

Coed Darcy Crymlyn Tip Closure and Aftercare Management Plan

St. Modwen Developments Ltd

ATKINS

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1. Introduction

1.1. Background

An environmental permit (EPR/AP3990LR/V002) is held by St. Modwen Developments Ltd (SMD) for the Crymlyn Tip in Coed Darcy, Llandarcy, Neath. The permit boundary and the approximate area of historical landfill are shown on Drawing 5041216-RAP-DWG-1906 and 1907. It is understood that waste was deposited before 1974 although details are unknown, but the landfill was licenced to accept refinery wastes including demolition materials, asbestos, boiler cleanings, oily sludge, bitumen, waxes and pyrophoric materials between 1974 and 1999. The approximate distribution of waste types within the landfilled area are shown on Drawing 5041216-RAP-DWG-1907. The landfill ceased accepting landfill materials in 1999 and was the former Environment Agency Wales recorded the site as closed in July 2001.

The following documents were submitted to (the Environment Agency Wales (EAW (now Cyfoeth Naturiol Cynru – Natural Resources Wales (CNC-NRW)) in June 2013 as part of the improvement plan set out in the permit:

- Environmental Setting & Installation Design (ESID) Report¹;
- Landfill Gas Risk Assessment & Gas Management Plan (LfGRA)²;
- Hydrogeological Risk Assessment (HRA)³;
- Capping of Crymlyn Tip - Construction Quality Assurance Plan⁴; and
- Topographical Surveys for Settlement of Crymlyn Tip⁵.

These documents provided a conceptual site model and reviewed the monitoring data of ground gases (undertaken between October 2010 and May 2013), leachate/groundwater (undertaken between May 2008 and November 2010).

CNC-NRW provided some interim comments on the above documents in September and October 2013, and a meeting was held between CNC-NRW and Atkins on 30 January 2014 to discuss the Crymlyn Tip including the issues related to future monitoring. (The CNC-NRW/Atkins correspondence and meeting minutes are included in Appendix A)

1.2. Site setting and the Coed Darcy Urban Village

The Crymlyn Tip, i.e. the permit area, is located within the wider site of the Coed Darcy Urban Village development. Drawing 5041216-RAP-DWG-1529 shows the site location.

The Coed Darcy Urban Village is to be developed on the site formerly occupied by the BP Llandarcy Oil Refinery. The development covers an area of 250 hectares and is located immediately west of junction 43 of the M4, with Neath to the east and Swansea to the west. The Coed Darcy Urban Village site is bordered to the north and west by the Crymlyn Bog, a Site of Special Scientific Interest (SSSI) of international and ecological importance.

In 2008, SMD acquired the Coed Darcy Urban Village site, including the permit area of the Crymlyn Tip, and is responsible for the ongoing management and reclamation of it. A management company has been established, Coed Darcy Ltd, (formed by SMD, Neath Port Talbot County Borough Council and the Prince's Foundation for the Built Environment) who are responsible for the management of the Coed Darcy Urban Village site. Outline planning permission has been granted for the Urban Village, comprising a mix of: residential, business and commercial uses; education and other community facilities; and associated transport and services infrastructure.

¹ Atkins, Jun 2013, Coed Darcy, Environmental Setting & Installation Design (ESID) Report. St Modwen Developments Ltd.

² Atkins, Jun 2013, Crymlyn Tip, Coed Darcy, Llandarcy, Landfill Gas Risk Assessment & Gas Management Plan. St Modwen Developments Ltd.

³ Atkins, Jun 2013, Coed Darcy, Hydrogeological Risk Assessment, Crymlyn Tip. St Modwen Developments Ltd.

⁴ Atkins, Jul 2013, Coed Darcy, Capping of Crymlyn Tip - Construction Quality Assurance Plan. St Modwen Developments Ltd.

⁵ Atkins, Jul 2013, Topographical Surveys for Settlement of Crymlyn Tip, Ref. 5041216-RAP-OUT-000430.

1.3. Objectives

The Closure and Aftercare Management Plan has been prepared to fulfil the requirements of the permit (Improvement Condition IP2 and Table S1.2). This Plan has been prepared in line with the Environment Agency's *Environmental Permitting Guidance, The Landfill Directive (version 3.1)*⁶ and the interim guidance for *Landfill (EPR 5.02), How to comply with your environmental permit, Closing your Landfill*⁷, to detail the procedures for looking after the Site, i.e. area within the permit boundary, from present through the closure process to definite closure and into the aftercare phase.

This Plan should be read in conjunction with the Coed Darcy Crymlyn Tip Gas Monitoring Audit (Ref. 5041216-RAP-MEMO-0001399).

⁶ Environment Agency, Mar 2010, Environmental Permitting Guidance. The Landfill Directive. V3.1.

⁷ Environment Agency, Aug 2013, Interim guidance for Landfill, How to comply with your environmental permit, Closing your Landfill, Ref. EPR 5.02.

2. Closure Plan

2.1. The closure process

When waste acceptance at a landfill site ceases under current legislation it is necessary to apply for a Closure Notice. A Closure Notice allows for the managed closure of the site while retaining the necessary pollution prevention controls through the permit.

Commonly the permit will be varied during this process to reflect the site's new status. For example the list of wastes accepted at the site may be varied such that only restoration materials may be imported.

The operator will need to provide a Closure and Aftercare Management Plan and seek CNC-NRW's agreement as the first step of the closure process.

It is noted that Crymlyn Tip was closed in practical terms in 1999 and may be considered to be definitely closed as no application for a Pollution Prevention and control Permit was submitted as specified under the Landfill Directive. Therefore a Closure and Aftercare Management Plan was not prepared in advance of closure. When the permit was transferred to St Modwen the opportunity was taken to restrict the wastes that could be imported to restoration materials and require completion of a Closure and Aftercare Management Plan

Following the undertaking and completion of the works outlined in the approved Closure and Aftercare Management Plan, a Closure Report which containing the following information will need to be submitted to the CNC-NRW:

- The area of the site to which closure application relates;
- Confirmation that the waste mass is stable;
- Relating to the infrastructure and procedures that are in place for the management and monitoring during the aftercare phase (for example, landfill gas, leachate, groundwater and stability/settlement); and
- Confirming that procedures are in place for the reporting of any significant environmental effects during the aftercare phase.

Closure can apply to the whole landfill or to parts of it. In order to meet the requirements for closure and for the site to be regarded as definitely closed, the CNC-NRW require a final on-site inspection and an assessment of the Closure Report submitted by the operator before communicating their approval for definite closure, although in the Case of Crymlyn Tip the site is already definitely closed. The operator may still need to apply for a variation to the permit to include the Closure Report and to formally record the definite closure.

The definite closure of a landfill does not relieve the operator of liability under the conditions of the environmental permit.

This plan details the requirements for the closure report and sets out the monitoring and management at the site that will assist during the closure process. The content of the proposed CAMP has been summarised below.

2.2. Area of closure

The entire area with the permit boundary shown on Drawing 5041216-RAP-DWG-1907 is proposed for definite closure. This area encompasses the following:

- The formally landfilled area located in the east of the permit area;
- The non-landfill area which is an approximate area of mixed soils and materials called "Site 1";
- The remaining non-landfill area within the permit boundary which is outside Site 1 and outside the water bodies; and
- The three connected water bodies, Crymlyn Bog Lagoon, West bay, both located in the south-west of the permit area, and the South Bay located to south of the landfilled area which ultimately drain via a discharge consent into the Crymlyn Bog.

2.3. Proposed after use of site

The proposed after use of the land within the permit boundary is open space. The surface water bodies will remain on site and will form part of the drainage system for the wider Coed Darcy development. Note: the drainage system forming the ponds already provides a direct hydraulic linkage to the Crymlyn Bog via a license discharge.

The land immediately to the north and west of the site will remain as Crymlyn Bog Site of Special Scientific Interest (SSSI), Special Areas of Conservation (SAC), National Nature Reserves (NNR) and Ramsar Site. The land to the south and east of the permit boundary is proposed to be a mix of open spaces and residential areas.

2.4. Site stability and final landform

The final landform will be designed by considering surface water run-off, slope stability, final land use requirements and water storage capacity of the existing lagoons (former Closure and Completion Strategy prepared for BP by URS⁸).

2.5. Monitoring strategy

2.5.1. Water

Preliminary groundwater monitoring was undertaken by Atkins between May 2008 and November 2010 to determine both the quality of water and groundwater levels. This groundwater monitoring has been limited and focussed on the assessment of free oily product recovery with some monitoring of groundwater within the Crymlyn Bog periphery. Groundwater levels have been recorded during gas monitoring rounds.

The groundwater quality monitoring was undertaken nine years after the final deposition of landfill waste (in 1999) therefore results represent the quality of groundwater following infiltration of rainwater and potential migration of leachate to groundwater. As such, the quality of the groundwater is considered to provide an understanding of how groundwater is affected by the presence of the landfill. Details of the monitoring can be found in the previous ESID submitted in 2013.

According to the 2008 to 2010 monitoring data, exceedances in TPH, BTEX and MTBE were recorded outside of the permit boundary both up-gradient and down-gradient of the landfill. This suggests that the groundwater is not only being impacted by the landfill but also by other sources of contamination. This is consistent with the known history of the wider Coed Darcy site.

Further groundwater, leachate and surface water monitoring is proposed to create the data set to establish the effect of the on-going wider Coed Darcy remediation efforts and the residual concentrations attributable to the presence of the landfill.

2.5.2. Gas

Two periods of gas monitoring have been conducted within and in the vicinity of the permit boundary. A review of the gas monitoring data (undertaken in October 2010 to May 2013) was presented in the ESID and LfGRA submitted in 2013. A more recent set of data (collected between October 2013 and May 2014) has been reviewed in a Coed Darcy Crymlyn Tip Gas Monitoring Audit (Ref. 5041216-RAP-MEMO-0001399). Exceedances in methane and carbon dioxide concentrations were recorded both within the landfilled area and non-landfilled part of the site.

The findings of the monitoring identified that the landfilled area is still producing landfill gases, this is predominantly within the centre of the landfill as methane readings within this area were consistently and significantly above the 1% value that is conventionally used for screening. The boreholes within the landfill, yet located around the periphery seldom exceeded the methane threshold. The source of the landfill gas is plausibly to be from the degradation of placed hydrocarbon sludge waste (previous LfGRA submitted in 2013).

⁸ URS, 2006. BP Llandarcy Remedial Action Plan Tip Closure and Completion Strategy. Issue 1.

High gas readings were recorded in the non-landfilled area Site 1. Recent ground works discovered mixed soils and materials with oil within Site 1 which is likely to be the source of hydrocarbon-based vapours which would be misinterpreted as a high concentration of methane if the gas emission is measured with an infra-red meter, such as a GA-2000 gas analyser.

Further gas monitoring will need to be conducted to establish emissions from the landfill only. The gas monitoring strategy and the appropriate detection methods have been detailed in the Coed Darcy Crymlyn Tip Gas Monitoring Audit.

Note: the landfill is built over alluvium and peat deposits and high levels of methane is also plausibly derived from natural gas production from organic rich soils. Localised gas bubble are frequently observed within the lagoons on site, most notably West Bay and the Crymlyn Bog lagoon.

2.6. Existing Pollution control measures and management systems

2.6.1. Free product Migration Prevention

The presence of significant quantities of free phase oil has been demonstrated in many areas of the landfill. The oil is suspected to derive predominantly as a result of oil being deposited within the waste during the operation of the tip. Oil is frequently observed within the waste matrix when exposed and on the periphery of the licenced area, most notably the 'downflow', western margin on the periphery of the SSSI. Oil collection and mitigation commenced during BPs management of the tip and continues to this day.

Works to control free phase oil was required as part of the Section 106 Agreement for the Coed Darcy development. Specifically actions were required under the Remediation Action Plan (RAP) which forms Schedule 7 of the Section 106. Whilst the RAP sits outside of the formal Permit surrender process the items included are considered very much integral to the management and aftercare of the tip and are contributory to the eventual Permit surrender. Specific RAP items relating to the Tip include:

- Actively collection of oil from within the tip by a system which hydraulically effects the free product until asymptotic conditions are demonstrated.
- Installation of permanent measures to prevent free phase migration:
 - At the western margins of the tip adjacent the Crymlyn Bog – Peripheral Trench
 - Adjacent Crymlyn Bog lagoon – Central Trench
 - Up flow of the tip to prevent residual oil migration onto the licensed area

These elements of the RAP works are complete and have been submitted for to the CNC-NRW for agreement. The collection of residual oily free phase is on-going and is currently collected on a regular basis and removed from site to a licensed facility for disposal or recycling.

Of the RAP features which are to form part of the main management strategy for the site the most important are the Peripheral and Central Trenches. The 2015 completion reports covering these features are contained within Atkins documents 5041216-RAP-RPT-0001401⁹ (Peripheral Trench) and 5041216-RAP-RPT0006813v3 (Central Trench)¹⁰.

2.6.2. Nutrient Management Plan

Surface water discharges running through the licensed area is monitored at two locations, W2 and W3:

- Crymlyn Bog W2; located to the north of the site. The discharge consent was implemented to monitor diffuse water quality flowing beneath the plywood oil-water separators that run between the landfill site and Crymlyn Bog (the Peripheral Trench); and

⁹ Atkins, May 2015, St. Modwen Developments Ltd, Coed Darcy RAP Feature 7 Verification Report, Ref. 5041216-RAP-RPT-0001401.

¹⁰ Atkins, Oct 2014, St. Modwen Developments Ltd, Coed Darcy RAP Feature 8 – Central Trench Verification Report, Ref. 5041216-RAP-RPT-000681v3

- Crymlyn Bog W3; located to the west of the site at the outflow of Crymlyn Bog Lagoon to Crymlyn Bog. The discharge consent was implemented to monitor water quality from the point source.

As part of the recently updated permit to discharge the monitoring conducted at these locations are operated in line with the Nutrient Management Plan 2013¹¹ which sets thresholds above which further investigation and sampling will need to be carried out. Results from the monitoring are reported to CNC-NRW on an annual basis, which includes any changes to the monitoring regime, any exceedances that have occurred, details of mitigation and investigation of source(s). It should be noted that drainage inputs to W3 include waters discharging off a large area of the Southern Catchment of the Coed Darcy, including the former Southern Tank Farm.

2.6.3. Security

The wider Coed Darcy Urban Village site is monitored by full time security and access to the site is restricted. At present the Principal Contractor, Hydrock, has responsibility to appropriately secure the tip area under the Construction (Design and Management) Regulations 2015¹².

It is recognised that as the site develops the provision of site-wide security may not satisfy the requirements of the Landfill Directive and that more local access control may be required.

¹¹ Atkins, 2013. Coed Darcy Development Nutrient Management Plan, Ref. 5041216-RAP-RPT-000746.

¹² Construction (Design and Management) Regulations 2015.

3. Additional and Proposed Works

3.1. Site 1

In 2014 the Site 1 are underwent and intensive investigation for sources of residual free phase product. The intention of this works was to remove 'significant' areas of free phase with the Site 1 and reduce reliance on the sections of the Peripheral and Central trenches which lie adjacent to the Crymlyn Bog and the Crymlyn Bog Lagoon respectively. These sections of the interception trenches were historically the least impacted and it is anticipated that after a suitable period of monitoring and agreement sections of the trenches could be progressively abandoned allowing natural vegetation to re-establish itself.

The works involved excavation of horizons of soil to approximately 2 and 5 metres below existing ground level. These excavations intercepted notable waste horizons from which free phase was released and recovered for off-site disposal and recovery. Wastes from local oil refinery included demolitions type wastes, pipes and crushed barrels some of which contained product. Oversized wastes including barrels were segregated and removed from site for disposal all other materials were return to the excavations.

Works were completed in Spring 2015 and are intended to produce an overall betterment to this part of the licenced area which will be demonstrated by on-going monitoring.

3.2. Sludge Removal

South Bay, Crymlyn Bog Lagoon and West Bay form part of the drainage system for the southern catchment of the Coed Darcy site. During refinery operation the lagoons acted as informal oil interceptors which resulted, over time, in the accumulation of significant volumes of hydrocarbon impacted sludge at the base of the lagoons. Although specific releases from the Tip cannot be discounted, it is likely that the majority of the impact was caused by migration of contaminants from the wider operational areas of the refinery. As part of the RAP works, under the Section 106 Agreement, sludge from the base of the lagoons was removed between 2010 and 2013.

The reports for these works have previously been presented to the CNC-NRW and formal agreement of these works is expected at the time of writing.

3.3. Proposed capping on landfilled area

Capping of landfilled area as shown on Drawing 5041216-RAP-DWG-0001907 will be required.

The design of the cap and restoration will need to be Landfill Directive compliant and the construction works to be carried out under construction quality assurance (CQA) procedures. A CQA Plan¹³ detailing the design and construction proposal of the capping and restoration of the landfilled area has been previously submitted to CNC-NRW in 2013. Following the approval of this Closure and Aftercare Management Plan, the CQA Plan for capping will be updated to incorporate CNC-NRW's comments and the findings of further monitoring.

The tasks involved in capping of the landfill are:

- Selection and processing of materials;
- Site clearance including the removal of redundant boreholes prior to waste surface re-profiling;
- Re-profiling the surface of the waste;
- Installation of a cap on top of the waste;
- Installation of a restoration layer on top of the cap; and
- Surveys and laboratory analysis for conformity.

¹³ Atkins, 2013.Coed Darcy Capping of Crymlyn Tip – Construction Quality Assurance Plan. St. Modwen developments Ltd. 5041216-RAP-RPT-000718

At present the proposed materials for the works are existing stockpiles of suitable soil in the wider Coed Darcy site, however if this is found to be not suitable at time of construction; soils may be imported subject to selection criteria.

3.4. Proposal for water bodies

The water bodies, particularly the South Bay, will continue to capture the surface water run-off from part of the landfilled area (including after the landfilled area is capped in the future), as well as to accept water from the wider southern catchment of the Coed Darcy site.

Given the works described in Section 3.2 above and that these bodies are currently forming part of an external drainage catchment it is proposed to seek a partial permit surrender for the three water bodies, Crymlyn Bog Lagoon West Bay and South Bay within the next 6 months.

3.5. Proposal of monitoring

The following monitoring is proposed to be carried out from the approval of this Closure and Aftercare Management Plan, throughout the closure process and into the aftercare phase unless any details of the monitoring regime are amended in agreement with the CNC-NRW. Due to the nature of the waste deposited at the site, sampling and monitoring will include, leachate, groundwater, surface water and gas. The monitoring of these constituents will occur at locations within and surrounding the site as outlined below and in Drawing 5041216-RAP-DWG-0001909.

3.5.1. Water

Leachate monitoring

Proposed leachate monitoring locations are shown on Drawing 5041216-RAP-DWG-0001909 including a number of proposed new boreholes. Details of the proposed monitoring frequency and determinands can be found in Table 1. The new boreholes are proposed to be combined gas and leachate monitoring in Site 1. Measurements of leachate levels in the boreholes should be undertaken in all the monitoring occasions and locations

Table 1 Proposed Leachate Monitoring Programme

Sample Type	Borehole ID		Proposed Analysis	Frequency
	Current serviceable boreholes	Proposed new boreholes		
Within the landfilled area	CARW0023, MSMW034, MSMW228, MSMW231 MSMW233, MSMW235 and MSMW238	None	TPH Benzene Ethylbenzene Naphthalene Benzo(a)pyrene GRO (C4 – C12) m&p Xylene MTBE O-Xylene Toluene BTEX	Monthly for one year, then subject to review.
Within Site 1	None	BH501, BH502, BH503, BH504 and BH505		
Non-landfill area outside Site 1 within the permit boundary	CARW008 and CARW009,	None		
Note: Monitoring of free phase products will be undertaken using a dip meter with an interface probe which will provide indication of the presence and the depths of the free phase products.				

Groundwater monitoring

Several new boreholes are proposed to be installed as shown on Drawing 5041216-RAP-DWG-0001909. The details of frequency and determinands are stated in Table 2. These boreholes includes locations from

upstream and downstream. Measurements of groundwater levels in the boreholes should be undertaken in all the monitoring occasions and locations.

Table 2 Proposed Groundwater Monitoring programme

Sample Type	Borehole ID		Proposed Analysis	Frequency
	Current serviceable boreholes	Proposed new boreholes		
Upstream in non-landfill area outside Site 1 within the permit boundary	MSMW034d1 (in gravel) and MSMW034d2 (in mudstone)	None	TPH Benzene Ethylbenzene Naphthalene Benzo(a)pyrene GRO (C4 – C12) m&p Xylene MTBE O-Xylene Toluene BTEX	Monthly for one year then subject to review
Downstream in non-landfill area outside Site 1 within the permit boundary	MSMW155d and MSMW155s (missing borehole record for MSMW155) and outside but very close to permit boundary MSMW154d (in mudstone) and MSMW154s (in gravel)	BH507d (in gravel), BH507s (in peat) and BH508 (in peat)		
Between the Crymlyn Bog and South Bay in non-landfill area outside Site 1 within the permit boundary		BH506d (in gravel) and BH506s (in peat)		
Note: Monitoring of free phase products will be undertaken using a dip meter with an interface probe which will provide indication of the presence and the depths of the free phase products.				

Surface water monitoring

Surface water monitoring will continue to be undertaken at the two location points: water from the Crymlyn Bog Lagoon at W2 and W3. It is proposed that additional surface water monitoring is also conducted at the surface water bodies, West Bay and South Bay. The proposed locations can be found on Drawing 5041216-RAP-DWG-0001909. The details of frequency and determinands are stated in Table 3.

Table 3 Surface Water Monitoring programme

Sample Type	Locations		Proposed Analysis	Frequency
	Current	Proposed		
Surface water from Crymlyn Bog Lagoon	W2 and W3	None	In line with Nutrient Management Plan. Electrical conductivity (EC); Dissolved oxygen; pH; Suspended solids;	Monthly for one year then subject to review.

Sample Type	Locations		Proposed Analysis	Frequency
	Current	Proposed		
Surface water from West Bay	None	W6	Ammoniacal nitrogen; Ammonia non-ionised as N; Biochemical Oxygen Demand (BOD) TPH Benzene Ethylbenzene	
Surface water from South Bay	None	W7	Naphthalene Benzo(a)pyrene GRO (C4 – C12) m&p Xylene MTBE O-Xylene Toluene BTEX	
Note: Visual inspection and photographic records will be undertaken to provide indication of the presence of free phase products.				

3.5.2. Gas

Gas monitoring is proposed within the landfill, and within or close to the permit boundary. Due to several boreholes being lost/ destroyed during earthworks, a number of new boreholes have been proposed. These new boreholes are shown on Drawing 5041216-RAP-DWG-0001909 and in Table 4.

There are several potential sources of gases on site, the boreholes are to be monitored in line with the detection methods and parameters stated in the Coed Darcy Crymlyn Tip Gas Monitoring Audit (Ref. 5041216-RAP-MEMO-0001399). Measurements of groundwater or leachate levels in the boreholes should be undertaken in all the gas monitoring occasions and locations.

Table 4 Proposed Gas Monitoring Programme

Location	Boreholes		Monitoring frequency
	Current serviceable boreholes	Proposed new boreholes	
Within the landfilled area	CARW023, MSMW228, MSMW231, MSMW233, MSMW235 and MSMW238.	None.	Monthly.
Within Site 1		BH501, BH502, BH503, BH504 and BH505.	Monthly.
Non-landfill area outside Site 1 within the permit boundary	CARW008, CARW009, MSMW034, MSMW154d, MSMW154s, MSMW155d and MSMW155s. (MSMW154 is outside but close to at the boundary)	BH506s, and BH508.	Monthly.

3.6. Audit and Maintenance of monitoring boreholes

The available information regarding the serviceability of the existing boreholes and their locations are shown on Drawings 5041216-RAP-DWG-0001908 and 1909. It should be noted that a number of the boreholes with existing monitoring data (undertaken in 2010 to 2014) are no longer serviceable. Within Site 1, all the previous boreholes have been destroyed due to the movement of earth materials.

An audit of the integrity of all the boreholes for the proposed monitoring should be carried out for each round of monitoring to allow the accurate collection of data throughout the closure process and aftercare phase.

3.7. Monitoring of the Product Collection Trenches

Existing free phase capture trenches are to be monitored at a minimum frequency of twice a week, or as required to prevent the build-up of free phase. The volumes of oil recovered at each location will be recorded to provide evidence of reduction in free phase migration.

3.8. Reporting of monitoring results

The results of the proposed monitoring of leachate, groundwater, surface water, gas and free phase monitoring outlined in Tables 1 to 4 will be conducted on site and reported to CNC-NRW annually.

Any changes of the above proposal should be agreed with CNC-NRW prior to changes being taken place.

3.9. Updating risk assessments

The previous ESID, HRA and LfGRA reports submitted in 2013 will need to be updated to incorporate further monitoring data as the data set expands. The updated HRA, subject to CNC-NRW's approval, will need to provide evidence to support the chosen capping solution. The updated ESID and HRA will review and conclude on the chemical acceptability criteria of capping and restoration materials for the landfilled area.

3.10. Topographical surveys

A final level survey will be undertaken following the approval of this Closure and Aftercare Management Plan to provide the baseline topographical levels. Further surveys will be undertaken annually during the closure process aftercare phase to confirm settlement rates.

Appendices

Appendix A – CNC-NRW/Atkins Correspondences



Dr Richard Mitchener
Principal Hydrologist, Water and Environment
Atkins
The Axis
10 Holiday Street
Birmingham
B1 1TF

Ein cyf/Our ref: EPR/AP3990LR

Eich cyf/Your ref:

Dyddiad/Date: 2 October 2013

Dear Dr Mitchener

Interim Comments on Landfill Gas Risk Assessment and Gas Management Plan

Following receipt of the Crymlyn Tip, Coed Darcy, Llandarcy – Landfill Gas Risk Assessment and Gas Management Plan (LfGRA), in accordance with Improvement Programme 1 of Table S1.3 Improvement programme requirements, please find our comments below. These comments are based on the information that has been provided in the LfGRA and the Environmental Settings and Installation Design Report (ESID).

It is acknowledged that the operator (St Modwen Developments Limited) have been restricted due to poor historic background gas data. In recent years the operator has made efforts to improve the data by the installation and monitoring of new gas wells. We agree with the comments that further monitoring is required on site. Due to the complexity of the site the increased monitoring needs to be undertaken so that a more detailed risk assessment can be developed. This risk assessment should also include attempts to quantify the dispersion of landfill gas outside of the permitted area. The further monitoring and revised risk assessment will facilitate the preparation of a gas management plan.

We would welcome attempts to quantify the fugitive release of methane from the surface of the landfilled area. This should ideally be done prior to and post the capping works proposed as part of the Capping of Crymlyn Tip – Construction Quality Assurance Plan. It is also noted that the submission has largely concentrated on the traditional bulk gases and there is limited examination of the potential emissions from other trace gases. This is particularly relevant due to the waste types that were accepted historically. Subsequently, further work should be

Natural Resources Wales/Cyfoeth Naturiol Cymru
Maes Newydd, Llandarcy, Neath Port Talbot, SA10 6JQ.
Llinell gwasanaethau cwsmeriaid/Customer services line: 0300 065 3000
www.cyfoethnaturiolcymru.gov.uk / www.naturalresourceswales.gov.uk

Croesewir gohebiaeth yn y Gymraeg a'r Saesneg

Correspondence welcomed in Welsh and English

undertaken to identify whether there are other trace gases present in the landfill gas that require assessment e.g. VOC's.

As part of the qualitative risk assessment, certain scenarios have been scored incorrectly: for example the "likelihood" of "loss of containment" should be "probable" as there is currently no containment at the facility. The risk assessment should therefore be re-examined once the additional investigative works are completed.

Have attempts been made to identify whether there are landfill gas indicator compounds present in the landfill gas that are not present in other sources. It is accepted that this could be problematic due to off-site contamination, but we would welcome discussions on this, as this will be helpful when the operator eventually aims to apply for full surrender.

Please could you provide further information on the method used to collect the gas flow readings.

Taking the above points into consideration, at this point we cannot accept and provide written approval for the Landfill Gas Risk Assessment submission. Subsequently, we require further monitoring before the risk assessment is then re-examined. Once this work is undertaken the operator should be in the position to then develop the landfill gas management plan in line with Landfill Directive requirements.

Further to this, it is recommended that attempts are made to start formalising the monitoring schedule as part of a Closure and Aftercare Management Plan required under IP2 of Table S1.3 Improvement programme requirements. The landfill gas monitoring proposals in section 3.2 seem appropriate, but we would request that the additional monitoring outlined above is included.

Once a monitoring schedule has been agreed as part of the Closure and Aftercare Management Plan, it can be amended or reduced in due course as more information is gathered and a better understanding of the site is achieved. The monitoring review can be undertaken annually and recommendations made by the operator as part of submissions made under condition 4.2.3.

We also wish to highlight our concern that the eventual housing development could potentially be sited directly adjacent to the landfill and therefore an appropriate understanding of the risks will be critical before this happens.

Natural Resources Wales/Cyfoeth Naturiol Cymru
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Llinell gwasanaethau cwsmeriaid/Customer services line: 0300 065 3000
www.cyfoethnaturiolcymru.gov.uk / www.naturalresourceswales.gov.uk

Croesewir gohebiaeth yn y Gymraeg a'r Saesneg

Correspondence welcomed in Welsh and English

Whilst the above comments relate to the risks from the landfill, it should be noted that there are also other sources of gas as outlined in the report. The developer must consider these when the development progresses to this area.

If you have any questions or wish to discuss any of the points raised above, then please do not hesitate to contact me via the details below.

Yours sincerely



Gareth M Davies

Senior Environment Officer
Neath Port Talbot Bridgend Environment Management Team

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Correspondence welcomed in Welsh and English

	EPR Compliance Assessment Report	Report ID: 1131010/ EAWML34003
This form will report compliance with your permit as determined by an NRW officer		
Site	Crymlyn Tip, Former BP Llandarcy Site	Permit Ref EAWML 34001
Operator/ Permit holder	St Modwen Developments Limited	
Date	10 October 2013	Time in 10:00 Out 12:45
What parts of the permit were assessed	Compliance visit of landfill, random surface emission check, visual inspection of some gas monitoring points and general permit compliance	
Assessment	Site Inspection/ Check Monitoring	EPR Activity: Installation Waste Op x Water Discharge
Recipient's name/position	Neil Williams – Construction Manager, St Modwen Properties Limited	
Officer's name	Gareth Davies and Neil Herbert	Date issued 15 October 2013

Section 1 - Compliance Assessment Summary				
This is based on the requirements of the permit under the Environmental Permitting Regulations. A detailed explanation and any action you may need to take are given in the "Detailed Assessment of Compliance" (section 3). This summary details where we believe any non-compliance with the permit has occurred, the relevant condition and how the non-compliance has been categorised using our Compliance Classification Scheme (CCS). CCS scores can be consolidated or suspended, where appropriate, to reflect the impact of some non-compliances more accurately. For more details of our CCS scheme, contact your local office .				
Permit Conditions and Compliance Summary			Condition(s) breached	
a) Permitted activities	1. Specified by permit	N		
b) Infrastructure	1. Engineering for prevention & control of pollution	3	2.8.1	
	2. Closure & decommissioning	A		
	3. Site drainage engineering (clean & foul)	N		
	4. Containment of stored materials	N		
	5. Plant and equipment	N		
c) General management	1. Staff competency/ training	N		
	2. Management system & operating procedures	3	1.1.1 (a) & (b)	
	3. Materials acceptance	N		
	4. Storage handling, labelling, segregation	N		
d) Incident management	1. Site security	N		
	2. Accident, emergency & incident planning	N		
e) Emissions	1. Air	A		
	2. Land & Groundwater	N		
	3. Surface water	N		
	4. Sewer	N		
	5. Waste	N		
f) Amenity	1. Odour	N		
	2. Noise	N		
	3. Dust/fibres/particulates	N		
	4. Pests, birds & scavengers	N		
	5. Deposits on road	N		
g) Monitoring and records, maintenance and reporting	1. Monitoring of emissions & environment	N		
	2. Records of activity, site diary, journal & events	N		
	3. Maintenance records	N		
	4. Reporting & notification	N		
h) Resource efficiency	1. Efficient use of raw materials	N		
	2. Energy	N		
KEY: C1, C2, C3, C4 = CCS breach category (*suspended scores are marked with an asterisk), A = Assessed or assessed in part (no evidence of non-compliance), N = Not assessed, NA = Not Applicable				

Number of breaches recorded	2	Total compliance score (see section 5 for scoring scheme)	8
If the Total No Breaches is greater than zero, then please see Section 3 for details of our proposed enforcement response			

Section 2 – Compliance Assessment Report Detail

This section contains a report of our findings and will usually include information on:

- the part(s) of the permit that were assessed (e.g. maintenance, training, combustion plant, etc)
- where the type of assessment was 'Data Review' details of the report/results triggering the assessment
- any non-compliances identified
- any non-compliances with directly applicable legislation
- details of any multiple non-compliances
- information on the compliance score accrued inc. details of suspended or consolidated scores.
- details of advice given
- any other areas of concern
- all actions requested
- any examples of good practice.
- a reference to photos taken

The purpose of the onsite compliance visit was to gain an understanding of the current landfill gas management on site and the condition of the gas infrastructure. The opportunity has also been taken to assess compliance with all other aspects of the permit, including documents that require submission to Natural Resources Wales.

Gas Surface Survey

As part of the visit we undertook a limited survey of the landfill area, a copy of this report has been provided with this Compliance Assessment Report. We used a *Gazomat* methane analyser to undertake the work, however it transpired that it was not possible to undertake any meaningful survey due to: obstruction such as presence of various stockpiles; limited access was restricted due to vegetation; some areas had been heavily compacted by vehicular traffic, and other areas were waterlogged. The findings from the survey are therefore limited although they suggest that methane surface emissions (in most of the areas checked) is not an issue presently. Two areas had elevated levels, one on the flank and one in the area where gas levels is known to be elevated. In time as restoration works progress more detailed surveys of surface emissions will be required to fully assess methane surface emissions.

Gas Monitoring Infrastructure

A random inspection of some of the site's gas monitoring infrastructure was undertaken.

A table showing well specific actions are listed below; however we have also included general actions that need to be undertaken for all wells. The operator needs to undertake an infrastructure check for all the gas monitoring points at the facility to ensure that they provide an effective means of monitoring gas.

Monitoring Point	Action required
GW37	Plastic screw type end caps are not air tight and should be replaced. 
Unidentified well at SS 70515 95539	It is unclear whether this is a gas monitoring point but the slotted section of the casing extends beyond the ground surface. This is not suitable for gas monitoring.
General (all)	Gas taps should be checked to ensure that they remain gas tight when turned off.
General (all)	A number of wells which we believe could be gas monitoring points were damaged. e.g. some wells were snapped in half etc. If these are gas monitoring points they need to be repaired.
General (all)	All gas monitoring infrastructure should be clearly labelled.

General (all)	Need to consider installing protective, lockable headworks on designated landfill gas monitoring point. At some points (e.g. where vehicular traffic is likely) then additional protection should be considered to prevent the loss of infrastructure.
---------------	--

We also observed that the sampling tap had been left open at one well. At another well we found the gas tap/bung arrangement had been left on the floor. This is indicative of poor sampling practice. Monitoring boreholes must remain sealed at all times to avoid the dilution of landfill gas with air.

The importance of collecting a good quality data set is paramount to the management of this closed landfill and will underpin the operator's risk assessments and eventual surrender application. NRW must have confidence in the quality of the data collected at the facility and in that regard we suggest a review of staff competence is now undertaken to ensure sampling staff are familiar and suitably trained in the site's sampling procedures. Whilst the deficiencies we noted in this report relate to gas we would suggest that this would be a good time to review the sampling procedures and training for all media monitored at the site.

Photograph showing monitoring point 41, with gas tap left open.



The failure we have noted in this report is considered a breach of condition 1.1.1 a) and b) and 2.8.1 of your permit. We have attributed a Compliance Classification Score of 3 for this breach against the b1 and c2 compliance headings. You have been given advice and guidance against this breach. CCS Reference 203720.

Leachate/ contamination remediation

The remediation works to mitigate the hydrocarbon contamination is ongoing and we observed several locations where this work was underway. We also observed that the interception trench has recently been subject to some maintenance with the improvement of the ply-board trench boundary.

General Permit Compliance

A review of the permit was undertaken in order to assess compliance with all conditions within the permit. The following table highlights those areas of the permit that require action or submissions to be made to Natural Resources Wales.

As per condition 4.2.1, please send correspondence to Natural Resources Wales, Maes Newydd, Britannic Way West, Llandarcy, SA10 6JQ and include permit number EPR/AP3990LR and EAWML 34003 as the reference.

Permit Condition Number	Permit Condition	Action Required
1.1.1 (a) and (b)	The operator shall manage and operate the activities in accordance with a written management system that identifies and minimises risks of pollution, including those arising from operations, maintenance, accidents, incidents, non-conformances, closure and those drawn to the operators as a result of complaints.	A written management system shall be submitted to Natural Resources Wales. Please provide a timescale for submission of a written management system by 6 November 2013
1.1.4	The operator shall comply with the requirements of an approved competence scheme.	Please provide details of the competent person on site, this should include their name and the qualification that they have obtained. Please provide these details by 6 November 2013.
1.2.1 (a)	The operator shall maintain an accident management plan.	An accident management plan shall be submitted to Natural Resources Wales. Please provide a timescale for submission of an accident management plan by 6 November 2013.
2.3.1 – linked to Schedule 1 – Operations, Table S1.2 Operating techniques and Table S1.3 Improvement programme requirements – IP2.	The operator shall, subject to the conditions of the permit, be operated using the techniques and in the manner described in the documentation specified in schedule 1, table S1.2, unless otherwise agreed in writing by the Environment Agency (now Natural Resources Wales)	A Closure and aftercare management plan shall be submitted to Natural Resources Wales for written approval. Please provide a timescale for submission of a Closure and Aftercare Management Plan by 6 November 2013.
2.4.1	The operator shall complete the improvements specified in schedule 1 table S1.3 by the date specified in that table unless otherwise agreed in writing by the Environment Agency (Natural Resources Wales).	It is noted that the Hydrogeological Risk Assessment, Stability Risk Assessment and Gas Risk Assessment have been submitted to Natural Resources Wales for review and comments have been provided to Atkins, consultants acting on behalf of St Modwen Developments Limited.
2.7.1	The operator shall maintain a closure and aftercare management plan.	As per condition 2.3.1 a Closure and Aftercare Management Plan shall be submitted to Natural Resources Wales for written approval.
2.8.1	The operator shall take appropriate measures, including, but not limited to, those specified in any approved closure and aftercare management plan, to control the migration of landfill gas.	The findings and recommendations from the gas survey shall be implemented alongside the comments made in response to the Gas Risk Assessment.
3.1	Emissions to water, air or land	The emissions to water, air or land shall be review as part of the Closure and Aftercare Management Plan. The Closure and Aftercare Management Plan shall have consideration of conditions of 3.1.1, 3.1.2, 3.1.3, 3.1.5 and 3.1.6.
3.5.1	The operator shall, unless otherwise agreed in writing by the Environment Agency (Natural Resources Wales), undertake the monitoring and any other actions specified in the agreed closure and aftercare management plan including (a) leachate; (b) point source emissions; (c) Groundwater; (d) Landfill gas; and (e) Surface water.	As per condition 2.3.1 and 2.7.1 a Closure and Aftercare Management Plan shall be submitted to Natural Resources Wales. The Closure and Aftercare Management Plan shall have consideration for the monitoring required under condition 3.5.1 and conditions 3.5.2, 3.5.3, 3.5.4 and 3.5.5.

Site	Crymlyn Tip, Former BP Llandarcy Site	Permit	EAWML 34003
Operator/ Permit	St. Modwen Developments Limited	Date	10 October 2013

You must take immediate action to rectify any non-compliance and prevent repetition. Non-compliance with your permit conditions constitutes an offence and can result in criminal prosecutions and/or suspension or revocation of a permit. Please read the detailed assessment in Section 2 and the steps you need to take in Section 4 below.	
Other than the provision of advice and guidance, at present we do not intend to take further enforcement action in respect of the non-compliance identified above. This does not preclude us from taking enforcement action if further relevant information comes to light or advice isn't followed.	X
In respect of the above non-compliance you have been issued with a warning. At present we do not intend to take further enforcement action. This does not preclude us from taking additional enforcement action if further relevant information comes to light or offences continue.	
We will now consider what enforcement action is appropriate and notify you, referencing this form.	

Criteria Ref.	CCS Category	Action Required/Advised	Due Date
See Section 1 above			
B1 and C2	3	Review sampling staff competence and ensure that they are familiar with the sampling procedures for the facility.	Prior to the next sampling round.
N/A	N/A	To ensure future compliance please also undertake the following actions: - Operator to undertake a gas monitoring infrastructure audit to ensure that all gas monitoring points remain fit for purpose. Please complete actions listed in this report and the operator may also find the following guidance of use https://brand.environment-agency.gov.uk/mb/BOIMbl. Any defects identified by the audit shall be rectified and a summary report detailing the findings and actions taken shall be submitted to NRW. - Operator to submit a landfill gas monitoring plan for assessment by NRW – see recent comments on LFGRA for further information.	6 weeks from the issue of this report 3 weeks from the issue of this report

Section 5 - Compliance notes for the Operator

To ensure you correct actual or potential non-compliance we may

- advise on corrective actions verbally or in writing
- require you to take specific actions in writing
- issue a notice
- require you to review your procedures or management system
- change some of the conditions of your permit
- decide to undertake a full review of your permit

Any breach of a permit condition is an offence and we may take legal action against you.

● We will normally provide advice and guidance to assist you to come back into compliance either after an offence is committed or where we consider that an offence is likely to be committed. This is without prejudice to any other enforcement response that we consider may be required.

● Enforcement action can include the issue of a formal caution, prosecution, the service of a notice and or suspension or revocation of the permit.

See our Enforcement and Civil Sanctions guidance for further information

This report does not relieve the site operator of the responsibility to

- ensure you comply with the conditions of the permit at all times and prevent pollution of the environment
- ensure you comply with other legislative provisions which may apply.

Non-compliance scores and categories

CCS category	Description	Score
C1	A non-compliance which could have a major environmental effect	60
C2	A non-compliance which could have a significant environmental effect	31
C3	A non-compliance which could have a minor environmental effect	4
C4	A non-compliance which has no potential environmental effect	0.1

Operational Risk Appraisal (Opra) - Compliance assessment findings may affect your Opra score and/or your charges. This score influences the resource we use to assess permit compliance.

Section 6 – General Information

Data protection notice

The information on this form will be processed by Natural Resources Wales (NRW) to fulfill its regulatory and monitoring functions and to maintain the relevant public register(s). NRW may also use and/or disclose it in connection with:

- offering/providing you with its literature/services relating to environmental matters
- consulting with the public, public bodies and other organisations (e.g. Health and Safety Executive, local authorities) on environmental issues
- carrying out statistical analysis, research and development on environmental issues
- providing public register information to enquirers
- investigating possible breaches of environmental law and taking any resulting action
- preventing breaches of environmental law
- assessing customer service satisfaction and improving its service
- Freedom of Information Act/Environmental Information Regulations request.

NRW may pass it on to its agents/representatives to do these things on its behalf. You should ensure that any persons named on this form are informed of the contents of this data protection notice.

Disclosure of information

NRW will provide a copy of this report to the public register(s). However, if you consider that any information contained in this report should not be released to the public register(s) on the grounds of commercial confidentiality, you must write to your local area office within twenty working days of receipt of this form indicating which information it concerns and why it should not be released, giving your reasons in full.

Customer charter

What can I do if I disagree with this compliance assessment report?

If you are unable to resolve the issue with your site officer, you should firstly discuss the matter with the officer's line managers. If you wish to raise your dispute further through our official **Complaints** and Commendations procedure, phone our general enquiry number **0300 065 3000** (Mon to Fri **08.00–18.00**) and ask for the **Customer Contact team** or send an email to enquiries@naturalresourceswales.gov.uk If you are still dissatisfied you can make a complaint to the Public Services Ombudsman for Wales. For advice on how to complain to the Ombudsman phone their helpline on **(0845) 601 0987**.



Cyfoeth Naturiol Cymru Natural Resources Wales

Dr Richard Mitchener
Principal Hydrologist, Water and Environment
Atkins
The Axis
10 Holiday Street
Birmingham
B1 1TF

Ein cyf/Our ref: EPR/AP3990LR

Eich cyf/Your ref:

Dyddiad/Date: 25 September 2013

Dear Dr Mitchener

Interim Comments on Hydrogeological Risk Assessment

Following receipt of the Hydrogeological Risk Assessment (HRA) in accordance with Improvement Programme 1 of Table S1.3 Improvement programme requirements, please find our comments below. These comments are based on the information that has been provided in the HRA and Environmental Settings and Installation Design Report (ESID).

1. It would be beneficial that the naming of the boreholes across the site was standardised with one map with all the locations referenced within the report produced. Currently there is reference to boreholes that are not marked on any maps provided, e.g. MSMW157. Please could all of the borehole logs be provided.
2. From our understanding of the wider Coed Darcy site we note that groundwater flow is towards the Crymlyn Bog (SAC) and generally following topography. However, in drawing ESID 13 it is drawn as being west to south west, perpendicular to the wider site groundwater flow direction. Further to this in ESID section 3.5.2 it is stated that the dominant groundwater flow is to the east, towards Crymlyn Bog. Please could clarification be provided on whether this is a typographical error and should read groundwater flow is to the west, towards Crymlyn Bog.
3. In 3.5.2 of the ESID and Drawing 11, reference is made to radial flow. Is this due to the pumping within the landfill or are the boreholes monitoring a different horizon? Further to this, what time of year do the groundwater contour lines represent in ESID Drawing 11? The contour plots should consider the whole year and any variation e.g. due to the seasons.

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Correspondence welcomed in Welsh and English

4. Groundwater quality data is not included within the two reports for all of the sampled locations (ESID section 3.5.3 mentions 8 locations, but only gives three borehole names).
5. The sampling suite should be suitable for the contamination of concern present in the waste mass, but should also include general landfill determinants, e.g. ammoniacal nitrogen and chloride. Vanadium was deposited in areas of the landfill and subsequently should be sampled and analysed. A suite of metals, total and dissolved, should also be included in the sampling suite.
6. The HRA submission has based on sampling from 2008 to 2010. Has any recent sampling been completed? We agree that further water quality and water level monitoring should be completed to help derive the control levels and compliance limits. We would recommend at least 12 months of monthly monitoring data to help support this assessment.
7. Please could the area of the containment ash bund and the extent of the marine ply board that runs adjacent to the northern boundary of the site be marked on a relevant plan.
8. What remediation activities have and are being carried out with the containment area and previously landfilled area? Are these activities having an effect on the waste mass and groundwater beneath the containment and previously landfilled area?
9. We understand that this site will form a wildlife area as part of the wider site Master Plan with the intention to return to nature. We note therefore that a simple cap design might be the way forward. However, the cap design mentioned under ESID section 2.3.1 may not be sufficient to help reduce the generation of leachate and subsequent leachate plume from the landfilled area.

Please also find below some further general comments in relation to the content of the HRA and ESID.

- There are two ESID 9 Drawings for different plans and the plans do not appear in order.
- Update reference to guidance and regulations to latest versions. Groundwater Regulation 1998 and Landfill Regulation 2002 are now part of Environmental Permitting Regulation 2010. Guidance H1 Annex I and J3 should be used for landfills, not the 2003 documents reference in ESID section 4.2.
- Threshold values (under WFD Direction 2010) should only be used for river basin

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planning. EQS and DWS should be used for setting of Environmental Assessment Levels.

- Compliance limit has replace trigger level terminology and should not be used – control level remains the same.

In light of the above comments written approval cannot be granted for the Hydrogeological Risk Assessment in accordance with IP1 of Table S1.3 Improvement programme requirements.

If you have any questions or wish to discuss any of the points raised above, then please do not hesitate to contact me via the details below.

Yours sincerely



Gareth M Davies

Senior Environment Officer
Neath Port Talbot Bridgend Environment Management Team

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Correspondence welcomed in Welsh and English



May Chan
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The Axis
10 Holiday Street
Birmingham
B1 1TF

Ein cyf/Our ref: EPR/AP3990LR

Eich cyf/Your ref:

Dyddiad/Date: 25 September 2013

Dear Ms Chan

Interim Comments on Capping of Crymlyn Tip – Construction Quality Assurance Plan

Following receipt of the Capping of Crymlyn Tip - Construction Quality Assurance Plan in accordance with condition 2.5.1, please find our comments below. These comments are based on the information that has been provided in the Capping of Crymlyn Tip – Construction Quality Assurance Plan and Environmental Settings and Installation Design (ESID) Report.

Stability Calculations

Please could clarification be provided on the following:

The shear box testing has been derived from samples under different normal stress loads 50, 100 and 200 kPa. Why were these normal stress loads chosen as the material will only endure the self weight of the soils and plant/machinery. A more applicable range of 30, 50 and 70 kPa may have derived slightly different values for effective shearing strength parameters (ϕ') and cohesion (c'). Only peak shear strengths have been used.

The report states that the residual shear strengths are not applicable and that the stability analysis identifies slopes of 1v:3h ($\sim 18^\circ$) having adequate factors of safety. It is note that materials analysed from Batches 01 and 02 are identified by the lab as non plastic with very low dry densities. However, the sampling methodology at the Batches is not explained. This is important to discuss in order to appreciate whether the samples are representative and accommodate the inherent variability of waste.

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Correspondence welcomed in Welsh and English

The report refers to peat being present under the existing waste and being compressed with the potential to form a natural geological barrier beneath the site. The ESID document identifies till (sands, clays and gravels). The values used are a bulk density of 2.2Mg/m^3 , peak effective shear strength parameters of ϕ' of 31° and c' of 12kPa . Please provide further clarification as to why these are considered conservative if peat is prevalent.

It was noted that based on the hydraulic conductivity results Atkins consider, with the PSD tests on Batches 01 and 02, the fine fractions are probably under represented in the soil sample selected. In Appendix D2 there is also a requirement that slopes greater than 1v:6h or $\sim 9^\circ$ must not be trafficked.

There are potential concerns over the material properties, its quality when laid and compacted or another factor that there is some inherent instability. We would like to seek an assessment of slope stability using residual shear strength parameters, particularly for access haul routes onto the tip where deformation in wet weather is feasible. Please ensure calculations accommodate the loading of plant and machinery. Veneer assessments should also be considered.

Import Volumes & Material Characterisation

In Appendix E, reference is made to requiring $45,000 - 50,000\text{m}^3$ of restoration materials. Material at Area 1 was being treated and was expected to yield approximately $10,000\text{m}^3$ of granular material (a power station ash containing up to 200ppm asbestos or ACM), $25,000\text{m}^3$ silty soils and $10,000\text{m}^3$ of weathered rock. Please could you provide clarification on whether Batch 1 relates to Area 1 or if the treatment of Area 1, ongoing in 2007, yielded the three products that are stored at Batches 01 and 02. Please could you clarify if the silty soils or weathered rock contain contaminants such as asbestos.

Appendix D identifies that Batch 01 and 02 will be used within the capping project, however, there is no description of what these contain other than the geotechnical parameters obtained in Appendix B.

Within Section 1.2.6 reference is made to waste and post restoration profiles, which indicate the following:

Base Surface	Comparison Surface	Cut m^3	Fill m^3	Net m^3
Topo Survey	Top of Waste	3,725	36,736	33,010
Top of waste	Top of cap	0	18,581	18,581
Top of cap	Top of Restoration	0	19,319	19,319
			Σ	70,910

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In the absence of other figures being provided, it is assumed that circa 21,000 - 26,000m³ of materials will be brought onto site. Please include a reasoned generic background to the origin, volume and quality of materials being used.

Within Section 4.2 of the CQA Reporting it would be beneficial to include isopachyte drawings. The drawings will include the upper and lower topographical surveys for each of the three layers, waste profiling, cap and restoration soils to indicate thickness of materials added. These will be particularly helpful in demonstrating thickness of added layers. This should also be supported by traditional methods in case of query due to waste mass settlement/movement.

Reference is made to Drawing 5041216 – RAP DRWG – 0001081 in Section D1.3.3, however this drawing has not been provided.

Validation / Verification

With regard to chemical conformance of materials, Section 3.1.5 refers to Appendix D, which itself refers to Appendix D, Table 3 and Table 4. Please could you provide clarification on whether there is verification of the source material prior to accepting at the site (Crymlyn Tip) and then validation sampling once deployed or received. Please could the report include text explaining what Plan 5041216-RAP-DWG-0001086 on CQA Testing Location Reference relates to. Is it just to topographic survey locations? The conformance sampling strategy is particularly relevant should St Modwens Development Ltd look to accept and receive materials from external sources.

It is clear that materials brought on to develop the cap either for waste profiling, capping or restoration soils, each require conformance samples at 1/5000m³. If on site materials have already been categorised on the basis of leachable metals, asbestos and TPH, the need for ongoing laboratory analysis of on-site sources becomes questionable, except for asbestos, for the presumably cleaner silts or crushed rock.

Table D4 is also only really of assistance if used prior to accepting materials ie from off site. If used on site after materials are deployed, it will be problematic if failures occur due to the length of time taken for analysis. The use of visual and olfactory evidence plus a portable PID on site would seem to satisfy most elements for site won materials assuming Batches 01 and 02 were derived from Area 1. What is the reason for having 2 columns, as the values appear the same?

The frequency of off-site sampling appears very small. It is our understanding that the long term aim for the containment area is for it to be open for public access. Subsequently, would it be more protective for the Minimum Validation Testing Frequencies in Table 4 of the Section 106 to be applied? Verification and validation

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Maes Newydd, Llandarcy, Neath Port Talbot, SA10 6JQ.
Llinell gwasanaethau cwsmeriaid/Customer services line: 0300 065 3000
www.cyfoethnaturiolcymru.gov.uk / www.naturalresourceswales.gov.uk

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samples should also be sought. Will the import of material be managed through the site wide materials management plan?

The use of Table D3 for off-site materials is a concern and we would seek an alternative table for this. Why is Lead value set at 1mg/kg and mercury 75mg/kg, is this a typographical error? The Risk Based Screening Level for Lead is 337 mg/kg in recreational and Mercury is set at 1 mg/kg for recreational. Clarity for the asbestos content for off-site materials is sought, as I am presuming Neath Port Talbot have given consent on the basis of this site already having ACMs. It would be preferable for off-site sources to be identified as zero or as not present for asbestos. Vanadium should be reduced or removed, it is not a ubiquitous metal in traditional landscapes and is present here because of bespoke use. A value should also be used for polycyclic aromatic hydrocarbons and benzo(a)pyrene. The correspondence between URS and EAW pre-dates the sale of the site to St Modwen, so the Section 106 agreement was not in place. Clarification should be sought on whether the Section 106 agreement supercedes any previous agreements for contamination levels agreed between EAW and Jacobs. As stated previous, it is our understanding the Crymlyn Tip forms part of the wider development.

Whilst we are content with the upper limit for TPH, the analysis should be specified, as it is intended to be protective of controlled waters, EPH analysis would be suggested. The perverse aspect here is that for TPH, Atkins are suggesting a limit of 8,500mg/kg, the same as ethylbenzene. It should be noted that the BTEX substances will be odourous at these concentrations and we would suggest that for off-site materials the BTEX values are reduced. The analysis for 1,2-Dichloroethane is only warranted if the source indicates it is likely to be present, this would be evident from the desk top study and site investigation

Landfill Directive Compliance

It is currently unclear the volume of waste/materials already covering the asbestos graves. This would help with the site setting and with establishing the parameters required for the cap. The only mention of construction of the cap is within section 2.2.4 of the main ESID Report. Information on the construction of the cap should be provided. This should be provided and explained as Annex 1, paragraph 3.3 of the Landfill Directive identifies surface sealing requirements for landfills. It is accepted that the competent authority can accept a reduction in standards, however we are unaware of previous discussions.

Section 2.2.5 of the ESID identifies the planting of trees on completion of the landfilling. We would not support the planting of trees, due to the proposed thickness of the cap. Further to this there could be issues for installing new wells if there are trees on site.

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Surface Water Management

Other than surface water being shed over the restored surface towards the existing interceptor trenches and thence to South Bay and Crymlyn Bog Lagoon, or via infiltration through the surface, there doesn't appear to be any surface water management on the restored area of some 45,700m². This appears anomalous even for the purposes of erosion control. However, in relation to stability and pore water pressures the absence of surface water management could indicate that extreme pore water pressure conditions can prevail.

Appendix A

It would be preferable that all non conformances are included in a table that can be attached to the CQA Verification Report. An example/pro forma could be included.

Sampling record forms are included for both the stockpile and each layer. It would be helpful in the comment column if olfactory and for example PID readings were included.

The daily record sheet, does not include a summary of construction activity or plant being used. This would be helpful and good practice.

In light of the above comments written approval cannot be provided for the Crymlyn Tip – Construction Quality Assurance Plan in accordance with 2.5.1.

If you have any questions or wish to discuss any of the points raised above, then please do not hesitate to contact me via the details below.

Yours sincerely



Gareth M Davies

Senior Environment Officer
Neath Port Talbot Bridgend Environment Management Team

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Correspondence welcomed in Welsh and English

Meeting notes

Project:	Coed Darcy		
Subject:	Crymlyn Tip Permit Compliance and Surrender		
Date and time:	30 th January 2014, 10:30	Meeting no:	2
Meeting place:	Llan Coed House	Minutes by:	Richard Mitchener
Present:	Mike Poland Richard Mitchener Adam Putt Peter Stanley Kay Roberts Joanne Fitton Gareth Davies	Representing:	Atkins (Operator's consultant) Atkins Atkins CNC/NRW - stability CNC/NRW - hydrogeology CNC/NRW - hydrogeology CNC/NRW - Senior Environment Officer

ITEM	DESCRIPTION & ACTION	RESPONSIBLE
1	Introduction	
1.1	MP set out the complex regulatory background - Remedial Action Plan (RAP) works agreed between BP and EAW in c.2000. The measures within the plan were focused on maintenance and risk management of a mothballed site. - Outline planning consent was granted by Neath Port Talbot Borough Council (NPTBC) for the "urban village" development was granted in XXXX. This consent includes the tip area with the actual landfill to be open space and the lower areas to be part of the surface water management system for the site. - Conditions relating to contamination (the standard conditions) were include din the consent and are discharged on a plot by plot basis, supported by risk assessment as needed. - A Section 106 agreement was signed by BP and NPTBC which imposed, inter alia, particular criteria for the reuse of materials within the site. It is understood that the EAW was consulted on this document but under legal advice did not comment. The RAP required a number of actions in the tip area, including remediation of the lagoons and the installation/maintenance of a marine ply bund within Crymlyn Bog itself to collect any oil seeping from the site into the SAC. Capping of the tip was also included in the RAP. It is understood by Atkins that the use a permeable cap was agreed between URS (as BP's consultant) and the EAW. It was noted that CNC/NRW does not recall any such agreement.	For info

Next meeting:

Distribution:	Attendees plus Neil Williams (St Modwen) Lee Owen (Prosurv)
Date issued:	File ref:

NOTE TO RECIPIENTS:

These meeting notes record Atkins understanding of the meeting and intended actions arising therefrom. Your agreement that the notes form a true record of the discussion will be assumed unless adverse comments are received in writing within five days of receipt.

ITEM	DESCRIPTION & ACTION	RESPONSIBLE
1.2	MP set out the background to the tip. Ash bund constructed in the 1930s to contain oil losses as a result of bombing. At some later time wastes from the site were deposited behind this bund. RM stated that although licensed from 1977 under COPA it is likely that waste was deposited prior to this date. MP highlighted that the licensed area also included a series of lagoons which had, and continue to, form part of the wider site's drainage system. Historically these functioned as oil interceptors and contained a significant volume of oily sludge which was remediated – verification reports for these works have been submitted to the regulators and approved. . In addition, there was a drum store in the lower part of the tip. The drums buried in this area have been removed. A verification report has been submitted to the regulators and approved. MP noted that the tip has received a range of waste included asbestos, vanadium and oily sludges. MP noted that measures to extract oils from the tip were ongoing. approximately 800m³ was collected by Celtic with a further 200m³ collected by Hydrock so far. Works are ongoing.	For info
1.3	MP outlined St. Modwen's objectives: - Formally move tip into long term management - Agree and install cap - Agree aftercare and management plan - Be in compliance with permit requirements - Remove lagoon areas from Environmental Permitting - Sludges have been removed and water quality is much improved - Remove low lying peat lands from the permit.	For info
1.4	GS and PS noted that there was some confusion over what materials had been placed on the tip so far. MP and RM explained that the "Area 1" materials, which were soils and rock which had been remediated (mostly for asbestos), were moved to the tip in 2008 with the agreement of the EAW. These materials were used to improve the land from as a regulation layer rather than a cap.	For info
2	Groundwater	
2.1	GD highlighted the need for a single borehole plan for the area, clearly linking borehole ID numbers to both the data and the borehole logs. AP confirmed that a survey of the remaining boreholes had just been completed. A single plan will be prepared from this. RM confirmed that existing data would be correlated with this new plan in a quality assured way to provide the baseline for ongoing monitoring.	RM
2.2	RM noted that additional borehole logs would be provided. However, no all boreholes from which data has been collected over the years would have an extant log. GD recognised this and did not consider it a bar to progress	RM
2.3	KR noted that the data did not tell a very clear picture of the site condition and groundwater flow directions. There was a discrepancy between the understood site-wide groundwater flow regime and that reported in the ESID. RM proposed that further assessment should be undertaken and that the dataset should, if appropriate be split between leachate	RM

ITEM	DESCRIPTION & ACTION	RESPONSIBLE
	and groundwater in a more explicit way. KR also requested further consideration of seasonal variation. RM noted that there was more data that would enable this to be done.	
2.4	KR & JF noted that not all groundwater quality data was provided in the ESID report. RM acknowledged that all data should be included. RM noted that the data available at the time was old – more recent data would be included in the revised report. MP explained that in terms of receptor monitoring improvements were being implemented to allow access to the boreholes on the bog.	RM
2.5	JF requested that typical landfill contaminants ammonium and chloride be added to the suite. Vanadium should also be added as it is known that this metal had been deposited in the site.	AP
2.6	KR noted that the groundwater quality provided was now quite old and requested that this be updated. RM agreed that more up to date data would be included in the revised report.	RM/AP
2.7	KR requested that the ash bund and the plywood barrier be shown on a drawing in the ESID. RM agreed that this would be done	RM
2.8	JF noted that validation reports had been submitted (voluntarily) for the lagoons and these were generally acceptable. However, no information had been received regarding the soils in the lower area. MP accepted that a validation report would be needed to support surrender of these areas.	To note
2.9	Capping of the site. JF noted that as far as CNC/NRW was concerned there was no agreement that a permeable cap was suitable for the site. PS noted that a landfill directive compliant cap may be required. RM suggested that, given that the site does not have any form of leachate collection or any basal lining, and given that groundwater and leachate are highly likely to be in connection, a low permeability cap would not have any significant environmental benefit. It would either increase the time for the site to reach surrender (as a result of reduced infiltration through the waste) or increase the concentration of dissolved hydrocarbons in groundwater local to the site which could impact the SSSI. RM also noted that although measures were ongoing to remove free oil significant volumes are likely to remain in the pore space even after this work is complete. JF/KR noted that this argument would have to be set out formally in the revised documents. PS stated that is there were to be a movement away from the landfill directive requirements he would seek agreement from others in his team	RM
2.10	JF/KR asked for the ESID drawings to be updated to reflect the issues discussed in the meetings.	RM
2.11	PS requested further discussion on the acceptability criteria set out in the submissions. For some parameters these values were not	

ITEM	DESCRIPTION & ACTION	RESPONSIBLE
	considered conservative enough or consistent with those agreed under the Section 106. It was noted that the values for Hg and Pb may have been transposed in the table.	
3	Stability Risk Assessment	Click to enter text
3.1	PS noted that the samples of the treated sludge proposed for capping had been undertaken at the default strains which were likely to be higher than the strains that the soils would be subjected to when placed. PS required that this was discussed in the SRA	MC
3.2	PS noted that it was not clear how the materials tested (batch 1 and batch 2) related to proposed capping materials. MP explained that these were two batches of sludges that had been remediated through addition of wood chip and then bioremediation. There is enough of these materials to cap the site as proposed and therefore no import of materials was proposed. MP noted that some further testing (chemical and geotechnical) might be needed as the materials were used. It was agreed that the SRA would be updated to make it clearer what was proposed.	RM/MC
3.3	PS asked that the actual aim of the capping works should be clarified.	MC
3.4	PS requested that the history of the site and any agreements made is clarified. RM noted that this would be done in the ESID report.	RM
3.5	PS noted that he was concerned about the lack of surface water management with regards to erosion as well as pore water pressures. MP noted that the low areas of the tip will form the surface water management area for the whole of the southern catchment of Coed Darcy. It was agreed that this would be considered in the SRA more explicitly.	MC/RM
3.6	PS requested justification for not analysing the slopes using residual shear strength. While PS recognised that if the proposed materials were non-plastic this could be appropriate but discussion is needed.	MC
3.7	PS noted that the peat present beneath the waste had not been considered in the stability analysis. RM noted that as the peat was effectively horizontal and no basal containment was assumed in any assessment it wasn't important. PS requested that the peat was discussed within the text and either ruled out or assessed using appropriate values.	MC
3.8	PS also noted that the ash bund had not been assessed. If the SRA was to satisfy the improvement condition then this would need to be discussed/assessed as it contains the waste on this boundary.	MC
3.9	PS requested that all analysis included consideration of plant loadings where appropriate.	MC
3.10	PS requested that details of the volumes to be used, their source	MC

ITEM	DESCRIPTION & ACTION	RESPONSIBLE
	and validation testing to be undertaken be provided. In particular he requested clarification on the asbestos content that would be acceptable MP noted that it may be necessary to import topsoil but other materials would be won from within the Coed Darcy site.	
3.11	PS requested discussion of differential settlement, especially with regard to the potential for voids within the waste. If available, historical photographs would be very helpful.	MC/AP
3.12	PS expressed concern about planting trees on the site given the relatively thin cap proposed. RM undertook to review this with the ecologists	RM
3.13	It was agreed that the revised report would be submitted to satisfy the permit requirements for an SRA as well as supporting the CQA report.	MC
4	Surrender	
4.1	GD noted that he had spoken to Nadine Jones and Paul Williams in the permitting and installations team. He confirmed that RGN6 and EPR 5.02 were the appropriate guidance documents.	To note
4.2	It was noted that the Section 106 was not signed by the EAW. Therefore any application based on compliance with the Section 106 would need to justify these values. MP noted that Atkins had reviewed the numbers which in many cases were lower than Atkins' SSVs. Where Atkins' numbers were lower these have been used.	To note
4.3	The boundary will need to be clearly defined, and ideally marked on the ground.	AP
4.4	Records of waste deposits should be provided in the surrender application where applicable.	AP
4.5	Where remediation had been undertaken the reasons for this and the outcomes should be set out.	To note
4.6	The monitoring that is being undertaken (whether as part of the landfill management or the wider site) should be set out clearly.	To note
4.7	The long term use of the areas to be surrendered should be provided to give context.	To note
4.8	GD suggested a pre application meeting should be held before progressing the surrender application.	To note

Drawings

List of Drawings

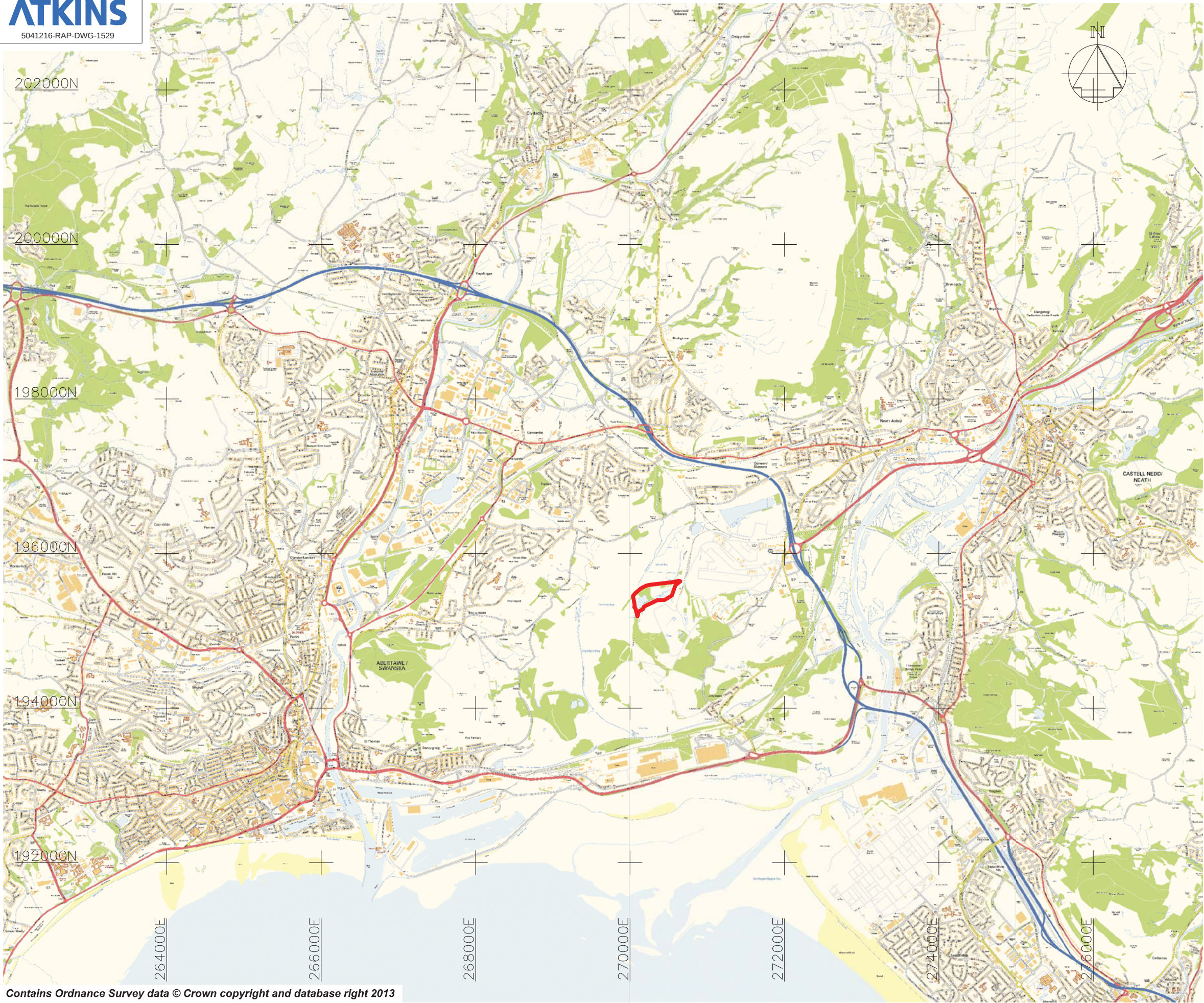
5041216-RAP-DWG-1529 - ESID 1 - Location

5041216-RAP-DWG-1906 - Historical Waste Deposition

5041216-RAP-DWG-1907 - Proposed Strategy

5041216-RAP-DWG-1908 - Previous Gas Monitoring Locations

5041216-RAP-DWG-1909 - Proposed Monitoring Locations



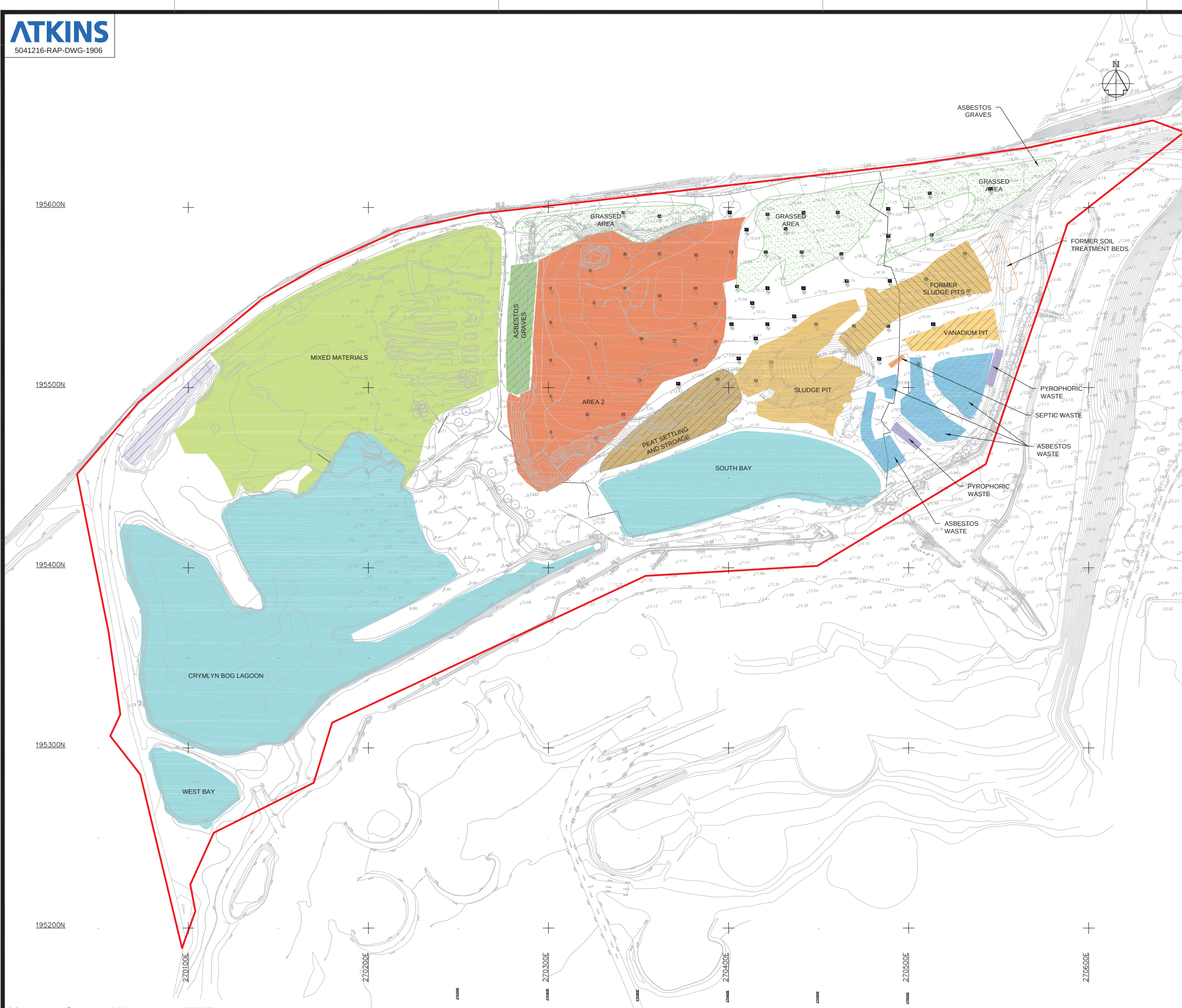
Contains Ordnance Survey data © Crown copyright and database right 2013

KEY:



ENVIRONMENTAL PERMIT
BOUNDARY

REVISIONS		Drawn By	Checked By	Date
PURPOSE OF ISSUE		Rev.	Authorised for issue	Date
Atkins Ltd Consulting Engineers The Axis, 10 Holliday Street Birmingham West Midlands B1 1TF		Tel 0121 483 5000 Fax 0121 483 5252		
© THIS DRAWING IS NOT TO BE SCALED				
CLIENT 				
PROJECT CRYMLYN TIP				
DRAWING TITLE ESID1 LOCATION				
SCALES 1:50000	DRAWN JSD DATE 22/05/13	CHECKED YMC DATE 22/05/13	CO-ORD CHECK — DATE —	
DRAWING NO 5041216-RAP-DWG-1529		SHEET A3		PLOT DATE 23.05.13 REV —



- NOTES
- DO NOT SCALE.
 - TOPOGRAPHY DATA TAKEN FROM SURVEY DATA PROVIDED BY PLANNED VISION ON DATE 21/05/2013 AND 22/05/2013 AND 10/06/2013.
 - CONTOURS SHOWN ARE IN mAD.
 - TIP FEATURES ARE TAKEN FROM URS DRAWING REF. 44382624-FIGURE 2, FEB 2006.
- KEY
- | | |
|-------------------------------|--------------------------------------|
| ENVIRONMENTAL PERMIT BOUNDARY | SITE 7 - ASBESTOS GRAVES |
| GRASSED AREA | DRUM BURIAL MOUND |
| SITE 1 MIXED MATERIALS | FORMER SOIL TREATMENT BEDS |
| AREA 2 | PEAT SETTING AND STORAGE |
| SITE 3 SLUDGE PIT | CRYMLYN BOG LAGOON, SOUTH & WEST BAY |
| SITE 3 FORMER SLUDGE PITS | |
| SITE 4 PYROPHORIC WASTE | |
| SITE 5 ASBESTOS WASTE | |
| SITE 5 VANADIUM PIT | |
| SITE 6 SEPTIC WASTE | |

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CLIENT ST.MODWEN			
PROJECT COED DARCY			
DRAWING TITLE HISTORICAL WASTE DEPOSITION			
Scales 1:1000	DRAWN JSD	CHECKED TC	CO-ORD CHECK MC
	DATE 14/05/15	DATE 14/05/15	DATE 14/05/15
0 + + + + +		SHEET A1	PLOT DATE 21.07.15
DRAWING NO 5041216-RAP-DWG-1906			REV -

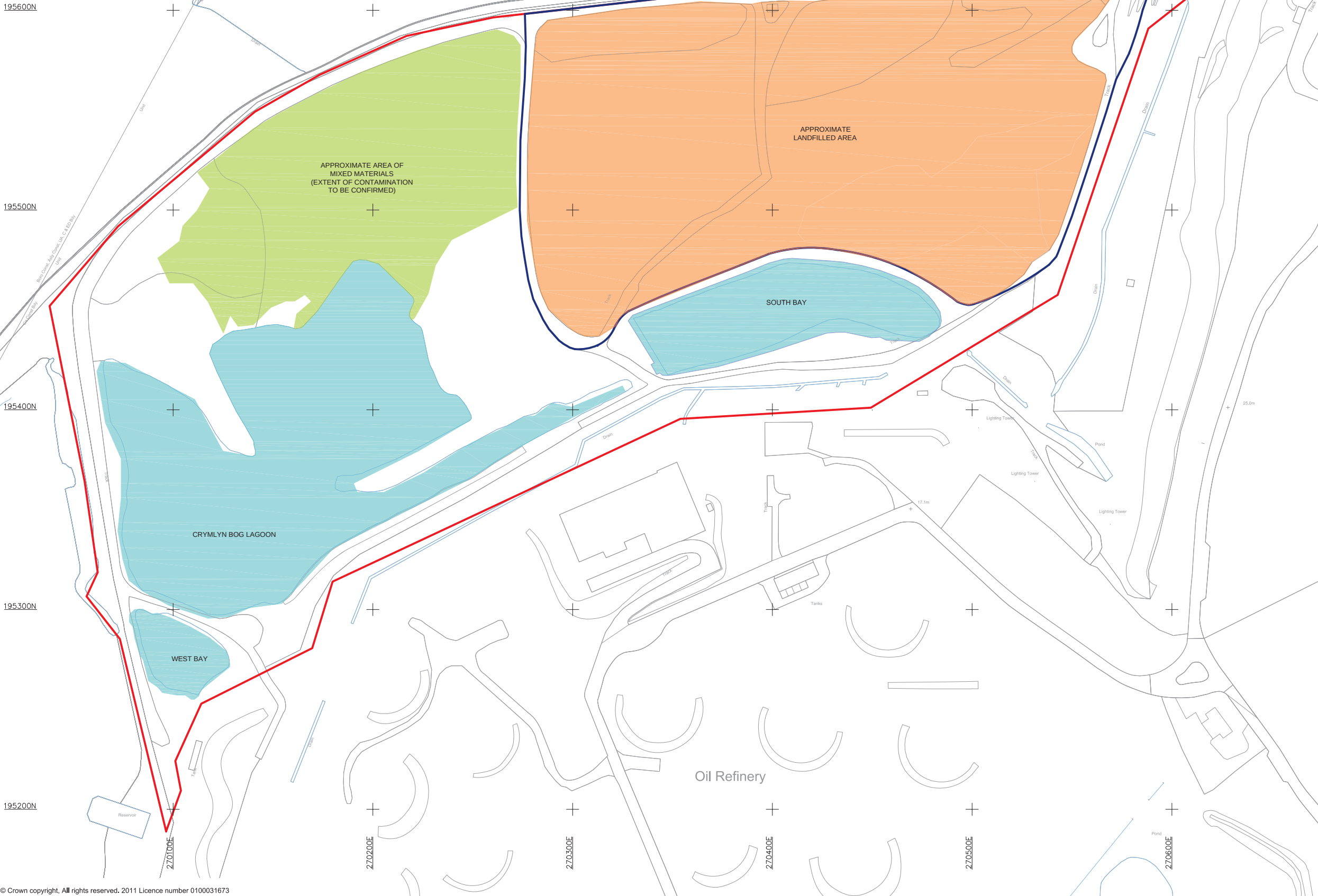
195600N

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- KEY
- ENVIRONMENTAL PERMIT BOUNDARY
 - APPROXIMATE AREA TO BE CAPPED (FUTURE)
 - PROPOSED PARTIAL SURRENDER (FUTURE)
 - APPROXIMATE LANDFILLED AREA
 - APPROXIMATE AREA OF MIXED MATERIALS

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CLIENT ST.MODWEN				
PROJECT COED DARCY				
DRAWING TITLE PROPOSED STRATEGY				
Scales 1:1000	DRAWN JSD	CHECKED TC	CO-ORD CHECK MC	
	DATE 14/05/15	DATE 14/05/15	DATE 14/05/15	
0 + + + + +			SHEET A1	PLOT DATE 21.07.15
DRAWING NO 5041216-RAP-DWG-1907				REV -

195600N

195500N

195400N

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195200N



NOTES

- DO NOTE SCALE
- BOREHOLE LOCATIONS ARE INDICATIVE AND COORDINATES ARE APPROXIMATE ONLY.

KEY

- ENVIRONMENTAL PERMIT BOUNDARY
- PROPOSED PARTIAL SURRENDER (FUTURE)
- APPROXIMATE LANDFILLED AREA
- APPROXIMATE AREA OF MIXED MATERIALS - SITE AREA 1
- GAS MONITORING LOCATIONS

REVISIONS	Drawn By	Checked By	Date
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PURPOSE OF ISSUE	Rev.	Authorised for issue	Date
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CLIENT	
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PROJECT	COED DARCY
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DRAWING TITLE	PREVIOUS GAS MONITORING LOCATIONS
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Scales	1:1000	DRAWN	JSD	CHECKED	TC	CO-ORD	CHECK	MC
DATE	14/05/15	DATE	14/05/15	DATE	14/05/15			

DRAWING NO	5041216-RAP-DWG-1908	SHEET	A1	PLOT DATE	21.07.15	REV	-
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Previous Gas Monitoring Locations in Oct 2010 to May 2014

Borehole ID	Easting (mE)	Northing (mN)	Gas Monitoring Data	Serviceable/Unrecoverable
CARW002	270601	195588	Oct2010-May2013	TBC
CARW005	270562	195508	Oct2010-May2013	Unrecoverable
CARW007	270545	195466	Oct2013-May2014	Unrecoverable
CARW008	270527	195453	Oct2013-May2014	Serviceable
CARW009	270504	195441	Oct2013-May2014	Serviceable
CARW015	270191	195568	Oct2010-May2013	Unrecoverable
CARW024	270300	195444	Oct2010-May2013	Unrecoverable
CARW025	270207	195551	Oct2010-May2014	Unrecoverable
CARW029b	270227	195497	Oct2010-May2014	Unrecoverable
CARW033	270471	195418	Oct2013-May2014	Unrecoverable
CARW034	270378	195403	Oct2013-May2014	Unrecoverable
CBH02	270302	195534	Oct2010-May2013	Unrecoverable
CBH04	270302	195493	Oct2010-May2013	Unrecoverable
CBH20	270832	195553	Oct2010-May2014	Unrecoverable
CBH26	270402	195533	Oct2013-May2014	Unrecoverable
CBH28	270422	195594	Oct2013-May2014	Unrecoverable
CBH31	270422	195533	Oct2010-May2013	Unrecoverable
CBH32	270442	195595	Oct2013-May2014	Unrecoverable
CBH33	270441	195573	Oct2010-May2013	Unrecoverable
CBH36	270461	195595	Oct2010-May2013	Unrecoverable
CBH37	270463	195572	Oct2010-May2013	Unrecoverable
CBH41	270490	195557	Oct2010-May2013	Unrecoverable
CBH42	270490	195533	Oct2010-May2013	Unrecoverable
CBH48	270394	195502	Oct2010-May2014	Unrecoverable
CBH49	270415	195501	Oct2013-May2014	Unrecoverable
CBH51	270393	195523	Oct2013-May2014	Unrecoverable

Previous Gas Monitoring Locations in Oct 2010 to May 2014

Borehole ID	Easting (mE)	Northing (mN)	Gas Monitoring Data	Serviceable/Unrecoverable
CBH52	270415	195525	Oct2013-May2014	Unrecoverable
CBH57	270410	195585	Oct2013-May2014	Unrecoverable
CBH58	270432	195585	Oct2010-May2013	Unrecoverable
CBH63	270545	195608	Oct2010-May2013	Unrecoverable
GA7	270068	195363	Oct2010-May2014	TBC
MSMW027	270053	195463	Oct2010-May2014	TBC
MSMW029	270426	195432	Oct2013-May2014	Unrecoverable
MSMW033	270518	195620	Oct2010-May2014	TBC
MSMW034	270563	195573	Oct2010-May2014	Serviceable
MSMW035	270532	195479	Oct2010-May2014	TBC
MSMW152	270485	195577	Oct2010-May2013	TBC
MSMW154	270104	195217	Oct2010-May2014	Serviceable
MSMW155	270063	195310	Oct2010-May2014	Serviceable
MSMW156	270267	195413	Oct2010-May2014	Unrecoverable
MSMW226	270455	195592	Oct2013-May2014	Unrecoverable
MSMW228	270441	195577	Oct2010-May2013	Serviceable
MSMW231	270405	195546	Oct2013-May2014	Serviceable
MSMW235	270336	195548	Oct2010-May2014	Serviceable
MSMW236	270335	195537	Oct2010-May2013	Unrecoverable
MSMW238	270334	195503	Oct2010-May2013	Serviceable
MSMW239	270469	195613	Oct2010-May2013	TBC
RFSW018	271846	196169	Oct2013-May2014	Unrecoverable

THE FOLLOWING LOCATIONS ARE NOT SHOWN ON THE DRAWING
*CBH20 is located approximately 250m to the east of the permit boundary
*RFSW018 is located approximately 1000m to the north east of the permit boundary

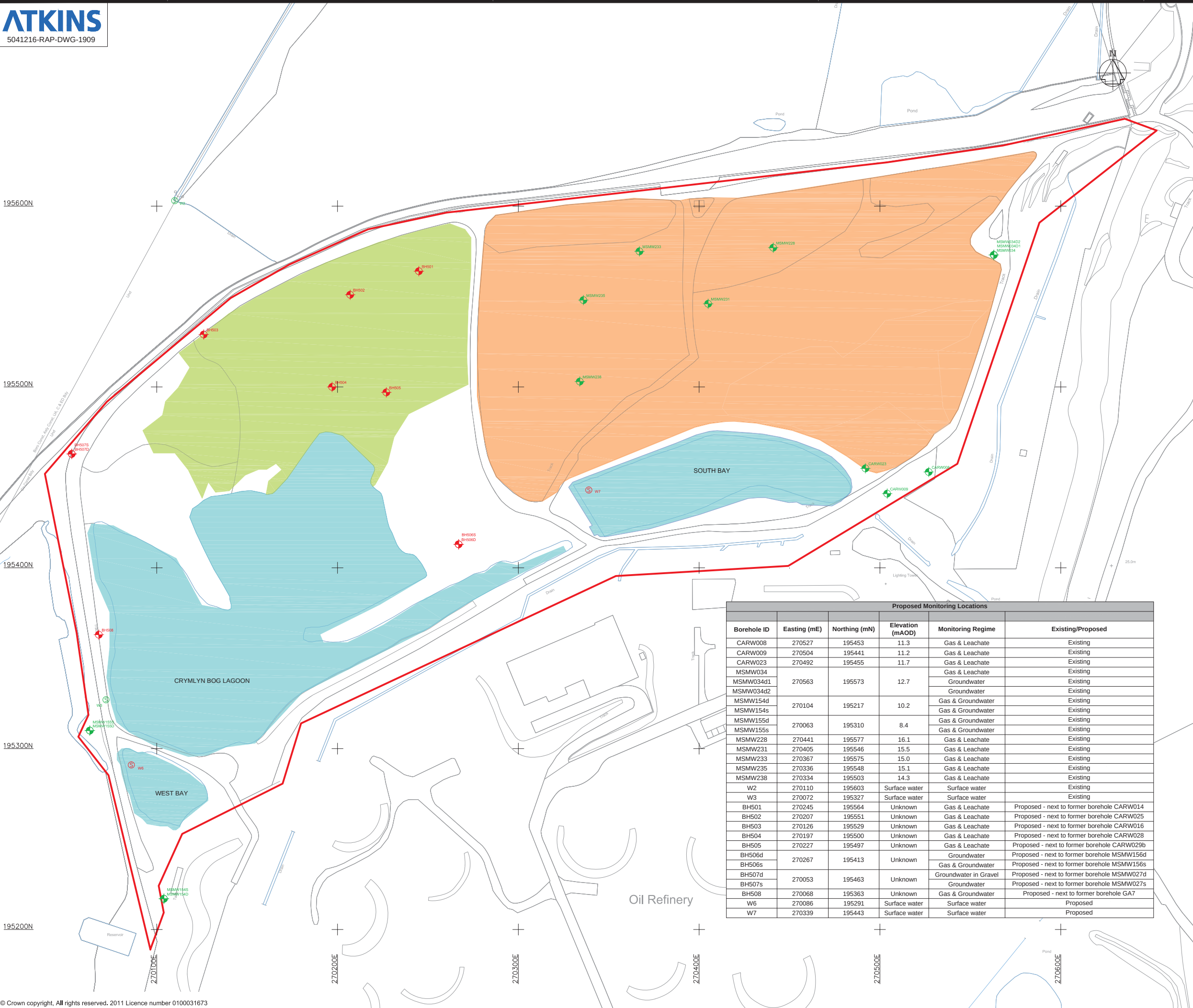
195600N

195500N

195400N

195300N

195200N



Proposed Monitoring Locations					
Borehole ID	Easting (mE)	Northing (mN)	Elevation (mAOD)	Monitoring Regime	Existing/Proposed
CARW008	270527	195453	11.3	Gas & Leachate	Existing
CARW009	270504	195441	11.2	Gas & Leachate	Existing
CARW023	270492	195455	11.7	Gas & Leachate	Existing
MSMW034	270563	195573	12.7	Gas & Leachate	Existing
MSMW034d1				Groundwater	Existing
MSMW034d2				Groundwater	Existing
MSMW154d	270104	195217	10.2	Gas & Groundwater	Existing
MSMW154s				Gas & Groundwater	Existing
MSMW155d	270063	195310	8.4	Gas & Groundwater	Existing
MSMW155s				Gas & Groundwater	Existing
MSMW228	270441	195577	16.1	Gas & Leachate	Existing
MSMW231	270405	195546	15.5	Gas & Leachate	Existing
MSMW233	270367	195575	15.0	Gas & Leachate	Existing
MSMW235	270336	195548	15.1	Gas & Leachate	Existing
MSMW238	270334	195503	14.3	Gas & Leachate	Existing
W2	270110	195603	Surface water	Surface water	Existing
W3	270072	195327	Surface water	Surface water	Existing
BH501	270245	195564	Unknown	Gas & Leachate	Proposed - next to former borehole CARW014
BH502	270207	195551	Unknown	Gas & Leachate	Proposed - next to former borehole CARW025
BH503	270126	195529	Unknown	Gas & Leachate	Proposed - next to former borehole CARW016
BH504	270197	195500	Unknown	Gas & Leachate	Proposed - next to former borehole CARW028
BH505	270227	195497	Unknown	Gas & Leachate	Proposed - next to former borehole CARW029b
BH506d	270267	195413	Unknown	Groundwater	Proposed - next to former borehole MSMW156d
BH506s				Gas & Groundwater	Proposed - next to former borehole MSMW156s
BH507d	270053	195463	Unknown	Groundwater in Gravel	Proposed - next to former borehole MSMW027d
BH507s				Groundwater	Proposed - next to former borehole MSMW027s
BH508	270068	195363	Unknown	Gas & Groundwater	Proposed - next to former borehole GA7
W6	270086	195291	Surface water	Surface water	Proposed
W7	270339	195443	Surface water	Surface water	Proposed

- NOTES
- DO NOTE SCALE
 - BOREHOLE LOCATIONS ARE INDICATIVE AND COORDINATES ARE APPROXIMATE ONLY.
- KEY
- ENVIRONMENTAL PERMIT BOUNDARY
 - PROPOSED PARTIAL SURRENDER (FUTURE)
 - APPROXIMATE LANDFILLED AREA
 - APPROXIMATE AREA OF MIXED MATERIALS
 - EXISTING MONITORING BOREHOLES
 - EXISTING SURFACE WATER MONITORING LOCATIONS
 - PROPOSED MONITORING BOREHOLES
 - PROPOSED SURFACE WATER MONITORING LOCATIONS

REVISIONS	Drawn By	Checked By	Date
PURPOSE OF ISSUE	Rev.	Authorised for issue	Date
Atkins Limited Birmingham Office The Axis, 10 Holliday Street Birmingham West Midlands B1 1TF Tel 0121 483 5000 Fax 0121 483 5252 © THIS DRAWING IS NOT TO BE SCALED			
CLIENT ST.MODWEN			
PROJECT COED DARCY			
DRAWING TITLE PROPOSED MONITORING LOCATIONS			
Scales 1:1000	DRAWN JSD	CHECKED TC	CO-ORD CHECK MC
DATE 14/05/15	DATE 14/05/15	DATE 14/05/15	DATE 14/05/15
0 + + + + +		SHEET A1	PLOT DATE 21.07.15
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