

Caulmert Limited

Engineering, Environmental & Planning
Consultancy Services

Bryn Posteg Landfill Site

Sundorne Products (Llanidloes) Ltd

Surface Water Management Plan

Prepared by:

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Client: Potters Waste Management

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1.0 INTRODUCTION

1.1 Terms of Reference

- 1.1.1 Bryn Posteg Landfill Site in Llanidloes, Powys is operated by Sundorne Products (Llanidloes) Ltd., trading as Potters Waste Management (Potters), under Environmental Permit EPR/BU7766IC. Caulmert Ltd was appointed by Potters to update the current Surface Water Management Plan (SWMP) to incorporate changes in landforms and consequential alterations to surface water management on site.
- 1.1.2 Reference has been made throughout this SWMP to the previous Plans associated with the site, namely:
- Surface Water Management - Eastern Outfall (Reference 1271 Bryn Posteg\Reports\Eastern Lagoon December 2004 Rev J);
 - Surface Water Management and Monitoring Plan (Reference SWMP2005v1)

2.0 CONTEXT AND SCOPE OF WORK

2.1 Requirements

- 2.1.1 The Bryn Posteg Landfill site received a Regulation 61 Information Notice on 18th January 2018. This statutory notice requires the operator of the landfill site to provide specific information to Natural Resources Wales (NRW) within a stated timeframe. The provision of a contemporary SWMP is required as part of that Notice under Schedule 1.
- 2.1.2 This revised SWMP followed a review of surface water features at the site by Caulmert on 2nd February 2018. The impact upon surface water caused by the over-tipping of waste quantities and consequential increase in leachate volumes was observed during that visit.

2.2 Limitations

- 2.2.1 Some of the aspects considered in this report are subject to change with time. Therefore consideration should be given to reviewing content to confirm that no changes have taken place, either at the site, the hydraulic setting, or within legislation.
- 2.2.2 This report is based on the use specified in the text. If this use is changed then consideration should be given to re-visiting the findings of this report to ensure that they remain valid.

3.0 SITE DESCRIPTION

3.1 Location and Details

- 3.1.1 The Bryn Posteg landfill site is located 2.8km to the south east of Llanidloes. It is accessed from the B4518 Llanidloes to Tylwch public highway. The landfill site occupies a total plan area of approximately 20.97 hectares, and generally comprises:

- landfill cells;
- materials recycling facility;
- offices and welfare facilities;
- biomass boiler / electricity generator;
- leachate water treatment components;
- surface water treatment facilities.

3.1.2 The site is broadly rectangular in plan. Its southwest boundary is adjacent to the B4518 highway. The northwest, northeast and southeast boundaries are adjacent to open pasture/grazing land. The site layout plan is in Appendix 1.

3.1.3 The site is constructed in a series of phases: 1, 2, 3A, 3B, 3C, 4A, 4B, 5, 6, 7, 8, 9A, 9B, 9C, 9D. Waste is currently accepted in Cell 9D; all other cells are complete. Cells 1 to 9B are all capped. The site is scheduled to be completed to the currently-agreed restoration contours in 2018.

3.1.4 Phases 1-5 were operated by Montgomeryshire, later Powys County Council, between 1982 and 1997. Evans Logistics Ltd operated Phases 6 – 8. Potters acquired the site in 2005. Phases 9A – 9D have been developed in the southern part of the site. Between 2008 and 2017 additional tipping was also ‘piggy-backing’ onto the existing site (Phases 3A, 3B, 4A and 4B).

3.2 Topography

3.2.1 The pre-landfill geography of the site area can be gauged from OS maps. These show that the site is at the head of two watercourse catchments – one to the east and one to the west.

3.2.2 The site is located in a ‘saddle’ between two geographically higher areas. The contour to the north is at 340m, and that to the southeast is 400m. The original ground profile of the site was crossed by the 320m contour.

3.2.3 Topographic surveys have been taken of the site during landfill operation over a period of time. The changeable nature of ground levels commensurate with the nature of operation render such surveys unreliable after a short period of time. Contemporary topographic surveys show the site to be within the 320m and 340m ground contours. The survey from January 2018 is provided as Appendix 2.

3.3 Hydrological Setting

3.3.1 The site is at the head of two natural drainage catchments; the Nant y Bradnant to the east of the site, and an un-named tributary of the Afon Dulas to the west.

Eastern Catchment

3.3.2 The Nant y Bradnant rises at the site boundary at OSGR 297389, 282233, and at a level of 313.5m. The watercourse flows generally northeast/north within a relatively deep and

narrow valley to outfall at the River Severn near Clydfanau Bridge at OSGR 298389, 285318, a level of 150m.

- 3.3.3 It is estimated that the drainage catchment from within the site boundary that contributes to the Nant y Bradnant is 8.0 hectares. This area is likely to change following landfill and landscaping operations.

Western Catchment

- 3.3.4 There is an un-named tributary of the Afon Dulas to the west of the B4518. The tributary flows west-southwest to join the Afon Dulas at OSGR 295435, 281727, some 1.4km from the B4518, and at a level of 195m. The tributary is shown to flow along a relatively flat, shallow wooded valley. The Afon Dulas itself is a tributary of the Afon Hafren/River Severn some 2.7km further downstream in Llanidloes.
- 3.3.5 It is estimated that the drainage catchment from within the site boundary that contributes to the western catchment is 8.8 hectares. Again, this is likely to change following site operations.

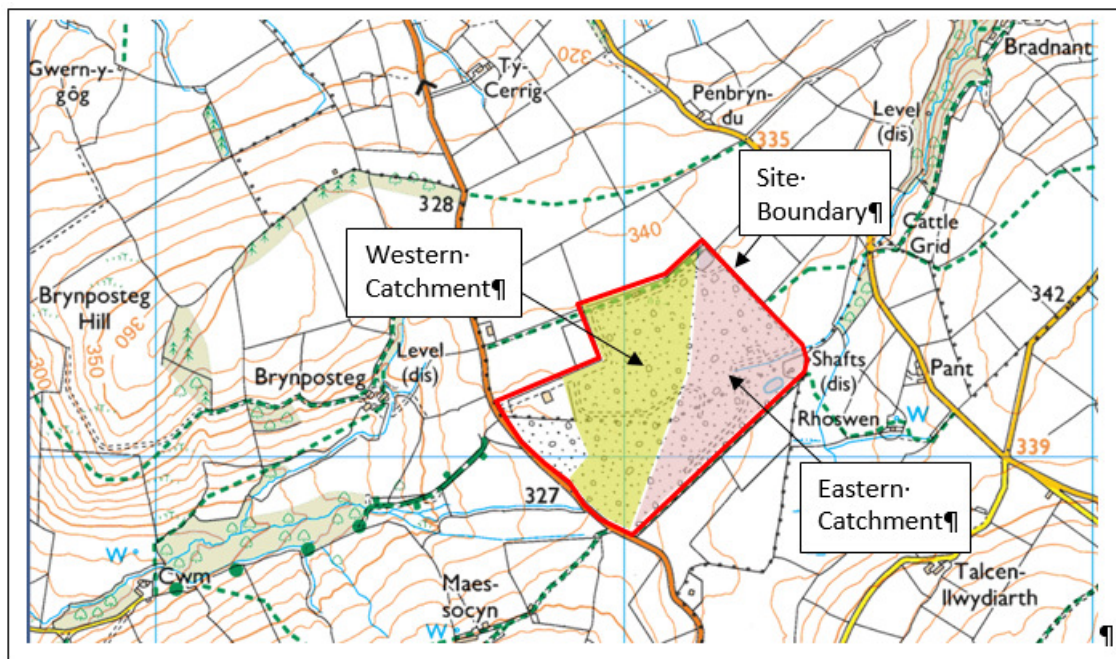


Figure 1 – Site Boundary and Drainage Catchments

3.4 Geology

- 3.4.1 The solid geology underlying the site is broadly split north-south. In the northern area it is the Caerau Mudstones Formation from the Silurian Period. The southern area is of the Rhayader Mudstones Formation from the same Period.

3.4.2 The superficial geology also shows variation. The northern area has no recorded superficial geology, whereas the southern area shows Till deposits formed in the Quaternary Period. An area to the south east of the site has superficial accumulations of peat.

3.4.3 The online BGS mapping shows what appears to be a fault line crossing through the site along an east-west axis.

3.5 Hydrogeology

3.5.1 The EA Groundwater Vulnerability Sheet No.20 indicates that the strata at the site are classified as a non-aquifer with negligible permeability. During the site investigation undertaken by CL Associates in 1998, in-situ testing in boreholes indicated permeabilities in the range of 1.28×10^{-4} m/s and 1.4×10^{-6} m/s in the underlying geological strata.

3.6 Rainfall

3.6.1 The average annual rainfall at the site is noted by HR Wallingford as being 1172mm.

3.6.2 According to HR Wallingford (uksuds.com), the Greenfield runoff estimate for the site Q_{BAR} is 69.8 litres per second. For the 20.97 hectare site, this equates to 3.3 litres per second per hectare. This estimate is based in IH124 methodology.

3.7 Flood Risk

3.7.1 Review of NRW's online Flood Risk Map confirms that Bryn Posteg is located in Flood Zone A. This zone is considered to be at little or no risk of fluvial or coastal/tidal flooding, and has a less than 1 in 1000 annual probability of flooding in a year (<0.1% AEP).

3.7.2 A review of Technical Advice Note 15 (Development and Flood Risk) confirms that development within Flood Zone A is considered to be at little or no risk of flooding. The precautionary framework used by TAN15 indicates that a justification test is not required and that there is no need to consider flood risk further.

4 EXISTING SURFACE WATER MANAGEMENT REVIEW

4.1 General Scheme Arrangement

4.1.1 The site is split into two separate drainage areas - the Eastern and the Western catchments. The catchment boundary is taken to be from a point at the northern most site boundary to a point diagonally opposite on the southernmost site boundary.

4.1.2 Waste over-tipping has taken place in the central area of the available landfill site. According to isopachyte values, which compare the consented levels with site topographic survey levels, the over-tipping peaks at up to 12.5m in excess of consented levels.

Eastern Catchment

- 4.1.3 Surface water from the eastern flanks is received by various engineered ground features. The slopes currently rise to a level of 346m and fall to a level of less than 320m alongside a dosing structure and a series of three water-filled lagoons. Surface water flow down the north-eastern flank is similarly collected by a ditchcourse, which directs flow towards the settlement lagoons.
- 4.1.4 There are three surface water treatment lagoons in the eastern corner of the site. Surface water flow from the majority of the north-eastern area drains into Lagoon 1. This lagoon discharges to a channel that is also used by the outlet from Lagoon 2, which then combines with a ditch from alongside the northern perimeter track. The channel then leaves the site boundary as the Nant y Bradnant. The NRW sampling point P1 is located downstream from the outlet of Lagoon 1.

Western Catchment

- 4.1.5 The landfill site in this catchment area is more complex than that of the eastern area. It is distinguished by partial ground restoration and has large areas of ground that is being tracked over for operational or restorative purposes. There is a range of buildings along much of the north-western boundary, a materials recycling facility (MRF) close to the site entrance, and areas of operation that are not related to landfill.
- 4.1.6 The western catchment has a boundary watercourse that runs the length of the northwest fenceline. It rises close to the leachate treatment lagoon at an elevation of 332m, and leaves the site at the main entrance to cross beneath the B4518 at a ground level of 319m. Much of this watercourse has been culverted, with short reaches of open channel at a number of locations.
- 4.1.7 Surface water runoff from the landfill area is contained in ditches located on the inside of the haul track. These ditches retain runoff from the landfill surfaces and prevents flow from reaching the haul track. The ditches connect to the perimeter watercourse via a culvert at two locations:
- Location A – by the gated field access opposite Chamber 1, and
 - Location B – close to the MRF area via a pipe to open watercourse.

4.2 Discharge Consents

- 4.2.1 The emission limits and monitoring requirements are provided in Table S3.3 (Point Source Emissions to Water (other than sewer)) of the Permit. These limits and requirements are reproduced as Table 1, below.

Emission Point Ref. & Location	Source	Parameter	Limit (incl. unit)	Reference Period	Monitoring Frequency
P1, P2	Surface water collection system	Ammoniacal Nitrogen	0.25 mg/l	Spot Sample	Monthly
		Suspended Solids	50 mg/l		
		pH	6 - 9		
		BOD	20 mg/l		

Table 1 – Extract from Permit Table S3.3

4.2.2 The monitoring location for each discharge point is provided below (Table 2). Both locations are shown on the drawing in Appendix 2.

Discharge Point	Easting	Northing	m AOD
P1 – Nant y Bradnant	297400	282239	313.5
P2 – Afon Dulas	296740	282120	317.5

Table 2 – Surface water monitoring sample locations

5 SURFACE WATER MANAGEMENT PLAN

5.1 Requirement

5.1.1 The surface water management system for the landfill site is designed to take account of:

- Control measures needed for surface water runoff from the site;
- Means to segregate leachate contamination from surface water runoff;
- The conveyance capacity of drainage systems to minimise ground erosion;
- Flood risk within receiving water bodies is not affected;
- The quality of surface water is compliant with the Environmental Permit.

5.1.1 The implementation of the drainage systems provide benefit to the receiving water bodies by achieving a water quality and quantity that is better representative of a natural catchment.

5.1.3 Bryn Posteg landfill site is divided into two different sub-catchment areas, consequential to its geography and engineered landform. Each contributes to different drainage locations

and/or systems on and off site. Where possible, existing drainage pathways are followed within the drainage system.

5.2 Eastern Catchment

- 5.2.1 Surface water from the eastern catchment is directed to the surface water treatment facility. Water treatment is based on flow proportional dosing with coagulation and flocculation additives.
- 5.2.2 Surface water is directed to the dosing structure where it is assessed and dosed accordingly. Flow is allowed to mix prior to being split to either Lagoon 1 or Lagoon 2. Retention within a lagoon allows flocs to settle as a sludge blanket at the bottom of the lagoon. Treated water is removed from lagoon by siphon or manual pump to a channel upstream of Sampling Point P1.
- 5.2.3 A third lagoon is available to allow flexibility during periods of operation or maintenance elsewhere. The third lagoon can also be used to provide retention/recirculation of heavily turbid water.

5.3 Western Catchment

- 5.3.1 Site operations associated with cells 9C and 9D are ongoing. These necessitate the creation of temporary bunds and drainage channels so that the surface water is effectually conveyed towards existing engineered channels. Temporary sumps can be created to withhold possible contaminated surface water, which is then pumped to the leachate treatment facility.
- 5.3.2 Discharge from the engineered ditches at the foot of the capped cells discharges to the boundary watercourse at two locations - Point A and Point B. A Siltbuster-type package treatment plant at the outfall of each maintains a degree of settlement for suspended solids within the flows.
- 5.3.3 Treated water outfalls to the boundary watercourse that outfalls towards the Afon Dulas via Sampling Point P2. A cascade weir along a section of open watercourse upstream of P2 allows the inspection of flow.

5.4 Waste Over-Tipping

- 5.4.1 The over-tipping of waste has occurred within the central area of the landfill site, principally over the cells for Phases 3A, 3B, 4A and 4B. Isopachyte detail show that the over-tipping is up to 12.5m in excess of the approved contours.
- 5.4.2 An increase in elevation within a confined footprint produces a steeper gradient. Rainfall falling on steeper slopes will generally flow over the surface at a faster rate, which can increase the risk of slope erosion and potentially a higher risk of mobilising colloidal material. This risk is minimal once vegetation has become established.

- 5.4.3 Mitigation against slope erosion can be made to lessen the risk of contamination by the creation of contour drains to intercept and slow runoff on slopes. The effect of runoff in such areas will form part of the regular site monitoring, and an identified trend at potential high erosion sites will trigger mitigation action.

5.5 Leachate Head Levels

- 5.5.1 A period of non-compliance with permitted leachate head limits was recorded between January 2016 and April 2017. The leachate heads associated with this period were contained at levels below the rim of the Site and therefore below the surrounding ground level. As such these increased leachate levels would not have come into contact with surface water systems and would have no potential for off-site migration of contaminants.
- 5.5.2 The impact of the non-compliant leachate head levels is therefore not considered further in this report in connection with the perimeter waste slopes.

6 OPERATION, INSPECTION AND MAINTENANCE

6.1 Overview

- 6.1.1 The surface water systems are inspected at a minimum frequency of monthly intervals. The systems are inspected for excessive silting, blockages or damage. The results of the inspections need to be recorded in the site log, together with any remedial actions that need to be made or that have been taken. The frequency of inspection can be increased at times of higher risk under the direction of the site manager.

6.2 Surface Water Monitoring Locations

- 6.2.3 The site has two surface water monitoring locations, identifies in Table 2, and summarised as:
- The eastern monitoring point at the site boundary near Lagoon 1 – Point P1;
 - The western monitoring point at a buried access chamber alongside the vehicular entry gate to the site from the Highway – Point P2.

6.3 Maintain, Monitor and Review

- 6.3.1 It is essential to maintain all components in a treatment chain so that optimum performance can be achieved. Regular site walkovers are made to record all areas of site, with particular emphasis on areas of marginal hydraulic capacity, exposed bedrock, ponding waters, and similar.
- 6.3.2 Runoff volumes and qualities are likely to vary over the seasons, and the means of retaining solids and treating flows will change accordingly. Historic data is used to seasonally adjust water treatment parameters. Correlations are made between rainfall events, operational activities, ditch excavation works, and similar. The impact of events on

suspended solids is predictable and appropriate measures can be put in place to mitigate suspended solids release in excess of that permitted.

Eastern Catchment

- 6.3.3 It is necessary to closely monitor the build-up of sediments within the dosing ponds and the three settlement lagoons. The rates of accumulation of sediment will depend on site activity, rainfall, and season. Sampling of flow at the inlet and the outlet of the dosing structure is made regularly to monitor the effectiveness of solids removal against inflow rate in order to optimise dosing levels.
- 6.3.4 Sampling of flow at the outlet from the operating lagoon is made weekly, weather permitting. Samples are made across the duration of the siphon (or pump) operation to inform effective operation.
- 6.3.5 The dosing structure should be cleaned out after a significant rainfall event, or at least every 6 months. The settlement lagoons should be cleaned out at least annually.

Western Catchment

- 6.3.6 The Siltbuster-type treatment facilities will be maintained and operated in accordance with the supplier's instructions. Generally, weekly inspections are made to ensure satisfactory flow connections are being maintained, and that the units are operationally available. Inspections are also made following significant rainfall events.
- 6.3.7 Solids capture from within the units should be removed at regular intervals. A manual or automated de-sludge facility is operated so that spillage to the watercourse is not possible.

7 SURFACE WATER CONTINGENCY PLAN

7.1 Purpose of the Scheme

- 7.1.1 This plan has been prepared in order to control and prevent pollution of any surface water from operations at Bryn Posteg. This will be achieved through:
- Identification of potential risk areas;
 - Mitigation through site design;
 - Regular monitoring, sampling and measurement of surface water;
 - Establishment of a protective site management regime.

7.2 Identification of Potential Failure Mechanisms

- 7.2.1 The primary failure for release of colloidal substances would be during the final tipping of a phase once ground level prior to capping, or during infilling, could lead to accumulated rainfall over-topping. A further source of contamination would be windblown litter entering the surface water courses and degrading.

- 7.2.2 It is considered that the risk of overtopping is extremely remote. However, some potential for surface water runoff could occur during works for Phase 9, and the following procedure shall be followed.

7.3 Mitigation

- 7.3.1 The site-wide surface water design incorporates several features that provide mitigation against potential surface water pollution by way of detailed design, construction, and regular inspection:

- Construction Phase – During the excavation of the Phase 9 cell, surface water will be directed to a temporary holding pond used for settlement and collection prior to pumping to an eastern catchment drainage feature/treatment facility;
- Operational – The site has been designed so that rainfall falling outside the engineered footprint will runoff towards the surface water channels.
- Routine surface water monitoring is undertaken at locations to visually identify contamination on a daily basis. Any accumulations of litter within the surface water system will be removed forthwith.

7.4 Emergency Plan

- 7.4.1 In the event of a surface water emergency a pre-determined series of events should be followed. The events include but are not limited to:

- Prevention of surface water from discharging to the natural catchments;
- Containment of potentially contaminated surface water;
- Treatment and removal of potentially contaminated surface water;
- Cleaning of surface water channels and bodies of water within the site;
- Bringing back into use;
- Emergency Plan systems review.

- 7.4.2 Notification of the NRW is made if a release of potentially contaminated surface water is suspected. The potentially contaminated surface water should be isolated as soon as possible:-

- In the event of pollution occurring to the Afon Dulas, its discharge point will be sealed up with either a bung in its discharge pipework or by blocking the channel with soils;
- Discharge to the Nant y Bradnant would be isolated at the settlement lagoons. Non-contaminated water may continue to flow to outfall through a hydraulically-independent lagoon whilst contaminated water is pumped to the site's leachate treatment facility.

- 7.4.3 All earthworks are to be carried out at a level that is beneath the bunds or perimeter seal until such time as capping is carried out. At this stage a small berm will be constructed on

the perimeter edge to prevent egress of surface water from temporary and permanent capped areas until vegetation is well established.

8 REFERENCES

- 1 Natural Resources Wales – Flood Risk Maps (online)
- 2 Ordnance Survey Maps (Various - online)
- 3 British Geological Survey – Online Viewer
- 4 Surface Water Management Eastern Outfall, Egniol Ltd for Evans Logistics (2004)
- 5 Construction Quality Assurance Surface Water Management and Monitoring SWMP2005v1
- 6 Surface Water Management Review, Caulmert Ltd. (2018)
- 7 CIRIA C753 The SuDS Manual

APPENDIX 1

Site Layout



WESTERN CATCHMENT

EASTERN CATCHMENT

LEACHATE
TREATMENT
PLANT /
LAGOONS

GATED ACCESS
FROM FIELD
PARCEL

A

B

WEIGHBRIDGE

SAMPLING
POINT P2
OUTFALL
TO AFON
DULAS

MATERIALS
RECYCLING
FACILITY
(MRF)

SURFACE
WATER
TREATMENT
LAGOONS

SAMPLING
POINT P1

OUTFALL
TO NANT Y
BRADNANT

①

②

③

B45118 PUBLIC HIGHWAY

LEGEND

SITE ACCESS

HAUL TRACK

PERIMETER TRACK

SITE BOUNDARY

NOTIONAL SPLIT BETWEEN EASTERN
AND WESTERN SURFACE WATER
CATCHMENTS

COMPOSTING SLAB

P1	ISSUED FOR INFORMATION	RWG	SBB	SBB	28.02.18
REV	MODIFICATIONS	BY	CH	AP	DATE

CLIENT:

POTTERS WASTE MANAGEMENT

PROJECT:

BRYN POSTEG LANDFILL SITE

TITLE:

SURFACE WATER MANAGEMENT
PLAN SITE LAYOUT

DRAWN BY	RWG	DATE	28.02.2018
REVIEWED BY	SBB	SCALE @ A3	JOB REF:
		NTS	3221
AUTHORISED BY	SBB	ISSUE	REVISION
		AO	C1

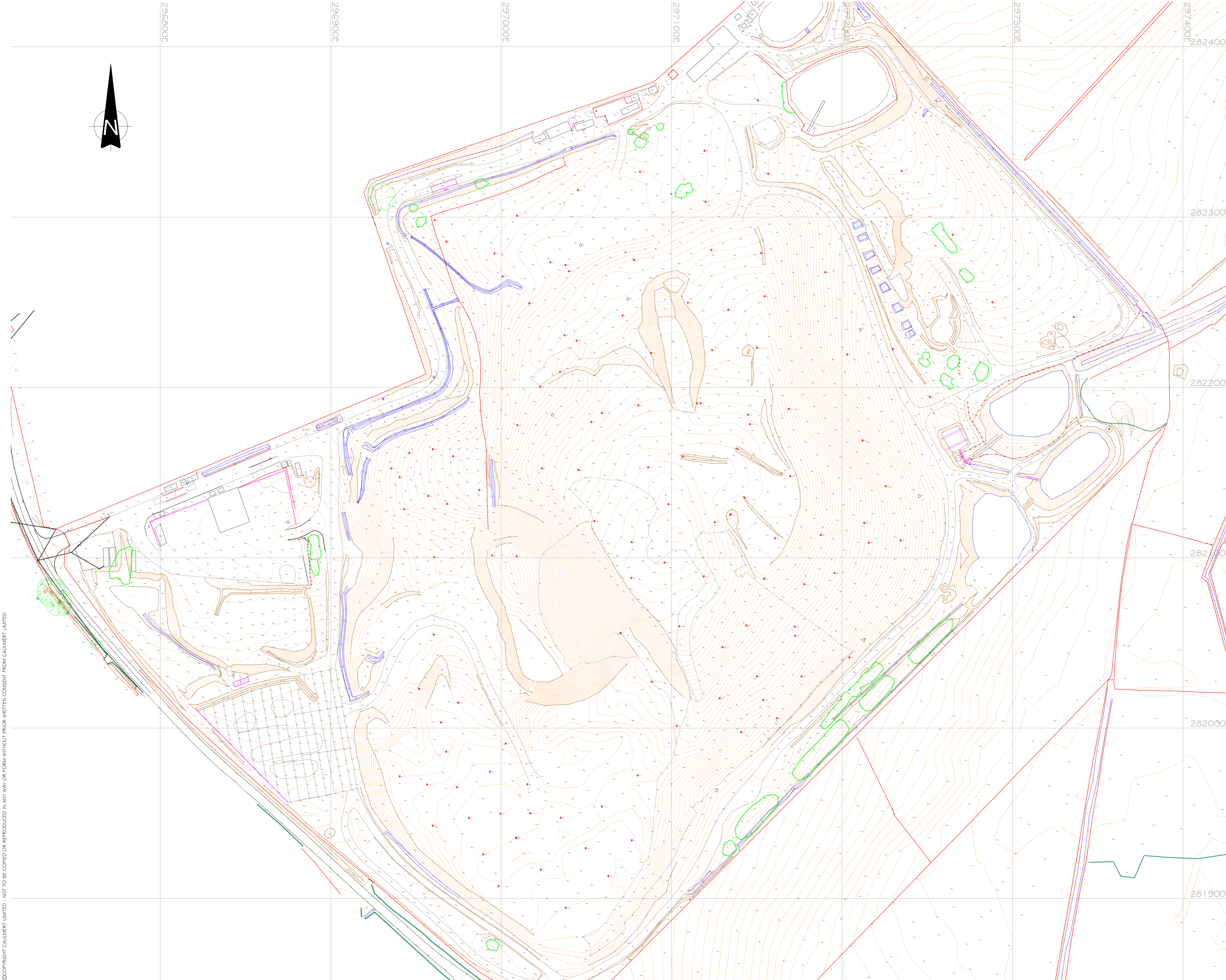
DRAWING NUMBER

3428-CAU-XX-XX-RP-V-0300




APPENDIX 2

Site Survey of 24/01/2018



NOTE

1. DO NOT SCALE FROM THIS DRAWING, WORK FROM FIGURED DIMENSIONS ONLY. ALL DIMENSIONS ARE IN METRES AND ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM U.N.O.
2. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING WILL BE ALLOWED WITHOUT THE PRIOR PERMISSION IN WRITING.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALIST DRAWINGS AND SPECIFICATIONS.

P2	JAN 2018 SURVEY ADDED	EJD	JC	JC	31.01.18
P1	ISSUED FOR COMMENT	EJD	JC	JC	19.01.18
REV	MODIFICATIONS	BY	RE	AP	DATE
POTTERS WASTE MANAGEMENT					
PROJECT: BRYN POSTEG LANDFILL SITE					
TITLE: SITE SURVEY OF 24/01/2018					
DRAWN BY EJD		DATE 19.01.2018			
REVIEWED BY JC		SCALE @ A1 1:1000		JOB REF: 3428	
AUTHORISED BY JC		ISSUE S1		REVISION P2	
DRAWING NUMBER 3428-CAU-XX-XX-DR-S-1801					
 engineering environmental planning					



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