RETAINED
- APPROXIMATE EXTENT OF PROPOSED VEGETATION
- ORDNANCE SURVEY BASE DATA

NOTE

-	-	-	-	-
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Drawing Based Upon: JODA TOPOGRAPHICS SITE SURVEY DRAWINGS-2007

Status:

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RPS
Conrad House Beaufort Square Chepstow Monmouthshire NP16 5EP
T 01291 621821 F 01291 627827 E rpssw@rpsgroup.com W www.rpsgroup.com

Client: Atlantic Ecopark Ltd

Project: Proposed EcoPark at Ty To Maen Farm, Newton Road, Rumney, Cardiff

Title: Proposed Materials Recycling Building Layout Plan

Date: 07.01.08 Scale: 1:500 Original Paper Size: A1

Drawn: KR Checked: MR Job Ref: JER7274-7H

Drawing Number: 004 Rev: 0

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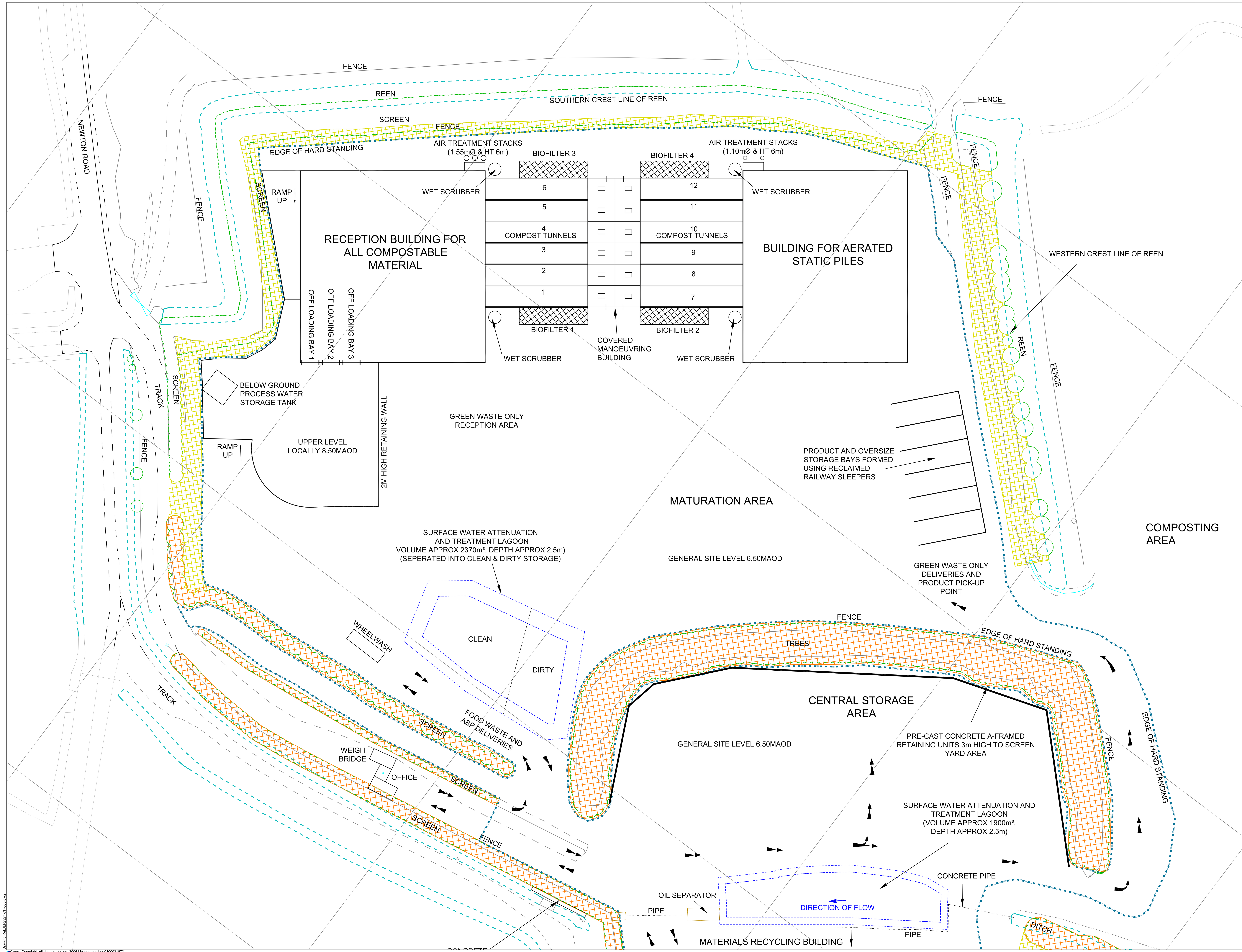

LEGEND

- PROPOSED BUILDINGS
- PROPOSED BUILDING VENTILATION AND DEODORISATION SYSTEM (BIOFILTER)
- EXTENT OF PROPOSED HARD STANDING
- PROPOSED SURFACE WATER ATTENUATION AND TREATMENT LAGOONS
- PROPOSED SURFACE WATER ATTENUATION AND TREATMENT PIPES
- EXISTING OVERHEAD CABLES
- APPROXIMATE LOCATION OF EXISTING SEWER AND 10m EASEMENT
- EXISTING REEN LOCATIONS
- APPROXIMATE LOCATION OF EXISTING TREES
- APPROXIMATE LOCATION OF EXISTING LINE OF TREES/SCREEN
- APPROXIMATE EXTENT OF EXISTING FOLIAGE TO BE RETAINED
- APPROXIMATE EXTENT OF PROPOSED VEGETATION
- ORDNANCE SURVEY BASE DATA

NOTE

Rev:	Date:	Amendment:	Name:	Checked:
-	-	-	-	-

Drawing Based Upon: JODA TOPOGRAPHICS SITE SURVEY DRAWINGS-2007

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RPS
Conrad House Beaufort Square Chepstow Monmouthshire NP16 5EP
T 01291 621821 F 01291 627827 E rpssw@rpsgroup.com W www.rpsgroup.com

Client: Atlantic Ecopark Ltd

Project: Proposed EcoPark at Ty To Maen Farm, Newton Road, Rumney, Cardiff

Title: Proposed Composting Facility Layout Plan

Date: 07.01.08 Scale: 1:500 Original Paper Size: A1

Drawn: KR Checked: MR Job Ref: JER7274-7H

Drawing Number: 005 Rev: 0

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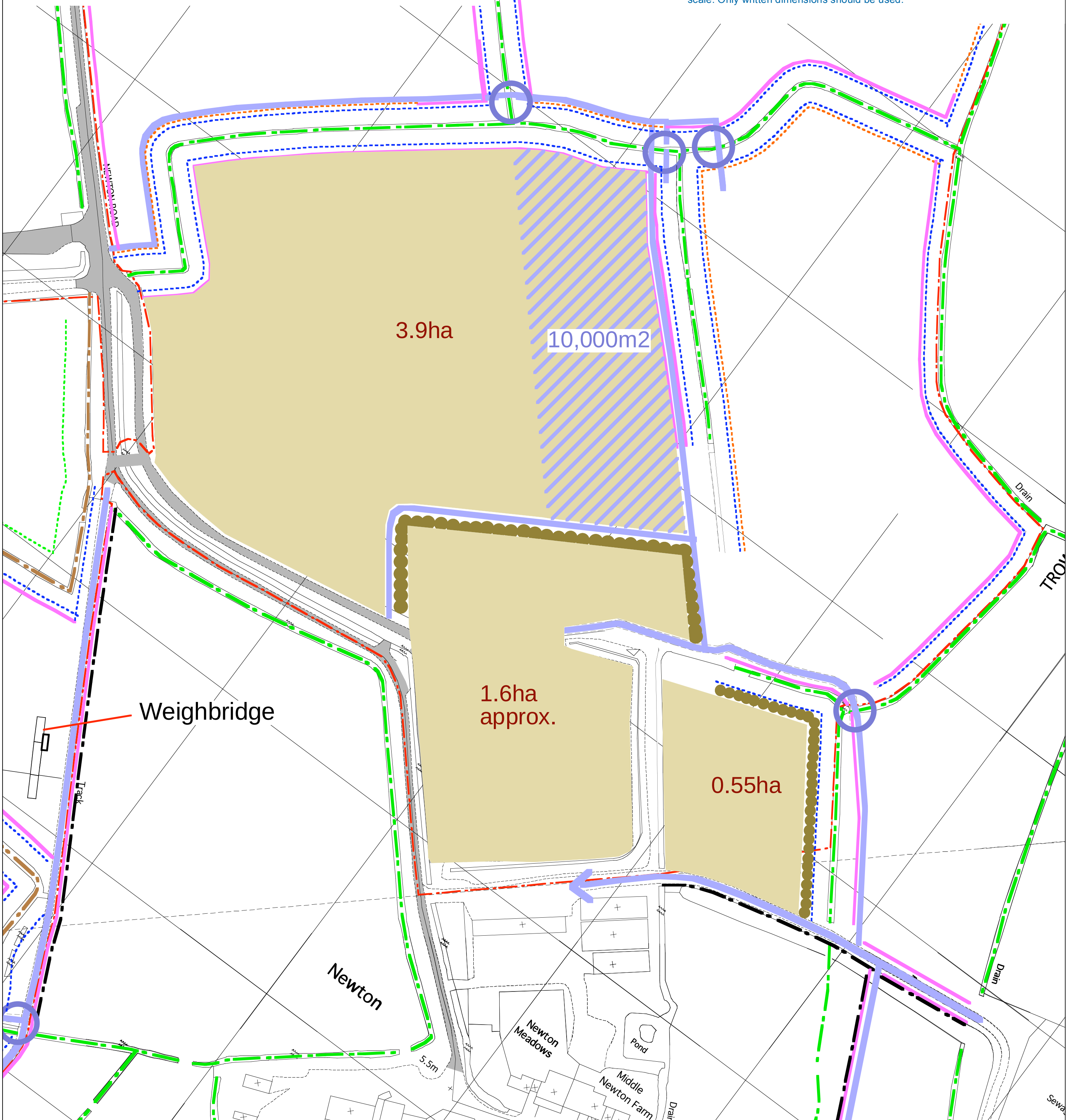

Client	Neal Soil Suppliers Ltd.
Project	Land at Newton Road, Rumney, Cardiff
Title	Areas of Concrete

RPS
Park House, Greyfriars Road,
Cardiff, CF10 3AF
T: +44(0)29 2066 8662
E: rpsca@rpsgroup.com
F: +44(0)29 2066 8622

Status	Drawn By	PM/Checked by
	PB	AH
Job Ref	Scale @ A4	Date Created
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Drawing Number		Rev
JCD 0170:34		-

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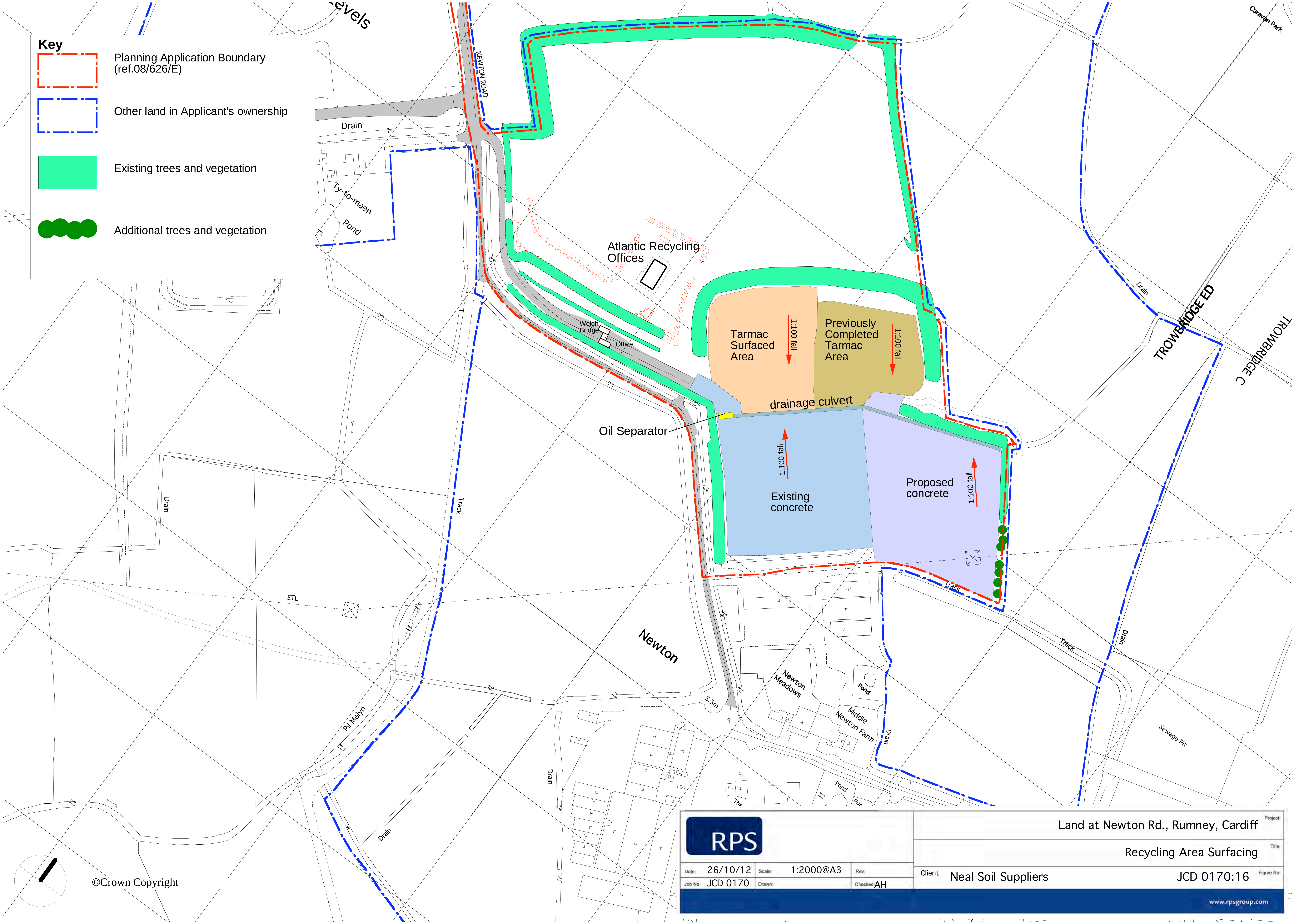

Key
Planning Application Boundary (ref.08/626/E)
Other land in Applicant's ownership
Existing trees and vegetation
Additional trees and vegetation
Atlantic Recycling Offices
Tarmac Surfaced Area
1:100 fall
Previously Completed Tarmac Area
1:100 fall
drainage culvert
Oil Separator
1:100 fall
Existing concrete
Proposed concrete
1:100 fall
Weigh Bridge
Office
NEWTON ROAD
Drain
Ty-to-maen
Pond
Newton
Newton Meadows
Middle Newton Farm
Pond
Track
ETL
Pil Melyn
Drain
Caravan Park
TROWBRIDGE ED
TROWBRIDGE C
Sewage Pit
5.5m
RPS
Date: 26/10/12
Scale: 1:2000@A3
Job No JCD 0170
Checked AH
Project: Land at Newton Rd., Rumney, Cardiff
Title: Recycling Area Surfacing
Client Neal Soil Suppliers
Figure No: JCD 0170:16
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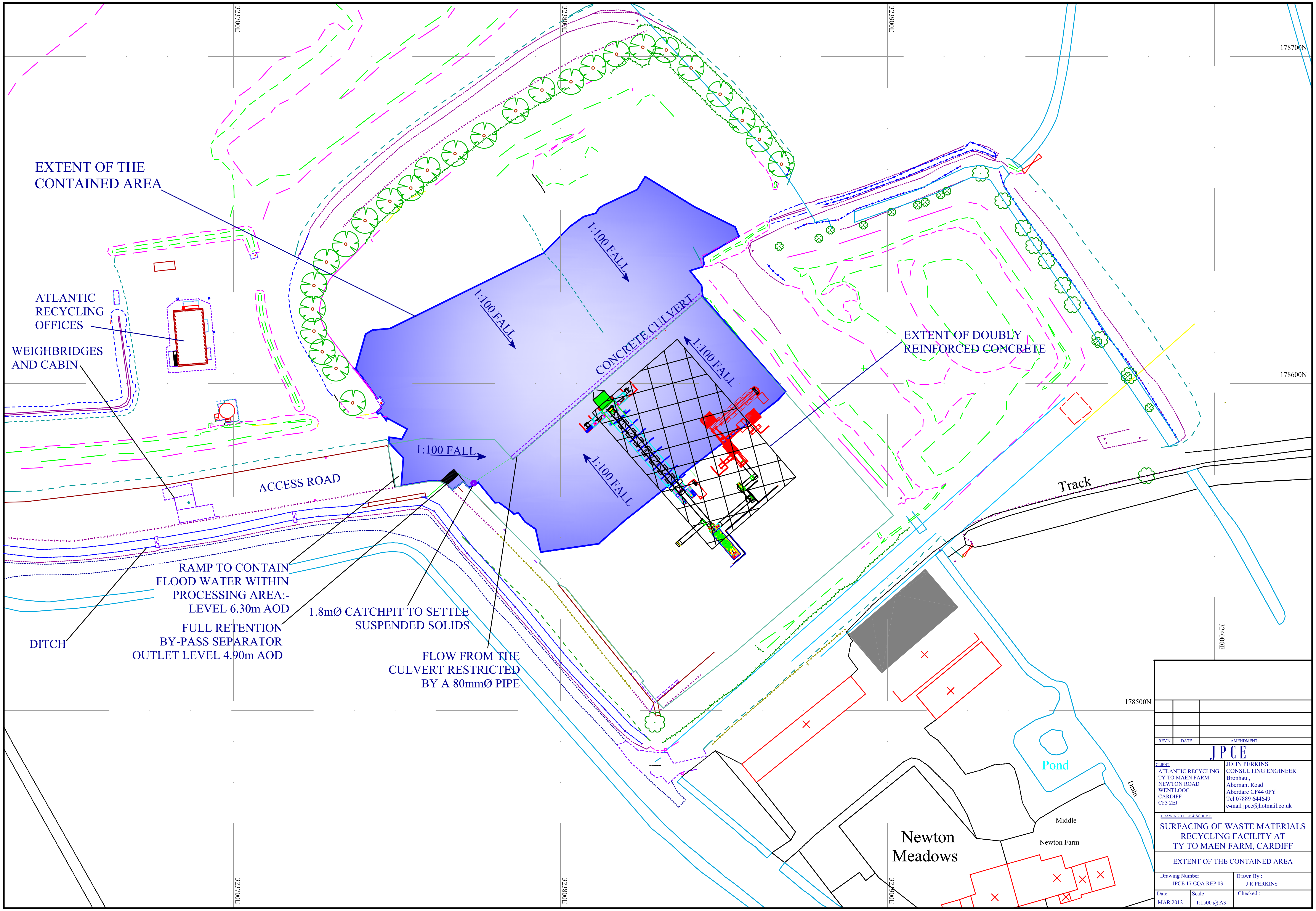
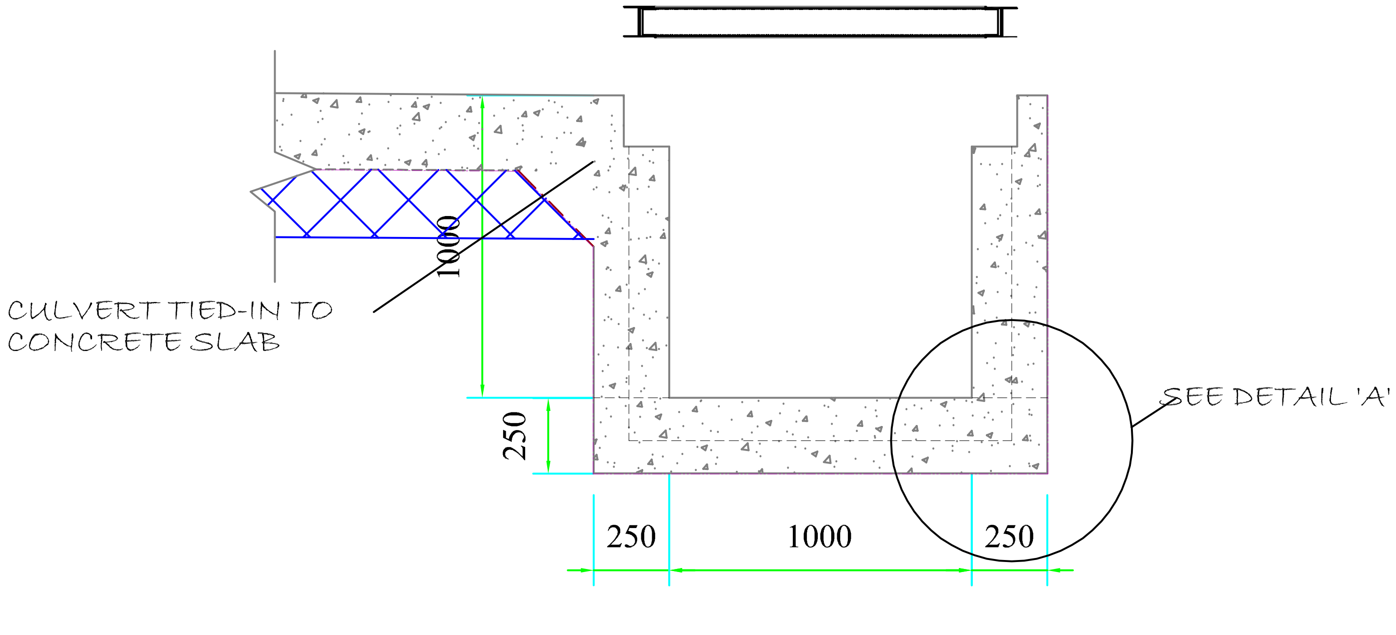
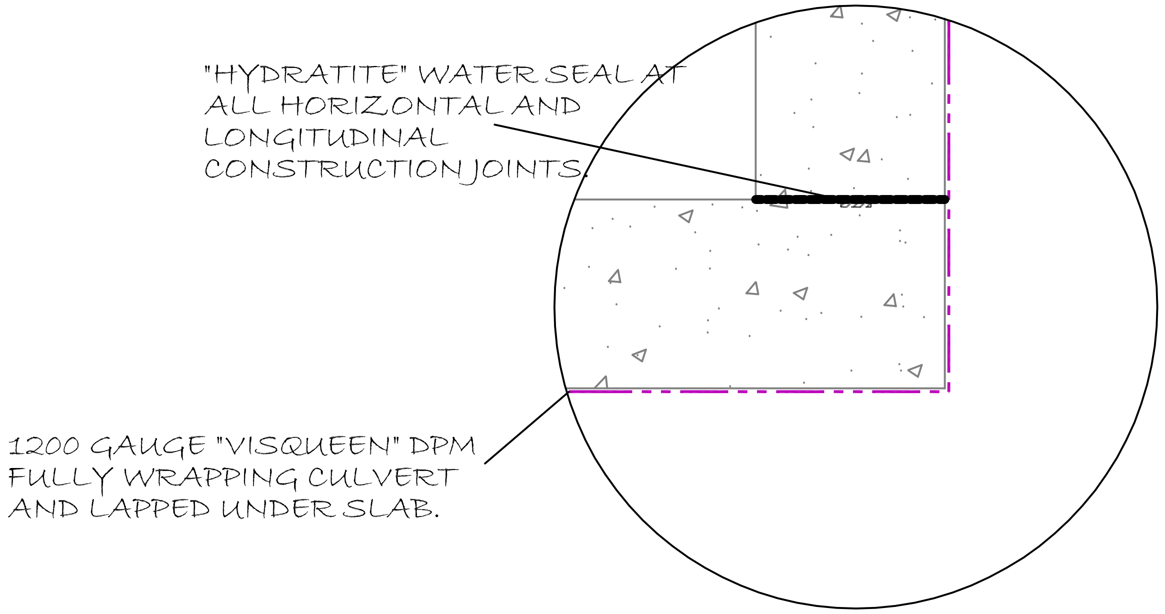

EXTENT OF THE CONTAINED AREA
ATLANTIC RECYCLING OFFICES
WEIGHBRIDGES AND CABIN
1:100 FALL
1:100 FALL
1:100 FALL
1:100 FALL
1:100 FALL
CONCRETE CULVERT
EXTENT OF DOUBLY REINFORCED CONCRETE
ACCESS ROAD
Track
RAMP TO CONTAIN FLOOD WATER WITHIN PROCESSING AREA:- LEVEL 6.30m AOD
FULL RETENTION BY-PASS SEPARATOR OUTLET LEVEL 4.90m AOD
DITCH
1.8mØ CATCHPIT TO SETTLE SUSPENDED SOLIDS
FLOW FROM THE CULVERT RESTRICTED BY A 80mmØ PIPE
Pond
Drain
Newton Meadows
Middle
Newton Farm
323700E
323800E
323900E
324000E
178700N
178600N
178500N
REV'N
DATE
AMENDMENT
JPCE
CLIENT
ATLANTIC RECYCLING
TY TO MAEN FARM
NEWTON ROAD
WENTLOOG
CARDIFF
CF3 2EJ
JOHN PERKINS
CONSULTING ENGINEER
Bronhaul,
Abernant Road
Aberdare CF44 0PY
Tel 07889 644649
e-mail jpce@hotmail.co.uk
DRAWING TITLE & SCHEME
SURFACING OF WASTE MATERIALS RECYCLING FACILITY AT TY TO MAEN FARM, CARDIFF
EXTENT OF THE CONTAINED AREA
Drawing Number
JPCE 17 CQA REP 03
Drawn By :
J R PERKINS
Date
MAR 2012
Scale
1:1500 @ A3
Checked :



1m DEPTH CULVERT



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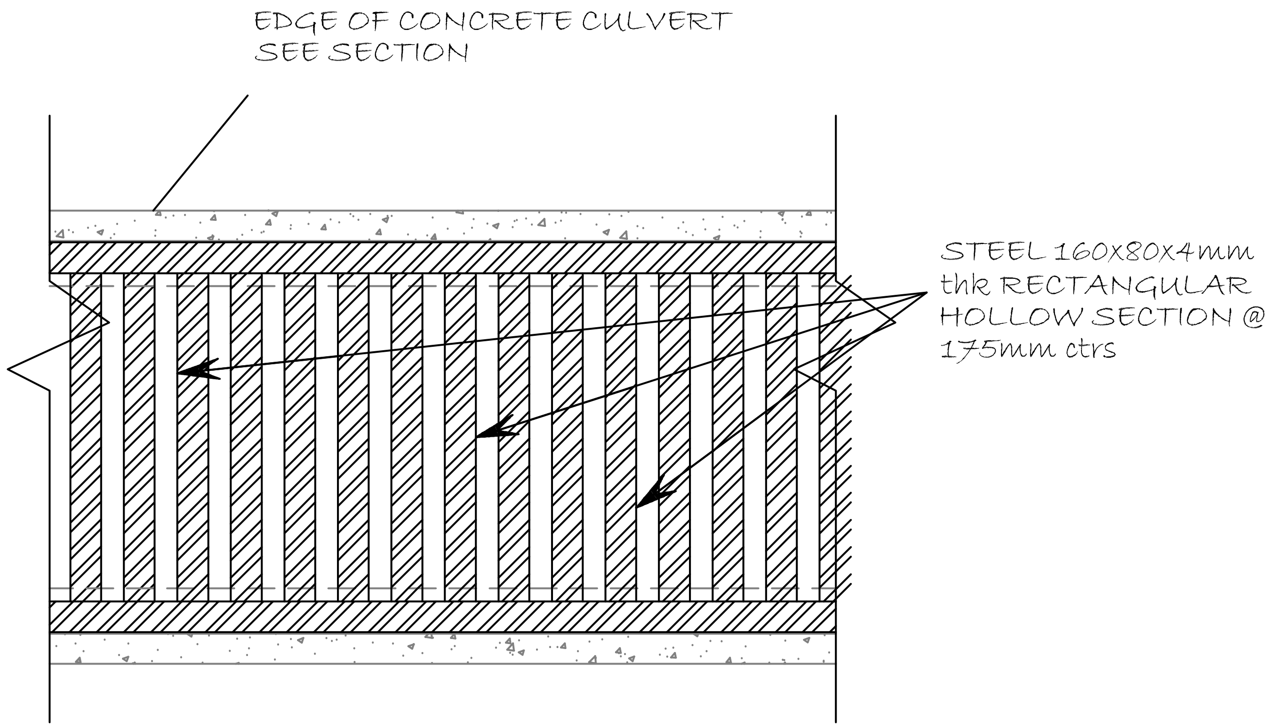
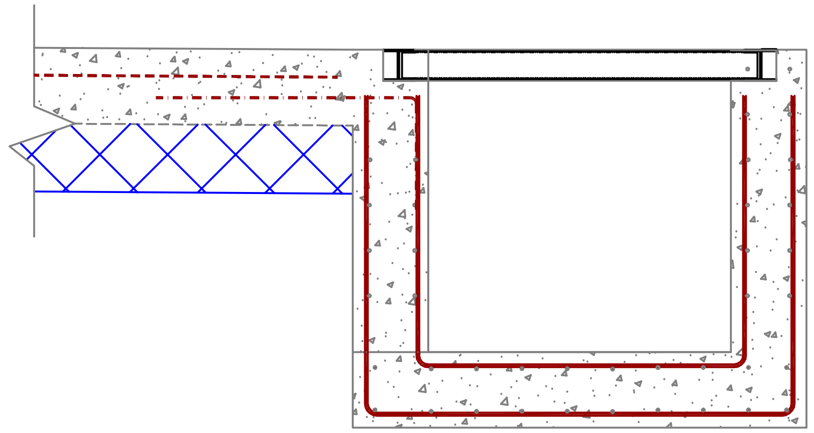


PLAN ON CULVERT GRID



REINFORCEMENT DETAILS

REV'N	DATE	AMENDMENT

JPCE

CLIENT:
ATLANTIC RECYCLING Ltd.
TY-TO-MAEN FARM
NEWTON ROAD,
RUMNEY
CARDIFF
CF3 2EJ

JOHN PERKINS
CONSULTING ENGINEER
Bronhaul,
Abernant Road
Aberdare CF44 0PY
Tel 07889 644649
e-mail jpce@hotmail.co.uk

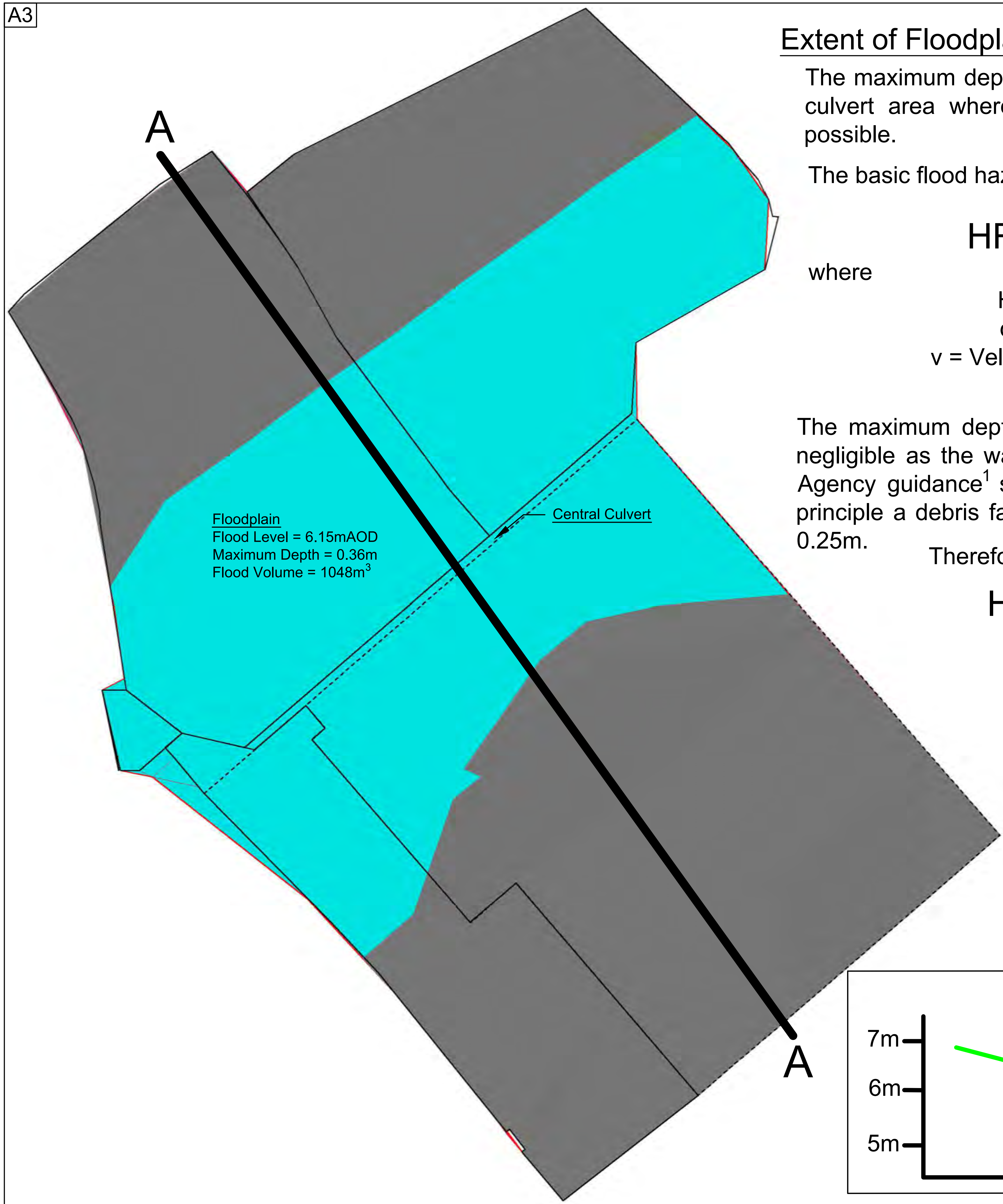
DRAWING TITLE & SCHEME
RE-CONSTRUCTION AND CONCRETE SURFACING OF CENTRAL WASTE PROCESSING YARD

REINFORCED CONCRETE CULVERT DETAILS

Drawing Number	Drawn By :
CQA Culvert	JRP

Date :	Scale
DEC 2011	1:25 @ A3

A3



Extent of Floodplain with Surface at 6.15mAOD

The maximum depth of the flooding will be over the central culvert area where a maximum depth of 0.36m will be possible.

The basic flood hazard is calculated from the equation[1]:

$$HR = d \times (v+0.5) + DF$$

where

HR = Flood Hazard Rating
d = Depth of Flooding (m);
v = Velocity of floodwaters (m/sec); and
DF = Debris Factor

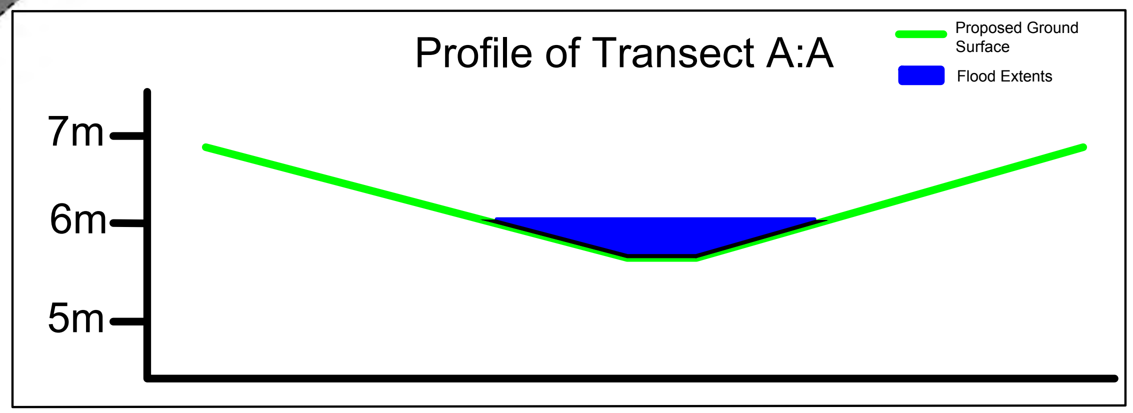
The maximum depth of flooding is 0.36m and the velocity is negligible as the water is effectively impounded. Environment Agency guidance[1] suggest that in line with the precautionary principle a debris factor of 1 is added to any flood depth over 0.25m.

Therefore,

$$HR = 0.36 \times (0+0.5) + 1$$

$$= 1.18$$

A flood hazard rating of 1.18 is classed as a *"Danger for some - including children, the elderly and the infirm"*[1]



N

NOTES:

Proposed Hardstanding

Flood Extent

Reference

[1] Supplementary Note on Flood Hazard Ratings and Thresholds for Development Planning and Control Purpose - *Clarification of the Table 13.1 of FD2320/TR2 and Figure 3.2 of FD2321/TR1*, May 2008

REV	DESCRIPTION	DATE	INITIAL

RPS
Bristol
2420 The Quadrant, Aztec West
Almondsbury Bristol, BS32 4AQ
T 01454 853000 E rpswbl@rpsgroup.com
F 01454 205820 W www.rpsgroup.com

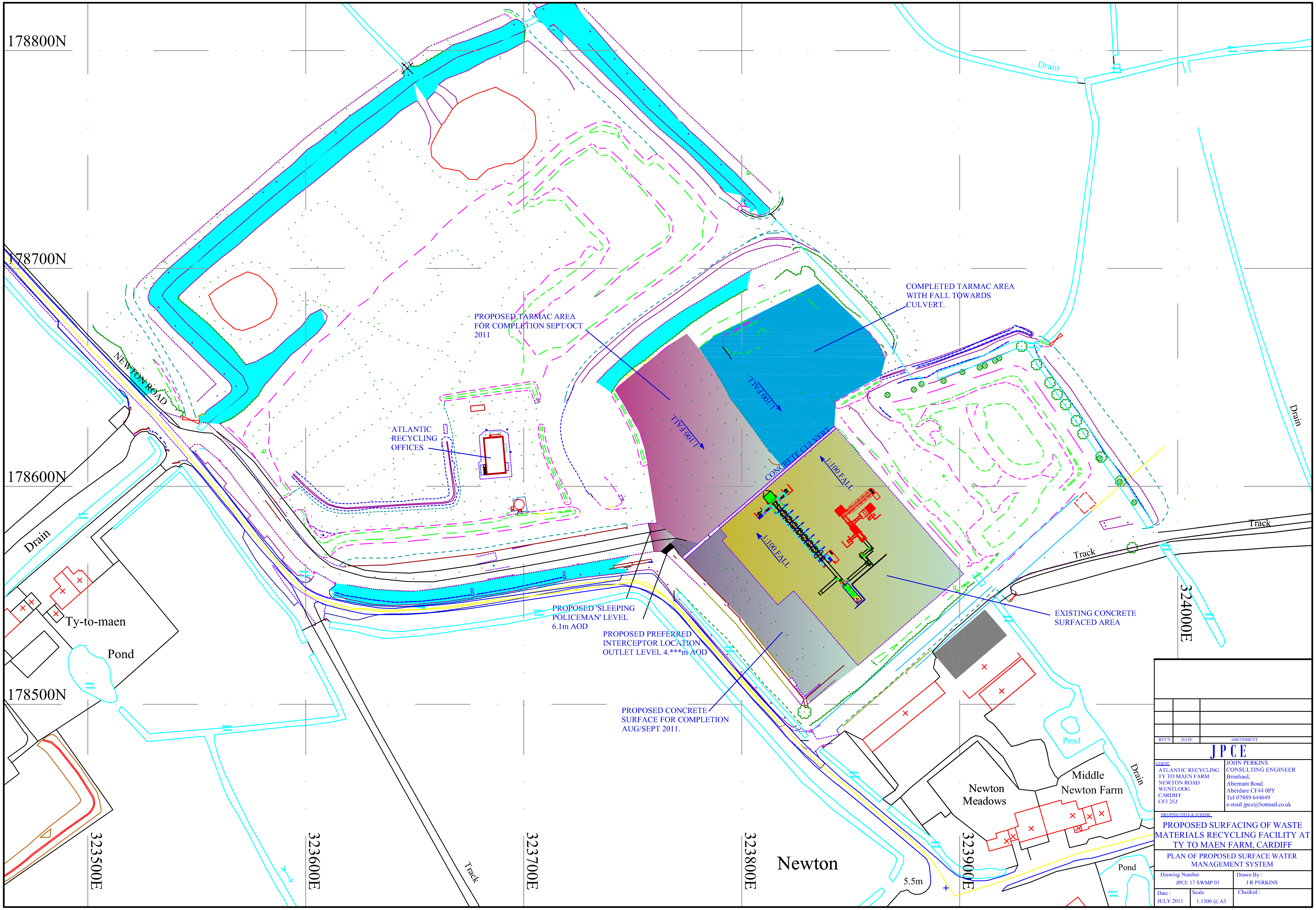
Client:
Atlantic Recycling

Project:
Waste Transfer Station

Title:
Flood Extents

Job No:	Drg No:	Rev:
JBR1671	001	-
Drawn:	Date:	Scale:
DM	26.09.2011	-
Status:	Checked By:	Approved By:
-	MK	KJL

Architects Engineers Landscape Architects Service Consultants
Surveyors Planners Urban Designers Project Managers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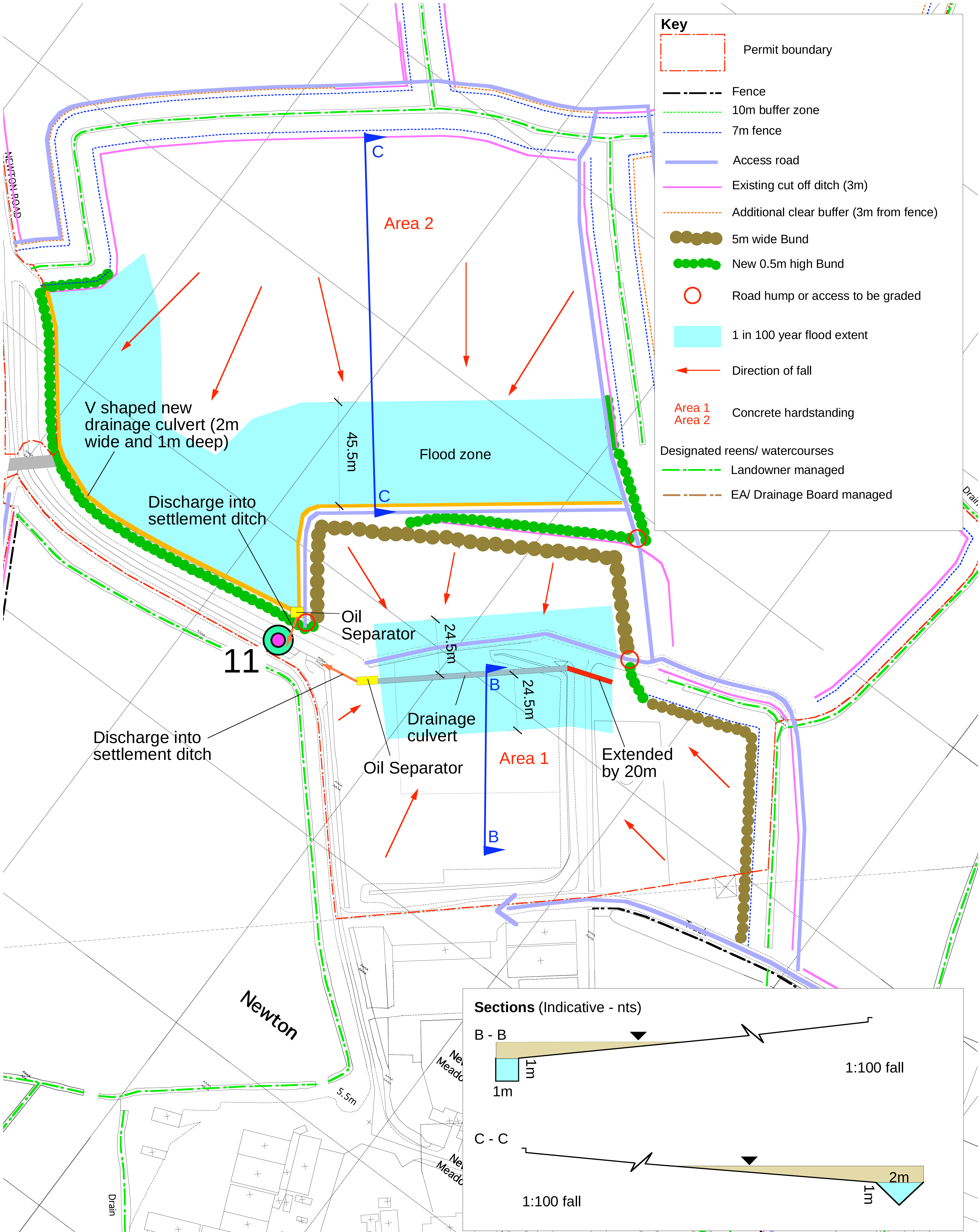
178700N
178600N
178500N
323500E
323600E
323700E
323800E
323900E
324000E
NEWTON ROAD
Drain
Drain
Drain
Drain
Track
Track
Track
Ty-to-maen
Pond
Pond
Pond
Newton
Newton Meadows
Middle Newton Farm
5.5m
PROPOSED TARMAC AREA FOR COMPLETION SEPT/OCT 2011
COMPLETED TARMAC AREA WITH FALL TOWARDS CULVERT.
ATLANTIC RECYCLING OFFICES
1:100 FALL
1:100 FALL
1:100 FALL
1:100 FALL
CONCRETE CULVERT
EXISTING CONCRETE SURFACED AREA
PROPOSED 'SLEEPING POLICEMAN' LEVEL 6.1m AOD
PROPOSED PREFERRED INTERCEPTOR LOCATION OUTLET LEVEL 4.***m AOD
PROPOSED CONCRETE SURFACE FOR COMPLETION AUG/SEPT 2011.
REV'N
DATE
AMENDMENT
JPCE
CLIENT
ATLANTIC RECYCLING
TY TO MAEN FARM
NEWTON ROAD
WENTLOOG
CARDIFF
CF3 2EJ
JOHN PERKINS
CONSULTING ENGINEER
Bronhaul,
Abernant Road
Aberdare CF44 0PY
Tel 07889 644649
e-mail jpce@hotmail.co.uk
DRAWING TITLE & SCHEME
PROPOSED SURFACING OF WASTE MATERIALS RECYCLING FACILITY AT TY TO MAEN FARM, CARDIFF
PLAN OF PROPOSED SURFACE WATER MANAGEMENT SYSTEM
Drawing Number
JPCE 17 SWMP 01
Drawn By :
J R PERKINS
Date :
JULY 2011
Scale
1:1500 @ A3
Checked :



Notes
1. This drawing has been prepared in accordance with the scope of RPS's appointment with its client and is subject to the terms and conditions of that appointment. RPS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.

2. If received electronically it is the recipients responsibility to print to correct scale. Only written dimensions should be used.

RPS
Park House, Greyfriars Road, Cardiff, CF10 3AF
T: +44(0)29 2066 8662
E: rpsca@rpsgroup.com
F: +44(0)29 2066 8622

Client	Neal Soil Suppliers
Project	Land at Newton Road, Rumney, Cardiff
Title	Flood Storage Areas 1 in 100 Year Event

Status	Drawn By	PM/Checked by
	PB	AH
Job Ref	Scale @ A3	Date Created
JCD 0170	1:1500	22/05/14
Drawing Number		Rev
JCD 0170:49		

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Appendix 1

WinDes Calculations

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.181	0.181	3.3	612.6	O K
30 min Summer	9.221	0.221	3.7	745.2	O K
60 min Summer	9.268	0.268	4.2	904.9	O K
120 min Summer	9.324	0.324	4.6	1095.0	O K
180 min Summer	9.362	0.362	4.9	1220.8	O K
240 min Summer	9.390	0.390	5.1	1316.3	O K
360 min Summer	9.432	0.432	5.4	1458.3	O K
480 min Summer	9.463	0.463	5.6	1562.9	O K
600 min Summer	9.487	0.487	5.8	1644.8	O K
720 min Summer	9.507	0.507	5.9	1711.3	O K
960 min Summer	9.528	0.528	6.0	1782.5	O K
1440 min Summer	9.552	0.552	6.2	1862.0	O K
2160 min Summer	9.563	0.563	6.2	1901.2	O K
2880 min Summer	9.567	0.567	6.3	1913.8	O K
4320 min Summer	9.574	0.574	6.3	1938.6	O K
5760 min Summer	9.574	0.574	6.3	1937.5	O K
7200 min Summer	9.569	0.569	6.3	1920.0	O K
8640 min Summer	9.561	0.561	6.2	1893.2	O K
10080 min Summer	9.551	0.551	6.2	1860.9	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	152.777	31
30 min Summer	93.111	45
60 min Summer	56.747	74
120 min Summer	34.585	134
180 min Summer	25.887	192
240 min Summer	21.078	252
360 min Summer	15.777	370
480 min Summer	12.846	490
600 min Summer	10.953	610
720 min Summer	9.616	728
960 min Summer	7.702	966
1440 min Summer	5.633	1444
2160 min Summer	4.120	2100
2880 min Summer	3.300	2400
4320 min Summer	2.438	3156
5760 min Summer	1.967	3976
7200 min Summer	1.665	4824
8640 min Summer	1.454	5624
10080 min Summer	1.296	6456

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	9.218	0.218	3.7	735.3	O K
30 min Winter	9.265	0.265	4.1	894.7	O K
60 min Winter	9.322	0.322	4.6	1086.8	O K
120 min Winter	9.390	0.390	5.1	1315.9	O K
180 min Winter	9.435	0.435	5.4	1467.9	O K
240 min Winter	9.469	0.469	5.7	1583.6	O K
360 min Winter	9.520	0.520	6.0	1756.4	O K
480 min Winter	9.558	0.558	6.2	1884.4	O K
600 min Winter	9.588	0.588	6.4	1985.4	O K
720 min Winter	9.613	0.613	6.5	2068.0	O K
960 min Winter	9.640	0.640	6.7	2159.0	O K
1440 min Winter	9.672	0.672	6.8	2266.8	O K
2160 min Winter	9.692	0.692	6.9	2334.8	O K
2880 min Winter	9.696	0.696	7.0	2347.4	O K
4320 min Winter	9.699	0.699	7.0	2360.5	O K
5760 min Winter	9.695	0.695	7.0	2346.0	O K
7200 min Winter	9.684	0.684	6.9	2308.2	O K
8640 min Winter	9.669	0.669	6.8	2257.4	O K
10080 min Winter	9.652	0.652	6.7	2199.9	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Winter	152.777	31
30 min Winter	93.111	45
60 min Winter	56.747	74
120 min Winter	34.585	132
180 min Winter	25.887	190
240 min Winter	21.078	248
360 min Winter	15.777	366
480 min Winter	12.846	482
600 min Winter	10.953	600
720 min Winter	9.616	716
960 min Winter	7.702	950
1440 min Winter	5.633	1408
2160 min Winter	4.120	2076
2880 min Winter	3.300	2696
4320 min Winter	2.438	3372
5760 min Winter	1.967	4272
7200 min Winter	1.665	5192
8640 min Winter	1.454	6136
10080 min Winter	1.296	6968

Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.364	Cv (Winter)	0.900
Return Period (years)	100	E (1km)	0.282	Shortest Storm (mins)	15
Site Location		F (1km)	2.479	Longest Storm (mins)	10080
C (1km)	-0.024	Summer Storms	Yes	Climate Change %	+30
D1 (1km)	0.396	Winter Storms	Yes		
D2 (1km)	0.339	Cv (Summer)	0.750		

Time / Area Diagram

Total Area (ha) 2.150

Time (mins)	**Area (ha)**	**Time (mins)**	**Area (ha)**	**Time (mins)**	**Area (ha)**	**Time (mins)**	**Area (ha)**
0-4	0.600	4-8	0.600	8-12	0.600	12-16	0.350

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	3375.0	2.800	3375.0	5.600	3375.0	8.400	3375.0
0.400	3375.0	3.200	3375.0	6.000	3375.0	8.800	3375.0
0.800	3375.0	3.600	3375.0	6.400	3375.0	9.200	3375.0
1.200	3375.0	4.000	3375.0	6.800	3375.0	9.600	3375.0
1.600	3375.0	4.400	3375.0	7.200	3375.0	10.000	3375.0
2.000	3375.0	4.800	3375.0	7.600	3375.0		
2.400	3375.0	5.200	3375.0	8.000	3375.0		

Orifice Outflow Control

Diameter (m) 0.064 Discharge Coefficient 0.600 Invert Level (m) 9.000

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.180	0.180	5.8	1109.6	O K
30 min Summer	9.219	0.219	6.6	1349.9	O K
60 min Summer	9.267	0.267	7.5	1639.6	O K
120 min Summer	9.323	0.323	8.3	1984.8	O K
180 min Summer	9.360	0.360	8.9	2213.6	O K
240 min Summer	9.388	0.388	9.3	2387.3	O K
360 min Summer	9.430	0.430	9.8	2646.1	O K
480 min Summer	9.461	0.461	10.2	2836.8	O K
600 min Summer	9.486	0.486	10.5	2986.4	O K
720 min Summer	9.505	0.505	10.7	3108.1	O K
960 min Summer	9.527	0.527	11.0	3239.2	O K
1440 min Summer	9.551	0.551	11.3	3387.2	O K
2160 min Summer	9.563	0.563	11.4	3463.0	O K
2880 min Summer	9.568	0.568	11.4	3490.9	O K
4320 min Summer	9.576	0.576	11.5	3544.1	O K
5760 min Summer	9.577	0.577	11.5	3548.5	O K
7200 min Summer	9.573	0.573	11.5	3521.8	O K
8640 min Summer	9.565	0.565	11.4	3477.0	O K
10080 min Summer	9.556	0.556	11.3	3421.5	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	152.777	42
30 min Summer	93.111	57
60 min Summer	56.747	86
120 min Summer	34.585	144
180 min Summer	25.887	202
240 min Summer	21.078	262
360 min Summer	15.777	380
480 min Summer	12.846	498
600 min Summer	10.953	616
720 min Summer	9.616	734
960 min Summer	7.702	972
1440 min Summer	5.633	1446
2160 min Summer	4.120	2080
2880 min Summer	3.300	2400
4320 min Summer	2.438	3136
5760 min Summer	1.967	3944
7200 min Summer	1.665	4776
8640 min Summer	1.454	5624
10080 min Summer	1.296	6456

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	9.217	0.217	6.6	1331.8	O K
30 min Winter	9.264	0.264	7.4	1620.7	O K
60 min Winter	9.320	0.320	8.3	1969.2	O K
120 min Winter	9.388	0.388	9.3	2385.2	O K
180 min Winter	9.433	0.433	9.9	2661.5	O K
240 min Winter	9.467	0.467	10.3	2871.9	O K
360 min Winter	9.518	0.518	10.9	3186.5	O K
480 min Winter	9.556	0.556	11.3	3419.8	O K
600 min Winter	9.586	0.586	11.6	3604.0	O K
720 min Winter	9.611	0.611	11.9	3754.8	O K
960 min Winter	9.638	0.638	12.2	3921.6	O K
1440 min Winter	9.670	0.670	12.5	4119.7	O K
2160 min Winter	9.690	0.690	12.7	4245.6	O K
2880 min Winter	9.694	0.694	12.7	4270.9	O K
4320 min Winter	9.700	0.700	12.8	4302.0	O K
5760 min Winter	9.696	0.696	12.8	4280.0	O K
7200 min Winter	9.685	0.685	12.7	4214.7	O K
8640 min Winter	9.671	0.671	12.5	4125.0	O K
10080 min Winter	9.654	0.654	12.3	4023.0	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Winter	152.777	42
30 min Winter	93.111	56
60 min Winter	56.747	84
120 min Winter	34.585	142
180 min Winter	25.887	200
240 min Winter	21.078	258
360 min Winter	15.777	374
480 min Winter	12.846	490
600 min Winter	10.953	606
720 min Winter	9.616	722
960 min Winter	7.702	954
1440 min Winter	5.633	1412
2160 min Winter	4.120	2076
2880 min Winter	3.300	2700
4320 min Winter	2.438	3352
5760 min Winter	1.967	4280
7200 min Winter	1.665	5200
8640 min Winter	1.454	6080
10080 min Winter	1.296	6976

Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.364	Cv (Winter)	0.900
Return Period (years)	100	E (1km)	0.282	Shortest Storm (mins)	15
Site Location		F (1km)	2.479	Longest Storm (mins)	10080
C (1km)	-0.024	Summer Storms	Yes	Climate Change %	+30
D1 (1km)	0.396	Winter Storms	Yes		
D2 (1km)	0.339	Cv (Summer)	0.750		

Time / Area Diagram

Total Area (ha) 3.900

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.600	8-12	0.600	16-20	0.600	24-28	0.300				
4-8	0.600	12-16	0.600	20-24	0.600						

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	6150.0	2.800	6150.0	5.600	6150.0	8.400	6150.0
0.400	6150.0	3.200	6150.0	6.000	6150.0	8.800	6150.0
0.800	6150.0	3.600	6150.0	6.400	6150.0	9.200	6150.0
1.200	6150.0	4.000	6150.0	6.800	6150.0	9.600	6150.0
1.600	6150.0	4.400	6150.0	7.200	6150.0	10.000	6150.0
2.000	6150.0	4.800	6150.0	7.600	6150.0		
2.400	6150.0	5.200	6150.0	8.000	6150.0		

Orifice Outflow Control

Diameter (m) 0.087 Discharge Coefficient 0.600 Invert Level (m) 9.000

Appendix 2

Depth area relationship models

length and therefore storage volume varies with depth
to determine depth and length of a volume of water read off the relevant data from the table

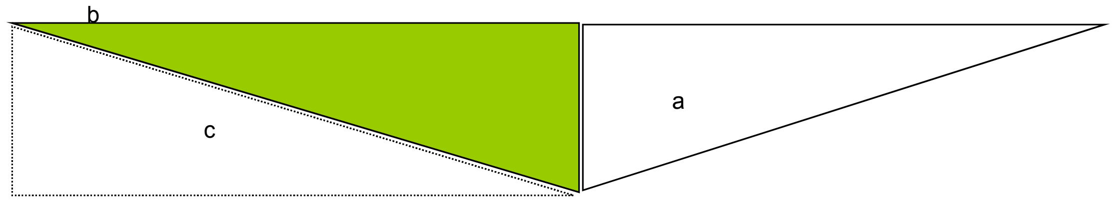
Table A — width of pad **94** m

1 in 100 slope slope length m	double sided height/depth at centre m	pad area area (length x depth) m2	double sided storage capacity m3	one sided
100	1	100	9400	m
99	0.99	98.01	9213	
98	0.98	96.04	9028	
97	0.97	94.09	8844	
96	0.96	92.16	8663	
95	0.95	90.25	8484	
94	0.94	88.36	8306	
93	0.93	86.49	8130	
92	0.92	84.64	7956	
91	0.91	82.81	7784	
90	0.9	81	7614	
89	0.89	79.21	7446	
88	0.88	77.44	7279	
87	0.87	75.69	7115	
86	0.86	73.96	6952	
85	0.85	72.25	6792	
84	0.84	70.56	6633	
83	0.83	68.89	6476	
82	0.82	67.24	6321	
81	0.81	65.61	6167	
80	0.8	64	6016	
79	0.79	62.41	5867	
78	0.78	60.84	5719	
77	0.77	59.29	5573	
76	0.76	57.76	5429	
75	0.75	56.25	5288	
74	0.74	54.76	5147	
73	0.73	53.29	5009	
72	0.72	51.84	4873	
71	0.71	50.41	4739	
70	0.7	49	4606	
69	0.69	47.61	4475	
68	0.68	46.24	4347	
67	0.67	44.89	4220	
66	0.66	43.56	4095	
65	0.65	42.25	3972	
64	0.64	40.96	3850	
63	0.63	39.69	3731	
62	0.62	38.44	3613	
61	0.61	37.21	3498	
60	0.6	36	3384	
59	0.59	34.81	3272	
58	0.58	33.64	3162	
57	0.57	32.49	3054	
56	0.56	31.36	2948	
55	0.55	30.25	2844	
54	0.54	29.16	2741	
53	0.53	28.09	2640	
52	0.52	27.04	2542	
51	0.51	26.01	2445	
50	0.5	25	2350	
49.5	**0.495**	**24.5025**	**2303**	**Area 1**
49	0.49	24.01	2257	
48	0.48	23.04	2166	
47	0.47	22.09	2076	
46	0.46	21.16	1989	
45	0.45	20.25	1904	

Definition drawing

Pad has a cross section area 2 x the shaded area
area = length x depth
slope is 1 in 100
storage capacity is length x depth x width
length m

depth m



length and therefore storage volume varies with depth
to determine depth and length of a volume of water read off the relevant data from the table

width of pad **389** m

Definition drawing

Pad has a cross section area = the shaded area
area = length x depth /2
slope is 1 in 100
storage capacity is length x depth x width
length m

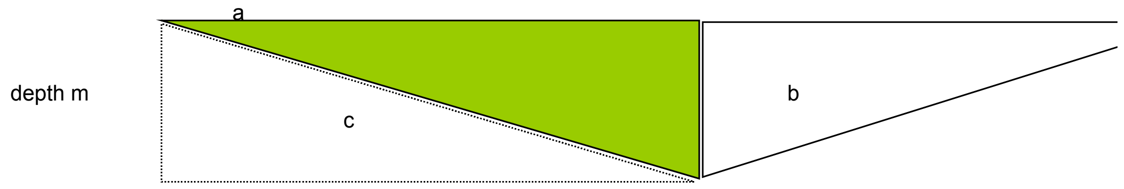


Table A

1 in 100 slope slope length m	Single sided height/depth at centre m	pad area area (a * b)**/2** m2	Single sided storage capacity m3	one sided	
100	1	50.00	19450	m	
99	0.99	49.01	19063		
98	0.98	48.02	18680		
97	0.97	47.05	18301		
96	0.96	46.08	17925		
95	0.95	45.13	17554		
94	0.94	44.18	17186		
93	0.93	43.25	16822		
92	0.92	42.32	16462		
91	0.91	41.41	16107		
90	0.9	40.50	15755		
89	0.89	39.61	15406		
88	0.88	38.72	15062		
87	0.87	37.85	14722		
86	0.86	36.98	14385		
85	0.85	36.13	14053		
84	0.84	35.28	13724		
83	0.83	34.45	13399		
82	0.82	33.62	13078		
81	0.81	32.81	12761		
80	0.8	32.00	12448		
79	0.79	31.21	12139		
78	0.78	30.42	11833		
77	0.77	29.65	11532		
76	0.76	28.88	11234		
75	0.75	28.13	10941		
74	0.74	27.38	10651		
73	0.73	26.65	10365		
72	0.72	25.92	10083		
71	0.71	25.21	9805		
70	0.7	24.50	9531		
69	0.69	23.81	9260		
68	0.68	23.12	8994		
67	0.67	22.45	8731		
66	0.66	21.78	8472		
65	0.65	21.13	8218		
64	0.64	20.48	7967		
63	0.63	19.85	7720		
62	0.62	19.22	7477		
61	0.61	18.61	7237		
60	0.6	18.00	7002		
59	0.59	17.41	6771		
58	0.58	16.82	6543		
57	0.57	16.25	6319		
56	0.56	15.68	6100		
55	0.55	15.13	5884		
54	0.54	14.58	5672		
53	0.53	14.05	5464		
52	0.52	13.52	5259		
51	0.51	13.01	5059		
50	0.5	12.50	4863		
49	0.49	12.01	4670		
48	0.48	11.52	4481		
47	0.47	11.05	4297		
46	0.46	10.58	4116		
45.5	**0.455**	**10.35**	**4027**		**Area 2**
45	0.45	10.13	3939		
44	0.44	9.68	3766		
43	0.43	9.25	3596		
42	0.42	8.82	3431		
41	0.41	8.41	3270		
40	0.4	8.00	3112		

ATLANTIC WASTE ECOPARK PAVING PROJECT

CQA Plan

Appendix 2
Slab Design Calculations

Report Number 1379r3v1d0615

JK

08.06.15

'ATLANTIC RECYCLING', CARDIFF

THICKNESS DESIGN & SPECIFICATION FOR PAVING USING HBM – 1ST PHASE

<u>Draft for client approval</u>

Introduction

Atlantic Recycling (AR) process and recycle waste. To satisfy Environment Agency (EA) requirements, AR are obliged to construct working areas which afford a hard impermeable surface.

To achieve this aim, AR will construct a pavement consisting of a surface layer of hydraulically bound mixture (HBM). It is understood that this approach is acceptable to the EA.

The work is to be carried out in phases. A 20,000 m2 area forms the 1st phase and will be constructed using in-situ cement stabilization of aggregate; the latter processed from AR's recycling operations. Later stages will consider the use of incinerator bottom ash (IBA) for the aggregate.

This note details the design and specification of the cement stabilisation for this 1st phase of the works.

HBM thickness design approach

The pavement concerned is a heavy duty pavement because it will be subject to wheel loads of up to 10 tonnes and therefore axle loads of up to approximately 20 tonnes which are twice that permitted on the public road.

The design of the pavement is established using a simplified analytical design process as follows.

The design approach is based on the fact that unlike roads, which are subject to many passes of relatively light axles, heavy duty pavements are usually subject to relatively few passes of heavy loads. In such situations, it is the maximum intensity of load rather than frequency of loading that needs to be considered for design purposes. This is particularly relevant for HBM & concrete, which are particularly susceptible to immediate cracking and failure from over-loading.

Thus the design recommendation given here is based on Williams (ref) simplified analytical approach, which requires only a knowledge of the maximum load and is independent of loading frequency and design life. Thus the same design will apply for the full area extent of the pavement.

The design approach 'idealises' the pavement as a 2-layer system consisting of a HBM layer on a supporting layer. The stress (σ) at the bottom of the HBM layer is given by the expression;

$$\sigma = 1.8p(a/h)^{1.85}\log_{10}(E_1/E_2) \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..(A)$$

where,

p = tyre pressure
a = radius of tyre contact
h = HBM thickness
E_1 = HBM modulus
E_2 = foundation modulus.

Equation A is simplified by making use of the relationship between load (P) and tyre pressure;

$P = p\pi a^2$ so that $p = P/\pi a^2$**;**

and also by changing the power function from 1.85 to 2.

Thus equation A approximates to;

$\sigma = 0.57P/h^2 \log_{10}(E_1/E_2)$…………………………………………..(B)

or rearranged

$h = \sqrt{}\{0.57\ P/\sigma\ [\log_{10}(E_1/E_2]\}$………………………………………(C)

Equation C is used to establish the thickness of HBM using the following parameters and assumptions.

Design Assumptions

- Structural performance and life is un-defined and secondary to the main requirement for impermeability which is also not defined
- To this end, a wheel load of 7 tonnes is used in the design process. This is less than the maximum load of 10 tonnes but considered appropriate in the light of the client's overall requirements
- The use of an aggregate of adequate hardness to produce a well-graded cement-bound granular mixture (CBGM) with a maximum aggregate size of 31.5mm and compressive strength class of not less than 6 MPa at 28 days using 20C sealed curing measured on cubical or squat cylinder (aspect ratio of 1) strength specimens
- It is estimated that this should realize a CBGM with a flexural strength of circa 0.7 MPa and an elastic modulus, E, of 7,500 MPa
- An E value of 150 MPa is assumed for the CBGM supporting structure based on a 200mm sub-base depth of recycled aggregate of Type 1 quality on a sub-grade with a design CBR of not less than 8%. The latter should be checked prior to stabilization and soft spots/areas removed
- The CBGM is to be un-surfaced but it is understood that the intention is to produce a durable surface to the CBGM by the incorporation of fibres in the upper surface of the CBGM and modify the workability and properties of the surface to enable the use of power-floating
- Associated with this, to ensure CBGM soundness and durability, immersed strengths should be not less than 5 MPa.

Recommendation

Using the parameters/assumptions detailed above, equation C becomes;

$h = \sqrt{}\{0.57 \text{ x } 7/0.7 \text{ x } \log_{10}7500/150\}$
$h = \sqrt{}\{5.7 \text{ x } \log_{10}50\}$
$h = \sqrt{}\{5.7 \text{ x } 1.699\}$
$h = \sqrt{}\ 9.68$

$h \sim 300\text{mm}$

Thus the design requires;

- 300mm CBGM constructed as 1 lift with a fibre/power floated surface on
- 200mm recycled Type 1 sub-base on
- 8% CBR sub-grade.

CBGM Specification

Production, construction and testing should be carried out in full accord with the series 800 of the Specification for Highway Works assuming CBGM in conformity with clause 821 of that series.

In accordance with the series 800, the contractor should provide, in accordance with clause 817, a full method statement and testing schedule for approval by the client.

The contractor should pay particular attention to clauses 813, 816, 820, 870 & 880.

Induced cracking to clause 818 and the determination of the coefficient of linear thermal expansion to clause 871will not be required.

Reference

WILLIAMS R.I.T. Cement-treated pavements. (Elsevier Applied Science, 1986)

ATLANTIC WASTE ECOPARK PAVING PROJECT

CQA Plan

Appendix 3
Slab Construction Method Statement

Report Number 1379r3v1d0615

Generic Method Statement for In Situ Cement Bound Granular Material (CBGM) production in applications such as storage yards and roadways.

Overview

The method to be used will be 'mix in place' Stabilisation. The binders will be spread from a purpose built lime/cement spreader and then mixed with a stabiliser/mixer machine pulverising and mixing the host material with cement with water added during mixing process if necessary.

The end product will be a cement bound granular material with an unjointed, power floated finish. The product is designed to act as a competent bound surface made using a combination of recycled aggregates and cementitious materials, to provide a surface which can act as a lower cost material than ready mixed concrete.

The appearance, performance and lifespan will be inferior to ready mixed concrete and this is reflected in the cost of the product.

Plant & Machinery required

- Tractor crushing rotorvator
- Tractor & mixing rotorvator
- Tractor & binder spreader
- Tractor & water bowser
- Excavator
- Bobcat & grader attachment
- Self propelled roller
- Towed powder silo
- Power float

Labour required

- Site Manager
- Machinery operatives
- Labourers/Site operatives

Materials required

- Bulk Cement Powder
- Reinforcement fibres
- Water
- Recycled aggregate (<75mm approx.)

Scope of works

- Plant & equipment will be delivered to site on low loaders and offloaded to suitable areas. A towed powder silo will be set up in a hardstanding areas provided by the client with measurements of minimum 6m x 15m and suitably located so that it can be served daily by road going tankers. The powder silo will be fitted with an air compressor which has a filtration device to limit emissions to air.

- A working method will be agreed on site by the DLS site manager and the client and areas of approximately 2,000m^2 will be prepared and made available to DLS for treatment on a daily basis.
- The area for treatment will firstly be pulverised by a tractor and crushing attachment to ensure that the host material has a consistent grading of approx. 25mm and down. If a suitable grading is not achieved after one pass, subsequent passes will follow under the supervision of the DLS site manager.
- Cement will be delivered to site by road going tanker and coupled to the powder silo using pneumatic pipework. Cement will be offloaded from the delivery vehicle to the silo by a compressed air system fitted with a filtration device to limit emissions to air.
- Cement will be offloaded from the storage silo to the spreading machine through a similar compressed air system, with a filtration device fitted to the spreading machine also. The Spreader is purpose built with a variable speed delivery belt and distribution rotor. It is fitted with a skirt to reduce dust whilst spreading.
- The spreading machine will be towed to the working area and calibrated each day by spreading a small amount of powder on the ground and using a tray of known dimensions, the weight spread on to the ground will be calculated and adjusted in accordance with the mix design.
- Cement will be spread across the ground and the spreading machine will be closely followed by the mixing machine, which will ensure that the amount of time that cement is exposed to the open air before being incorporated in to the ground is minimal. Weather conditions including wind speed and direction will be closely monitored by the DLS site manager who will limit spreading operations if there are risks of cement becoming airbourne due to high winds.
- The mixing machine will travel over the ground at a set speed and a set depth, incorporating the cement with the host material and pulverising the mixture further. Parallel strips of host material will be mixed, with approximately 150mm overlap between adjacent passes. These overlaps will ensure that no material between the strips remains unprocessed.
- The moisture content will be observed by the machine operator and site manager and if water is required it will be pumped directly in to the mixing chamber by a tractor and water bowser linked to the stabilisation machine with a hose. Water content will be adjusted as per the requirements of the experienced operators.
- The depth of mixing and pulverising will ensure a final compacted thickness of 250mm. The mixing machine is fitted with an automatic hydraulic depth control system to maintain the correct depth of stabilisation.
- Once mixed, the area will be compacted with a self propelled smooth drum roller and trimmed to level by a bobcat and grader attachment which will be controlled by a laser level.
- The top surface will then be sprayed with a small quantity of water and power floated using suitable machinery to provide a sealed finish.
- Adjoining stabilised areas (for example when neighbouring areas are treated on concurrent days) will overlap by approximately 150mm to provide a sealed join in the treated areas. This will be done by the mixing machine “cutting in” to the previous/adjacent layer by 150mm.

Output/Productivity

A typical output would be 2,000 m^2 of finished area per day.

Spread rates of cement are typically $40kg/m^2$ which equates to 80 ton of cement per day or around 3 artic tanker loads.

ATLANTIC WASTE ECOPARK PAVING PROJECT

CQA Plan

Appendix 4 Interceptor Specification

Report Number 1379r3v1d0615

Klargester

PROFESSIONAL RANGE

Separators

A RANGE OF FUEL/OIL SEPARATORS FOR PEACE OF MIND

Part of Kingspan Environmental

Separators

A RANGE OF FUEL/OIL SEPARATORS FOR PEACE OF MIND

Surface water drains normally discharge to a watercourse or indirectly into underground waters (groundwater) via a soakaway. Contamination of surface water by oil, chemicals or suspended solids can cause these discharges to have a serious impact on the receiving water.

The Environment Regulators, Environment Agency, England and Wales, SEPA, Scottish Environmental Protection Agency in Scotland and Department of Environment & Heritage in Northern Ireland, have published guidance on surface water disposal, which offers a range of means of dealing with pollution both at source and at the point of discharge from site (so called 'end of pipe' treatment). These techniques are known as 'Sustainable Drainage Systems' (SuDS).

Where run-off is draining from relatively low risk areas such as car-parks and non-operational areas, a source control approach, such as permeable surfaces or infiltration trenches, may offer a suitable means of treatment, removing the need for a separator.

Oil separators are installed on surface water drainage systems to protect receiving waters from pollution by oil, which may be present due to minor leaks from vehicles and plant, from accidental spillage.

Effluent from industrial processes and vehicle washing should normally be discharged to the foul sewer (subject to the approval of the sewerage undertaker) for further treatment at a municipal treatment works.

SEPARATOR STANDARDS AND TYPES

A British (and European) standard (EN 858-1 and 858-2) for the design and use of prefabricated oil separators has been adopted. New prefabricated separators should comply with the standard.

SEPARATOR CLASSES

The standard refers to two 'classes' of separator, based on performance under standard test conditions.

CLASS I

Designed to achieve a concentration of less than 5mg/l of oil under standard test conditions, should be used when the separator is required to remove very small oil droplets.

CLASS II

Designed to achieve a concentration of less than 100mg/l oil under standard test conditions and are suitable for dealing with discharges where a lower quality requirement applies (for example where the effluent passes to foul sewer).

Both classes can be produced as full retention or bypass separators. The oil concentration limits of 5 mg/l and 100 mg/l are only applicable under standard test conditions. It should not be expected that separators will comply with these limits when operating under field conditions.

FULL RETENTION SEPARATORS

Full retention separators treat the full flow that can be delivered by the drainage system, which is normally equivalent to the flow generated by a rainfall intensity of 65mm/hr.

On large sites, some short term flooding may be an acceptable means of limiting the flow rate and hence the size of full retention systems.

BYPASS SEPARATORS

Bypass separators fully treat all flows generated by rainfall rates of up to 6.5mm/hr. This covers over 99% of all rainfall events. Flows above this rate are allowed to bypass the separator. These separators are used when it is considered an acceptable risk not to provide full treatment for high flows, for example where the risk of a large spillage and heavy rainfall occurring at the same time is small.

FORECOURT SEPARATORS

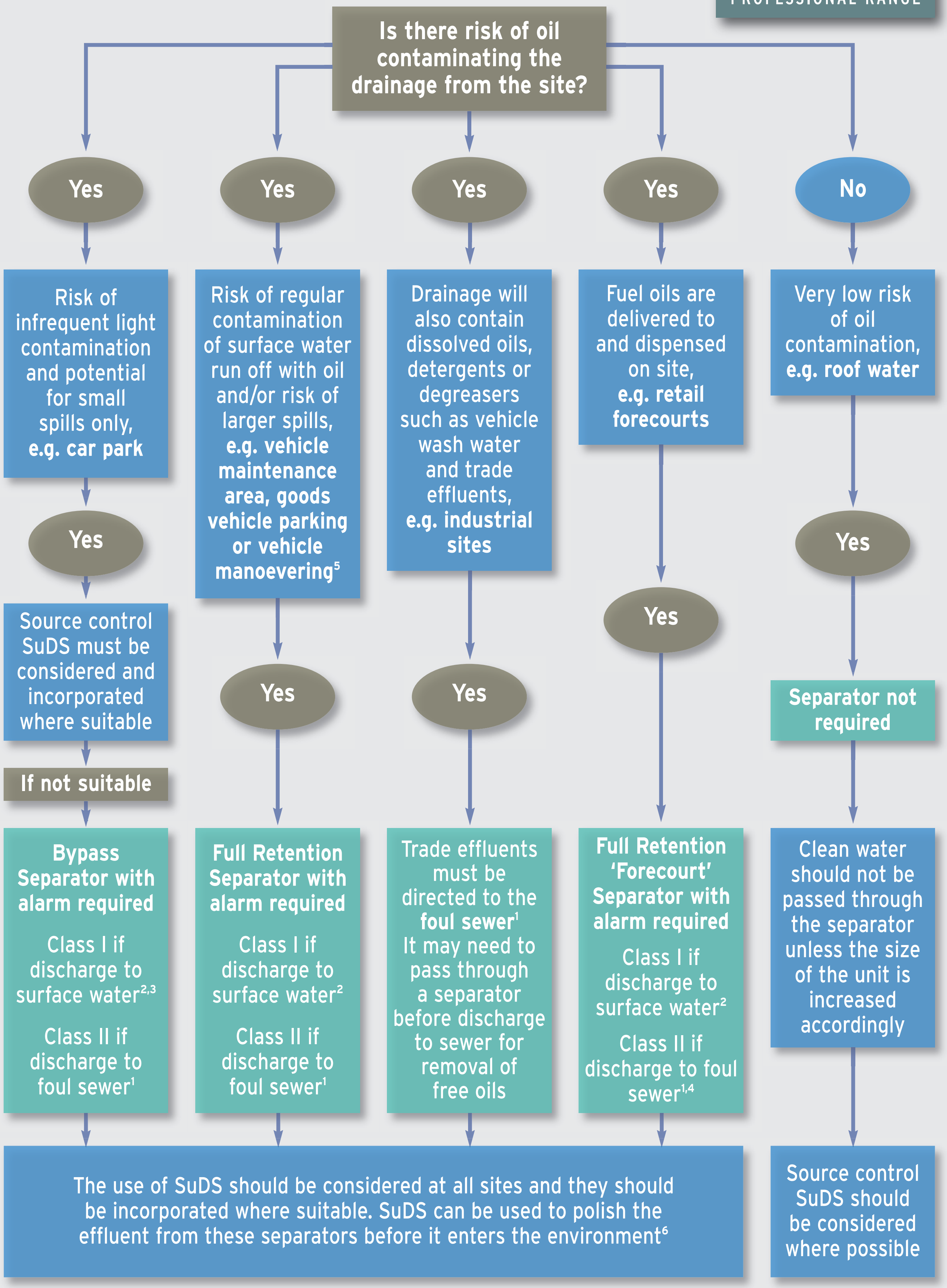
Forecourt separators are full retention separators specified to retain on site the maximum spillage likely to occur on a petrol filling station. They are required for both safety and environmental reasons and will treat spillages occurring during vehicle refuelling and road tanker delivery. The size of the separator is increased in order to retain the possible loss of the contents of one compartment of a road tanker, which may be up to 7,600 litres.

SELECTING THE RIGHT SEPARATOR

The chart on the following page gives guidance to aid selection of the appropriate type of fuel/oil separator for use in surface water drainage systems which discharge into rivers and soakaways.

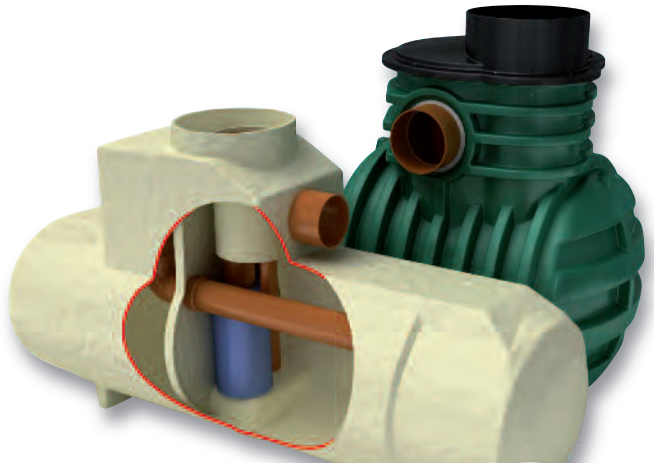
For further detailed information, please consult the Environment Agency Pollution Prevention Guideline 03 (PPG 3) 'Use and design of oil separators in surface water drainage systems' available from their website.

Klargester has a specialist team who provide technical assistance in selecting the appropriate separator for your application.



1 You must seek prior permission from your local sewer provider before you decide which separator to install and before you make any discharge.
2 You must seek prior permission from the relevant environmental body before you decide which separator to install.
3 In this case, if it is considered that there is a low risk of pollution a source control SuDS scheme may be appropriate.
4 In certain circumstances, the sewer provider may require a Class 1 separator for discharges to sewer to prevent explosive atmospheres from being generated.
5 Drainage from higher risk areas such as vehicle maintenance yards and goods vehicle parking areas should be connected to foul sewer in preference to surface water.
6 In certain circumstances, a separator may be one of the devices used in the SuDS scheme. Ask us for advice.

Bypass NSB RANGE



APPLICATION

Bypass separators are used when it is considered an acceptable risk not to provide full treatment, for very high flows, and are used, for example, where the risk of a large spillage and heavy rainfall occurring at the same time is small, e.g.

- Surface car parks.
- Roadways.
- Lightly contaminated commercial areas.

PERFORMANCE

Klargester were one of the first UK manufacturers to have separators tested to EN 858-1. Klargester have now added the NSB bypass range to their portfolio of certified and tested models. The NSB number denotes the maximum flow at which the separator treats liquids. The British Standards Institute (BSI) tested the required range of Klargester full retention separators and certified their performance in relation to their flow and process performance assessing the effluent qualities to the requirements of EN 858-1. Klargester bypass separator designs follow the parameters determined during the testing of the required range of bypass separators.

Each bypass separator design includes the necessary volume requirements for:

- Oil separation capacity.
- Silt storage capacity.
- Oil storage volume.
- Coalescer.

The unit is designed to treat 10% of peak flow. The calculated drainage areas served by each separator are indicated according to the formula given by PPG3 NSB = 0.0018A(m2). Flows generated by higher rainfall rates will pass through part of the separator and bypass the main separation chamber.

Class I separators are designed to achieve a concentration of 5mg/litre of oil under standard test conditions.

Class II separators are designed to achieve a concentration of 100mg/litre of oil under standard test conditions.

FEATURES

- Light and easy to install.
- Class I and Class II designs.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Vent points within necks.
- Oil alarm system available (required by EN 858-1 and PPG3).
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- GRP or rotomoulded construction (subject to model).

To specify a nominal size bypass separator, the following information is needed:-

- The calculated flow rate for the drainage area served. Our designs are based on the assumption that any interconnecting pipework fitted elsewhere on site does not impede flow into or out of the separator and that the flow is not pumped .
- The required discharge standard. This will decide whether a Class I or Class II unit is required.
- The drain invert inlet depth.
- Pipework type, size and orientation.

SIZES AND SPECIFICATIONS

UNIT NOMINAL SIZE	FLOW (l/s)	PEAK FLOW RATE (l/s)	DRAINAGE AREA (m^2)	STORAGE CAPACITY (litres) SILT	STORAGE CAPACITY (litres) OIL	UNIT LENGTH (mm)	UNIT DIA. (mm)	ACCESS SHAFT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT	STANDARD FALL ACROSS (mm)	MIN. INLET INVERT (mm)	STANDARD PIPEWORK DIA. (mm)
NSBP003	3	30	1670	300	45	1700	1350	600	1420	1320	100	500	160
NSBP004	4.5	45	2500	450	60	1700	1350	600	1420	1320	100	500	160
NSBP006	6	60	3335	600	90	1700	1350	600	1420	1320	100	500	160
NSBE010	10	100	5560	1000	150	2069	1220	750	1450	1350	100	700	315
NSBE015	15	150	8335	1500	225	2947	1220	750	1450	1350	100	700	315
NSBE020	20	200	11111	2000	300	3893	1220	750	1450	1350	100	700	375
NSBD024	24	240	13340	2400	360	3200	2012	600	2110	2010	100	1000	375
NSBD030	30	300	16670	3000	450	3915	2012	600	2110	2010	100	1000	450
NSBD036	36	360	20000	3600	540	3915	2012	600	2110	2010	100	1000	525
NSBD055	55	550	30560	5500	825	5085	2820	600	2310	2060	250	1000	750
NSBD072	72	720	40000	7200	1080	5820	2820	600	2310	2060	250	1500	750
NSBD084	84	840	46670	8400	1260	6200	2820	600	2310	2010	300	1500	750
NSBD096	96	960	53340	9600	1440	7375	2820	600	2310	2010	300	1500	825
NSBD110	110	1100	61110	11000	1650	7925	2820	600	2360	2010	350	1500	825
NSBD130	130	1300	72225	13000	1950	8725	2820	600	2360	2010	350	1500	825

Rotomoulded chamber construction   *GRP chamber construction*   ** Some units have more than one access shaft – diameter of largest shown.*

Full Retention NSF RANGE

Klargester
PROFESSIONAL RANGE

APPLICATION

Full retention separators are used in high risk spillage areas such as:

- Fuel distribution depots.
- Vehicle workshops.
- Scrap Yards

PERFORMANCE

Klargester were the first UK manufacturer to have the required range (3-30 l/sec) certified to EN 858-1 in the UK. The NSF number denotes the flow at which the separator operates.

The British Standards Institute (BSI) have witnessed the performance tests of the required range of separators and have certified their performance, in relation to their flow and process performance to ensure that they met the effluent quality requirements of EN 858-1. Larger separator designs have been determined using the formulas extrapolated from the test range.

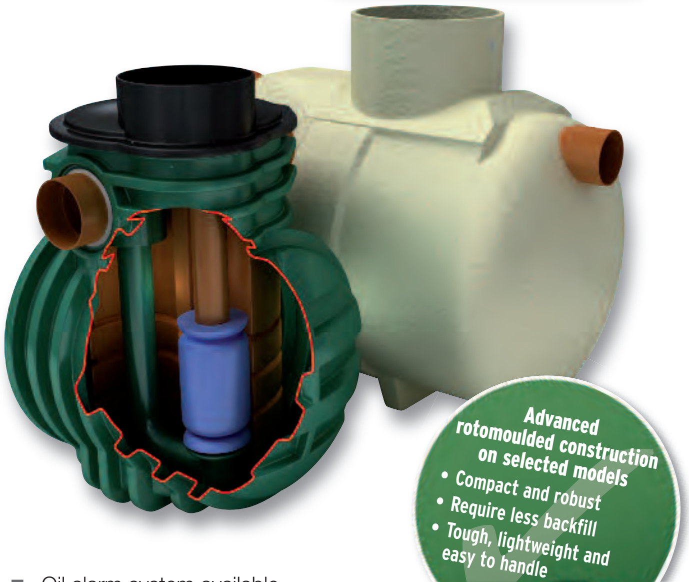
Each full retention separator design includes the necessary volume requirements for:

- Oil separation capacity.
- Silt storage capacity.
- Automatic closure device.
- Oil storage volume.
- Coalescer (Class I units only).

Klargester full retention separators treat the whole of the specified flow.

FEATURES

- Light and easy to install.
- Class I and Class II designs.
- 3-30 l/sec range independently tested and performance sampled, certified by the BSI.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.



- Oil alarm system available.
- Vent points within necks.
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- GRP or rotomoulded construction (subject to model).

To specify a nominal size full retention separator, the following information is needed:-

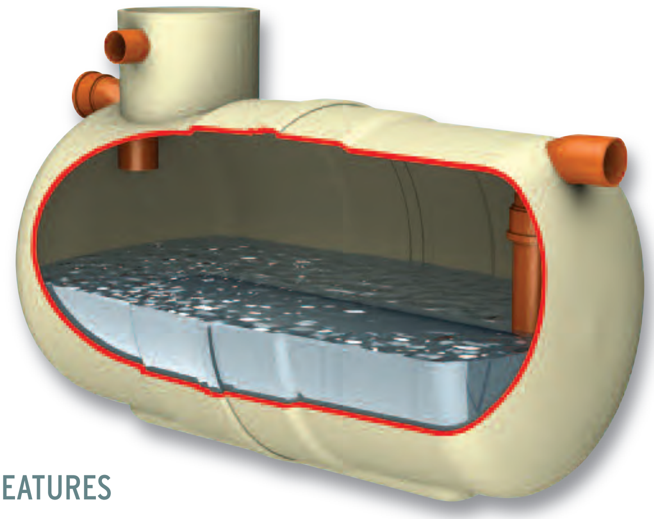
- The calculated flow rate for the drainage area served. Our designs are based on the assumption that any interconnecting pipework fitted elsewhere on site does not impede flow into or out of the separator and that the influent is not pumped.
- The required discharge standard. This will decide whether a Class I or Class II unit is required.
- The drain invert inlet depth.
- Pipework type, size and orientation.

SIZES AND SPECIFICATIONS

UNIT NOMINAL SIZE	FLOW (l/s)	DRAINAGE AREA (m^2) PPG-3 (0.018)	STORAGE CAPACITY (litres) SILT	OIL	UNIT LENGTH (mm)	UNIT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT	MIN. INLET INLET (mm)	STANDARD PIPEWORK DIA. (mm)
NSFP003	3	170	300	30	1700	1350	1420	1345	500	160
NSFP006	6	335	600	60	1700	1350	1420	1345	500	160
NSFA010	10	555	1000	100	2610	1225	1050	1000	500	200
NSFA015	15	835	1500	150	3910	1225	1050	1000	500	200
NSFA020	20	1115	2000	200	3200	2010	1810	1760	1000	315
NSFA030	30	1670	3000	300	3915	2010	1810	1760	1000	315
NSFA040	40	2225	4000	400	4640	2010	1810	1760	1000	315
NSFA050	50	2780	5000	500	5425	2010	1810	1760	1000	315
NSFA065	65	3610	6500	650	6850	2010	1810	1760	1000	315
NSFA080	80	4445	8000	800	5744	2820	2500	2450	1000	300
NSFA100	100	5560	10000	1000	6200	2820	2500	2450	1000	400
NSFA125	125	6945	12500	1250	7365	2820	2500	2450	1000	450
NSFA150	150	8335	15000	1500	8675	2820	2550	2450	1000	525
NSFA175	175	9725	17500	1750	9975	2820	2550	2450	1000	525
NSFA200	200	11110	20000	2000	11280	2820	2550	2450	1000	600

Rotomoulded chamber construction *GRP chamber construction*

Washdown & Silt



APPLICATION

This unit can be used in areas such as car wash and other cleaning facilities that discharge directly into a foul drain, which feeds to a municipal treatment facility.

If emulsifiers are present the discharge must not be allowed to enter an NS Class I or Class II unit.

- Car wash.
- Tool hire depots.
- Truck cleansing.
- Construction compounds cleansing points.

PERFORMANCE

Such wash down facilities must not be allowed to discharge directly into surface water but must be directed to a foul connection leading to a municipal treatment works as they utilise emulsifiers, soaps and detergents, which can dissolve and disperse the oils.

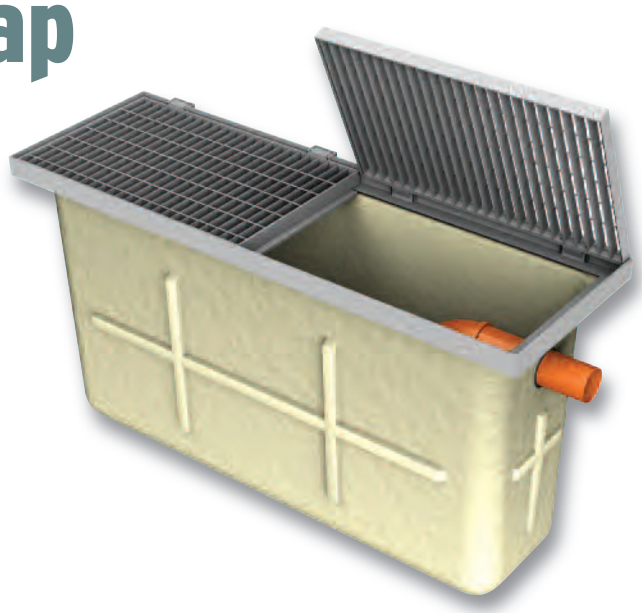
FEATURES

- Light and easy to install.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Vent points within necks.
- Extension access shafts for deep inverts.
- Maintenance from ground level.

SIZES AND SPECIFICATIONS

REF.	TOTAL CAPACITY (litres)	MAX. REC. SILT	MAX. FLOW RATE (l/s)	LENGTH (mm)	DIAMETER (mm)	ACCESS SHAFT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT (mm)	STANDARD FALL ACROSS UNIT (mm)	MIN. INLET INVERT (mm)	STANDARD PIPEWORK DIA. (mm)	APPROX EMPTY (kg)
W1/010	1000	500	3	1123	1225	460	1150	1100	50	500	160	60
W1/020	2000	1000	5	2074	1225	460	1150	1100	50	500	160	120
W1/030	3000	1500	8	2952	1225	460	1150	1100	50	500	160	150
W1/040	4000	2000	11	3898	1225	460	1150	1100	50	500	160	180
W1/060	6000	3000	16	4530	1440	600	1360	1310	50	500	160	320
W1/080	8000	4000	22	3200	2020	600	2005	1955	50	500	160	585
W1/100	10000	5000	27	3915	2020	600	2005	1955	50	500	160	680
W1/120	12000	6000	33	4640	2020	600	2005	1955	50	500	160	770
W1/150	15000	7500	41	5435	2075	600	1940	1890	50	500	160	965
W1/190	19000	9500	52	6865	2075	600	1940	1890	50	500	160	1200

Car Wash Silt Trap



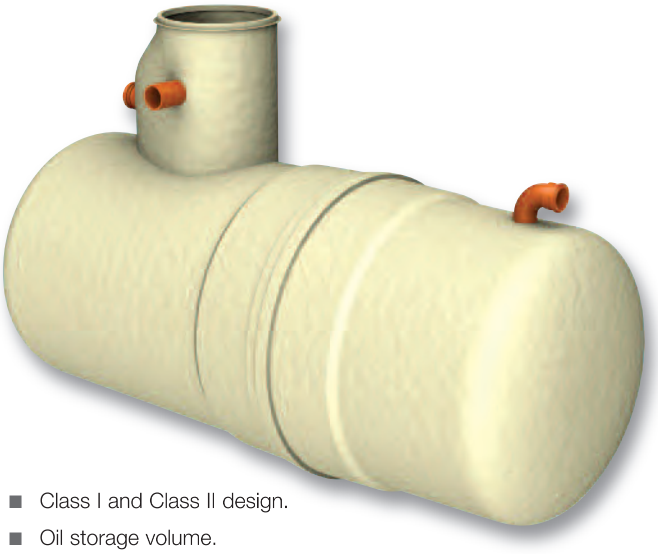
APPLICATION

Car Wash silt trap is designed for use before a separator in car wash applications to ensure effective silt removal.

FEATURES

- FACTA Class B covers.
- Light and easy to install.
- Maintenance from ground level.

Forecourt



APPLICATION

The forecourt separator is designed for installation in petrol filling station forecourts and similar applications. The function of the separator is to intercept hydrocarbon pollutants such as petroleum and oil and prevent their entry to the drainage system, thus protecting the environment against hydrocarbon contaminated surface water run-off and gross spillage.

PERFORMANCE

Operation ensures that the flow cannot exit the unit without first passing through the coalescer assembly.

In normal operation, the forecourt separator has sufficient capacity to provide storage for separated pollutants within the main chamber, but is also able to contain up to 7,600 litres of pollutant arising from the spillage of a fuel delivery tanker compartment on the petrol forecourt. The separator has been designed to ensure that oil cannot exit the separator in the event of a major spillage, subsequently the separator should be emptied immediately.

FEATURES

- Light and easy to install.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Vent points within necks.
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- Class I and Class II design.
- Oil storage volume.
- Coalescer (Class I unit only).
- Automatic closure device.
- Oil alarm system available.

INSTALLATION

The unit should be installed on a suitable concrete base slab and surrounded with a concrete backfill. Structural grade units can also be supplied suitable for installation within a granular backfill (i.e. pea gravel). Please specify unit required when ordering.

If the separator is to be installed within a trafficked area, then a suitable cover slab must be designed to ensure that loads are not transmitted to the unit.

The separator should be installed and vented in accordance with Health and Safety Guidance Note HS(G)41 for filling stations, subject to Local Authority requirements.

SIZES AND SPECIFICATIONS

ENVIROCEPTOR CLASS	BACKFILL TYPE	TOTAL CAP. (litres)	DRAINAGE AREA (m^2)	MAX. FLOW RATE (l/s)	LENGTH (mm)	DIAMETER (mm)	ACCESS SHAFT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT (mm)	STD. FALL ACROSS UNIT (mm)	MIN. INLET INVERT (mm)	STD. PIPEWORK (mm)	EMPTY WEIGHT (kg)
I	CONCRETE	10000	720	15	3915	2020	600	2180	2130	50	600	160	620
II	CONCRETE	10000	720	15	3915	2020	600	2180	2130	50	600	160	620

Alarm Systems

British European Standard EN 858-1 and Environment Agency Pollution Prevention Guideline PPG3 requires that all separators are to be fitted with an oil level alarm system and that it should be installed and calibrated by a suitably qualified technician so that it will respond to an alarm condition when the separator requires emptying.

- Easily fitted to existing tanks.
- Excellent operational range.
- Visual and audible alarm.
- Additional telemetry option.

PROFESSIONAL INSTALLERS

Klargester Accredited Installers

Experience shows that correct installation is a prerequisite for the long-lasting and successful operation of any wastewater treatment product.

This is why using an installer with the experience and expertise to install your product is highly recommended.

Services include :

- Site survey to establish ground conditions and soil types
- Advice on system design and product selection
- Assistance on gaining environmental consents and building approvals
- Tank and drainage system installation
- Connection to discharge point and electrical networks
- Waste emptying and disposal

Discover more about the Accredited Installers and locate your local expert online.

www.klargester.com/installers

CARE & MAINTENANCE

Kingspan Environmental Service

Who better to look after your separators than the people who designed and built them?

Kingspan Environmental have a dedicated service division providing maintenance for wastewater products.

Factory trained engineers are available for site visits as part of a planned maintenance contract or on a one-off call out basis.

To find out more about protecting your investment and ensuring peace of mind, call us on:

0844 846 0500

or visit us online:

www.kingspanenvservice.com

Kingspan Environmental : Service

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UK: College Road North, Aston Clinton, Aylesbury, Buckinghamshire HP22 5EW
Tel: +44 (0) 1296 633000 Fax: +44 (0) 1296 633001 Scottish Office: Tel: +44 (0) 1355 248484
email: info@klargester.com

Ireland: Unit 1a, Derryboy Road, Carnbane Business Park, Newry, Co. Down BT35 6QH
NI Tel : +44 (0) 28 302 66799 Fax: +44 (0) 28 302 60046 ROI Tel: 048 302 66799 Fax: 048 302 60046
email: info@klargester.ie

Visit our website **www.klargester.com**, or our company website **www.kingspanenv.com**

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