

ENVIRONMENTAL ASSESSMENT REPORT

**Petrol Coedpoeth,
High Street, Coedpoeth, Wrexham**

Report No: CP17129 CL 001

March 2017

Client: The Co-Operative Group Ltd

Report Prepared By:



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Report Reviewed By:



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Environmental Assessment Report – Petrol Coedpoeth, High Street, Coedpoeth

Environmental Investigation – Summary				
Sitework Completed				
Date investigation completed:	6 th – 7 th February 2017		No. boreholes constructed / maximum depth drilled	
Date of groundwater monitoring visit:	14 th February 2017		No. monitoring wells installed / maximum depth	
Site Sensitivity (based on desk-top information)				
Geology and Hydrogeology	No superficial deposits identified			
	Pennine Lower Coal Measures		Secondary (Class A) Aquifer	
Source Protection Zone:	No		Nearest Surface Water:	River Clywedog 230m SW
Encountered Hydrogeology/Geology				
Groundwater	Strike between 1.7 and 4.0m / Resting between 2.7 and 5.9m. Not continuous across site - groundwater encountered in three boreholes only.			
Soil Stratigraphy	Geological Unit	From	To	Description
	Made Ground	0.0	~1.2	SOFT to FIRM dark brown or black gravelly CLAY OR MEDIUM DENSE brown clayey GRAVEL with occasional large brick fragments.
	Glacial Till	~1.2	~2.5	FIRM to STIFF orange brown grey mottled CLAY with frequent fine gravel
	Pennine Lower Coal Measures	~2.5	>6.0	STIFF to VERY STIFF grey brown friable sandy CLAY OR WEAK to MODERATELY WEAK grey highly weathered MUDSTONE with occasional bands of black coal measures and sub-angular grey gravel.
Results of Environmental Investigation				
Environmental Assessment – Summary of Conclusions:	➤ We have identified low concentrations of petrol range hydrocarbons in shallow Made Ground and underlying shallow soils in BH3. Low concentrations of waste oil range hydrocarbons were identified in a single soil sample from BH4. We detected trace concentrations of various PAH compounds in soil samples obtained from BH2 and BH4. ➤ Elevated concentrations of lead were identified in underlying shallow Made Ground recovered from BH1, BH2, BH4 and BH5. Elevated concentrations of zinc were also reported from BH2 and BH4. ➤ Elevated concentrations of hydrocarbons, generally consistent with waste oil and possibly weathered diesel, were identified in the groundwater sample collected from BH4. No detectable hydrocarbons were identified in the other groundwater samples obtained (BH5 and MW1). ➤ The results of our Generic Quantitative Risk Assessment indicates that the concentrations of hydrocarbons identified in underlying soils and groundwater do not pose a potential long-term risk to future commercial site users. We do not consider offsite residential or environmental receptors to be at significant risk as we have not identified an active migration pathway from the site. On this basis, we consider the site to be suitable for continued commercial use.			
Please refer to our report for our conclusions and recommendations in full. Your attention is drawn to the Notice to Interested Parties included as Attachment One.				

Environmental Assessment Report – Petrol Coedpoeth, High Street, Coedpoeth

Site Investigation - Summary of Recommendations for Redevelopment Works		
Temporary works - slope stability	Foundation excavations likely to be formed within:	Granular Made Ground / Glacial Till (clay) / Coal Measures (clay / mudstone)
	Likely to remain stable for short periods without support or being battered back	Yes
	Note: We recommend that a detailed inspection of the side slopes be carried out in order to assess fully any support measures required.	
	We encountered weathered bedrock (Lower Pennine Coal Measures units) from around between 0.9m and 2.5m depths under the site. We were able to construct a borehole to a maximum depth of 7.2m using direct-push drilling methods. We consider driven sheet piles are likely to penetrate the underlying soils to sufficient depth to form a support measure for the tank farm excavation, although localised mudstone horizons could be present. Consideration of alternative support measures is recommended.	
Temporary works - De-watering	Anticipated depth to standing groundwater	Variable - ~2.5m - ~5m. Not continuous across site.
	Anticipated permeability	Low
	Dewatering likely to be required?	Possible - below ~3m
	Waste water likely to be impacted with hydrocarbons?	Possibly - impacted groundwater in BH4 only.
Disposal of Excavated Spoil	Soil / leachate samples analysed for compounds within Subadra Waste Acceptance Criteria Suite?	No
	Excavated soils from the site are likely to be classified as?	Non-Haz to Hazardous
	Note: We recommend that we classify all potentially impacted soils prior to disposal. All waste soils and fill must be disposed of at an appropriately licensed disposal site. We have not completed a detailed assessment of underlying Made Ground for the presence of asbestos containing materials although we have not identified detectable asbestos the samples we have submitted for asbestos screening.	
Additional Comments/Recommendations		
Additional comments regarding re-development works:	As with any petrol filling station, additional areas of hydrocarbon impacted soil may be encountered during redevelopment works. In particular these include areas we have been unable to investigate due to the restrictions of working on an operational filling station (i.e. site buildings, petroleum installation and services). We therefore recommend that verification sampling of excavations be undertaken during the site demolition and decommissioning works to confirm no additional contamination is present. The site has been a filling station and garage for several decades. It is therefore The site has been a garage / petrol station since at least the 1960s and we understand that the current petroleum installation dates from before 1988. Given the age of the site we consider it is possible that there could be further abandoned tanks remaining under the forecourt.	
Please refer to our report for our recommendations in full. Your attention is drawn to the Notice to Interested Parties included as Attachment One.		

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Attachment Two:	Site Plans and Borehole Logs
Attachment Three:	Chemical Analysis Certificates
Attachment Four:	Environmental Data Report
Attachment Five:	Public Utility Drawings

1 Introduction

1.1 The Purpose of This Assessment

We have been commissioned by The Co-Operative Group Ltd (Coop) to carry out an environmental assessment of their Petrol Coedpoeth site on High Street, Coedpoeth. We understand that Coop propose to redevelop the existing site; replacing the petroleum installation and constructing a larger convenience store.

The purpose of the assessment is predominantly to complete an appraisal of the ground conditions. This was completed to determine whether the quality of soil and/or groundwater underlying the site has been impacted with hydrocarbons associated with past operations and to provide information to assist in waste classification of excavated soils during the redevelopment works. The investigation data is also designed to assist in designing temporary works and permanent foundations for the proposed future petroleum installation.

This assessment has been undertaken in accordance with the guidelines presented in the Environment Agency, 'Model Procedures for the Management of Land Contamination'¹ and Environment Agency Guidance on Requirements for Land Contamination Reports².

All the activities comprising this assessment were carried out in accordance with the procedures set out in our Quality Manual. Your attention is drawn to the Notice to Interested Parties included as Attachment One.

1.2 The Scope of This Assessment

Our assessment of the site was carried out in the following parts:

- Preliminary Risk Assessment comprising a desk based review of site specific information that is readily available in the public domain to develop a conceptual site model and assess potential pollutants, pathways and receptors associated with the site;
- Underground utilities survey of the site using radio detection techniques to identify the location of below ground services at the site;
- A walkover inspection to identify visual signs of pollution or potentially polluting activities;
- An intrusive site investigation comprising five boreholes drilled using our Geoprobe direct-push drilling rig, with three of these completed as groundwater monitoring wells.
- Logging of soil cores and collection of soil samples.
- A return visit to carry out groundwater monitoring and obtain representative groundwater samples from the monitoring wells we installed at the site and from an existing well we encountered;
- Collection of a water sample from the drinking water supply for analysis.
- Chemical analysis of representative soil and groundwater samples to assist with our environmental assessment and to assist with classifying soils that are to be excavated during the proposed development works;
- Provision of this report, including the development of a Conceptual Site Model to assess potential pollutants, pathways and receptors associated with the site and completion of a Generic (Quantitative) Risk Assessment if required;

1.3 Previous Reports Relating to the Site

We do not hold, and have not been provided with any, previous reports relating to the site.

¹ DEFRA and Environment Agency (2004) "Model Procedures for the Management of Land Contamination" Report CLR 11 Environment Agency, Bristol.

² Environment Agency (2005) "Guidance on Requirements for Land Contamination Reports" Version 1.

2 Desk-based Information

2.1 Site Description, Location and Setting

Geographical Location and Description		
Site Description	The site comprises a Texaco branded retail petrol filling station with a combined petrol and diesel forecourt covered with an overhead canopy, jet wash and Co-op branded shop.	
Grid Reference	328080, 351440	Location: The site is located in Coedpoeth, off High Street (A525) and ~5km to the west of Wrexham.
Elevation	~235m Above Ordnance Datum	
Size (approx)	~0.13 Ha	

Table One: Site Location and Setting

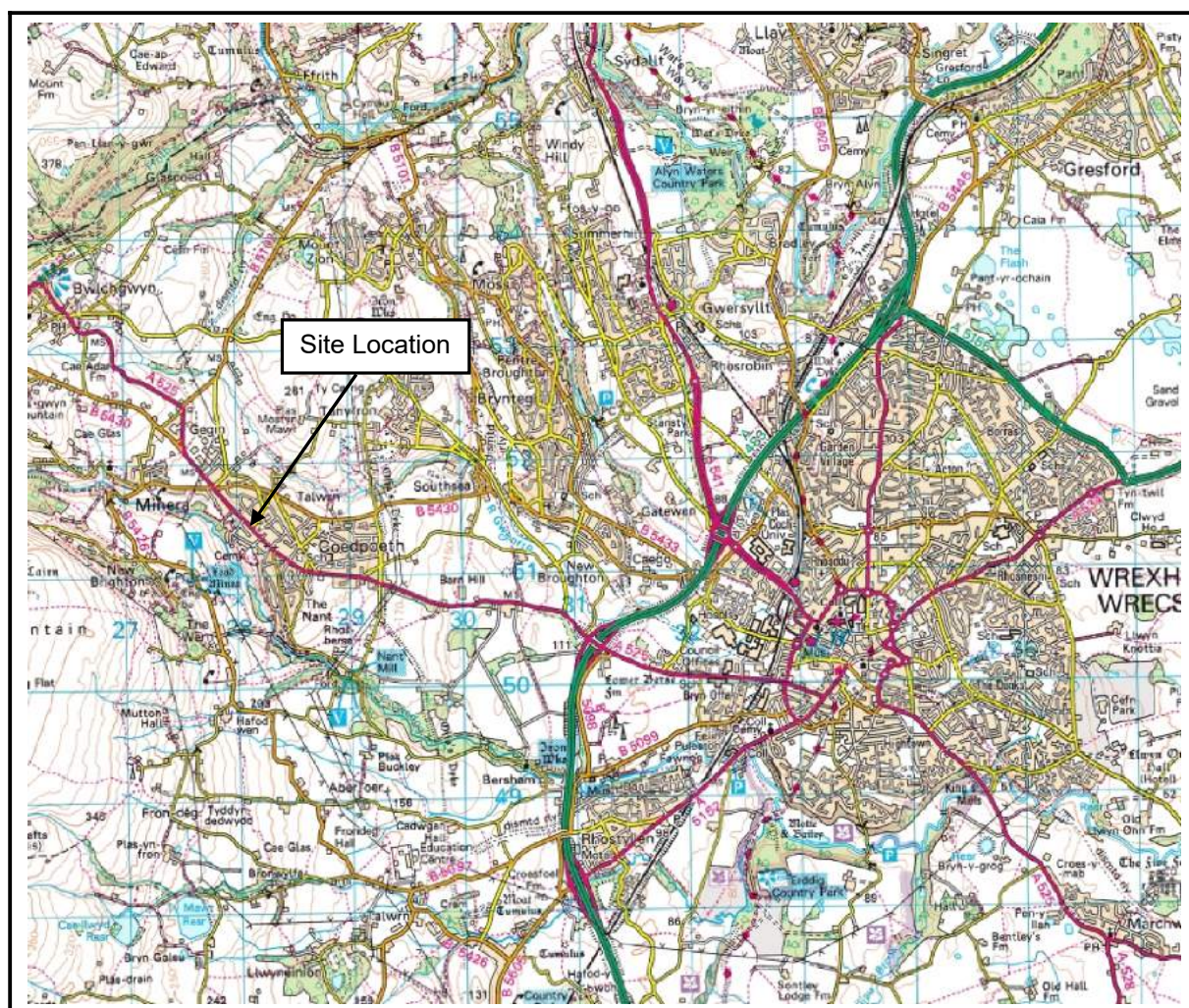


Figure One: Site Location Plan

Direction	Details
North	High Street (A525) forms the northern boundary of the site, with residential properties beyond (~15m).
East	Residential properties with gardens along High Street to the east of the site (~10m).
South	Terraced residential properties with gardens to the immediate south (~20m). Further residential properties beyond, and then a cemetery (~100m).
West	Residential properties to the immediate west (~10m) and further to the west. Industrial unit ~150m west and then woodland.

Table Two: Surrounding Land Use**Figure Two: Aerial Photograph Showing Site Setting**

2.2 Geology, Hydrogeology and Hydrology

Item	Geological Unit	Description	Estimated Thickness	Data Source
Drift Geology	Glacial Till	[Shown present along the north and western edge of the site only] Generally stiff slightly sandy clay with poorly sorted gravels.	~5m (if present)	British Geological Survey (BGS) mapping
Solid Geology	Pennine Lower Coal Measures / Pennine Middle Coal Measures (Undifferentiated)	Comprises interbedded layers of mudstone and siltstone, with sandstone and occasional coal seams and some ironstones.	>50m	
BGS Borehole Data	The BGS holds records for a borehole located ~ 100m north of the site (BGS Ref. SJ25SE974). Geology is described as 'drift geology' to ~24m depths, overlying coal to 30m depth and then layers of shale and ironstone to a depth of ~39m.			

Table Three: Regional Geology

Item	Geological Unit	Environment Agency Aquifer Classification	Data Source
Drift Geology	Glacial Till	Unproductive Strata	Natural Resources Wales / BGS
Solid Geology	Pennine Lower Coal Measures	Secondary Aquifer (Class A)	
BGS Borehole Data	No information regarding groundwater was provided on the available BGS borehole log (BGS ref. SJ25SE974).		BGS Website

Table Four: Regional Hydrogeology

Item	Description	Distance	Direction	Data Source
Surface Water Features	River Clywedog	~230m	W / SW	Ordnance Survey mapping
	Tributary of River Gwenfro	~400m	N	

Table Five: Regional Hydrology

Abstraction	Surface Water			Groundwater		
	Distance	Direction	Purpose	Distance	Direction	Purpose
Nearest	None identified within 1km			None identified within 1km		
Nearest Public Water Supply	None identified within 1km			None identified within 1km		
Source Protection Zone	The site does not lie within a designated Surface Water Protection Zone.					
Data sourced from Envirocheck report						

Table Six: Nearest Surface and Groundwater Abstractions

2.3 Site History

Date	Review of Map – Description of Land Use at Site and in the Immediate Surrounding Area	Potentially Contaminative Land-use	
		On-site	Off-site
1872-1873	The site is shown undeveloped and part of a field. The northern site boundary is formed by High Street. To the north of the site, beyond High Street, are a number of buildings labelled 'The Smelt' (~30m) with an old colliery beyond (~100m). There are a number of 'old shafts - coal and iron' shown within a raised area of mining spoil. Further old shafts are marked to the west and north east (>250m). To the north and west are residential properties and a chapel.	None identified	Coal and iron mine to the north, with associated smelt / smithy
1899	No significant changes.		
1912	No changes to the site, which remains undeveloped. The building to the north of the site is now labelled as a smithy. Residential development of the area to the south and east is now shown.		
1938	[10:000 scale map only] The site is shown developed, with a single building shown in the centre of the plot. There are no significant changes to the surrounding area which remains predominantly residential. The site area remains marked as 'The Smelt'.		
1954	[10:000 scale map only] No significant changes.		
1964 /8	The site is shown as a garage, with a large central building shown. The immediate surrounding area to the south and west has been developed with residential properties. Residential properties are also present to the immediate north east and south east of the site, along High Street. Further residential development is shown to the east.	Garage / petrol station use	Builder's Yard to the north.
1979	The site remains shown as a garage and a canopy is now visible extending from the main building towards High Street. The garage also appears to have been extended slightly to the south. The area to the north and north east (former colliery) has been developed for residential housing, with a builders yard marked off High Street to the immediate north.		
1984/1993	No significant changes visible at the site. The surrounding area continues to be developed for residential use. The builders yard remains marked to the north.		

Table Seven: Historical Maps Review

Date	Application reference	Local Planning Authority – Planning Records (obtained from local planning authority web-site)	Development Approved?
10/02/2012	P/2012/0098	Installation of new refrigeration plant unit and ATM	Granted
2009 - 2016	Various	Various applications for signage	Granted

Table Eight: Summary of Planning Records2.4 Additional Information

Flood Risk Zone	Flood Risk	Data Source
Zone 1	The site is not located in an area considered to be at risk from flooding from rivers, the sea or from reservoir failure. The site is not located in an area considered to be at risk from surface water flooding.	Natural Resources Wales website

Table Nine: Preliminary Flood Risk Assessment

Risk	Description	Data Source
Radon Risk	The site is located in an area where the National Radiological Protection Board have determined that between 10-30% houses exceed the recommended Action Level for radon for existing homes in the UK of 200Bqm ⁻³ (averaged over a year). Radon protective measures are therefore likely to be required in the construction of new dwellings or extensions.	Envirocheck report / UK Radon interactive map
Nearest Landfill	Natural Resources Wales records show that there are no current or past landfill sites within 250m of the site. The site is therefore unlikely to be at-risk of impact from elevated concentrations of hazardous ground gases that are commonly associated with landfill sites e.g. methane or carbon dioxide. As such we do not consider monitoring or assessment are required as part of any future investigation works and no special precautions are likely required to prevent landfill gas infiltration into the current building or future developments at the site.	Envirocheck report / Natural Resources Wales
Risk of Coal Mining	The site is located in an area that is considered to be at potential risk from coal mining. We have been provided with a copy of a Coal Mining Report obtained for the site on behalf of the Coop. The Coal Authority does not consider the site to be in a surface area at risk from underground past or present mining activity, however the property is in an area where coal could be at or close to the surface. This coal may have been worked at some time in the past. The site does not lie within a defined 'development high risk area' and there are no historical mine shafts within 20m of the site boundary. There have not been any claims made to the Coal Authority relating to mining related ground subsidence.	Coal Authority

Table Ten: Landfill, Radon Gas and Coal Mining Risk

3 Investigation Results

3.1 Summary of Site Walkover and review of Petroleum Register

Item	Details	Data		
General Site Information	Buildings	The main site building comprises a brick built structure with a pitched roof. The structure is single storey at the front, with 2 storeys at the rear. The building was in fair condition during our inspection with a number of cracks noted in the brickwork.		
	Canopy	The canopy covers the central dispensing forecourt and was in good condition at the time of our inspection. The canopy clearance height was 3.6m.		
	Site Pavement	The dispensing forecourt area is paved mostly with concrete hard standing. This was in poor condition with many scars and cracks noted across the forecourt as well as staining around the dispensing pumps. Near the site entrance, the forecourt is paved with tarmac which was in fair to poor condition, particularly around manhole chamber lids where the tarmac has begun to degrade. Towards the site exit, the forecourt is block paved and in average condition. The block paving was not sealed and in some cases gaps between the blocks were visible. The rest of the site was covered in tarmac or concrete hard standing, found in fair condition generally. Maintenance was noted in a number of areas across the site around drain and manhole chamber lids .		
Review of Petroleum Installation	Tank information	The Petroleum Licence for the site is issued by Wrexham County Council, with an expiry date shown as the 31 st July 2017.		
		There are five known underground storage tanks, all located in the southern end of the site. We understand that the site was last redeveloped during 1988, but the tanks may have been installed prior to this (information from site manager). In summary:		
		Tank	Contents	Capacity
		One	Unleaded	17,460 litres
		Two	Diesel	34,920 litres
		Three	Disused - decommissioned?	
		Four	Supreme Diesel	17,460 litres
	Five	Unleaded	34,920 litres	
	Tank fills, tank construction, tank testing	The operational tanks (Tank One, Two, Four, and Five) are filled via above ground, offset, fill points located adjacent to the shop building wall. Records suggest the tanks are constructed from single skin steel. There are no records of the tanks being integrity tested. Tank Three is present to the east of the shop building. During our inspection there were no signs that the tank had been permanently decommissioned (no foam / concrete present in the access chambers), but not currently in use.		

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Item	Details	Data
Review of Petroleum Installation	Tank access chambers	Tank access chambers were constructed from brick or concrete. These were found in average condition on the day of our inspection; all found silty with rubble in some of the chambers. Chambers to Tanks One and Three had standing water with a sheen, and there was no visible foam around the cable ducts in the chamber to Tank Two. Rust was visible around the pipework in all chambers.
	Offset fill points	The offset fills were located on a raised concrete curb area adjacent to Tank Five, next to the shop building. Although there was no staining visible around the offset fill points, there was no dedicated drainage or bunding in place around the offset fill points. The offset fills were labelled and locked.
	Fuel supply lines	The underground utilities survey indicated that the fuel supply pipework is constructed from single skin steel. There are no site records relating to any fuel line inspections.
	Pump Islands	There are four pump islands under the central canopy, comprising raised concrete curbs with a tiled surface. The pump islands were in good condition, with no significant cracks in the concrete, but some staining around the pumps.
	Dispensers	Two pump islands contained dual facing, triple nozzle, pump dispensers, while the other two islands contained dual facing double nozzle dispensers. These were in reasonable condition. We understand the pumps were installed in 1993.
	Vents	The vents are located immediately behind the offset fill points. They were all labelled and in good condition. There was no vent labelled to the disused tank - Tank Three.
	Vapour recovery	Vapour recovery systems are active at the site. The vapour recovery system was last tested in November 2016 by Eurotank Environmental Ltd.
Site Drainage	Wet-stock reconciliation	Tank contents are monitored using a Veeder Root TLS 350R system with wet-stock data monitored off-site by third party wet-stock specialist (Fairbanks Environmental Ltd).
	Surface water drainage and discharges	Surface water from the central forecourt area drains to a three stage site interceptor at the north western part of the site via a series of drainage gullies. These are present along the front of the forecourt and in front of the shop. The surface water drainage system at the site appeared to be in poor condition at the time of our visit, with gullies heavily silted and the interceptor blocked. We noted hydrocarbon product in several of the forecourt gullies. There is no dedicated drainage gully around the offset fill point and surface water in this area of the site appears to flow toward the jet wash. We noted the jet wash silt trap was blocked and we were unable to determine the discharge route for drainage from this area of the site. We understand from site staff, that the jet wash drain is always full/flooded and this is due to collapsed drains at the adjacent property.

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Item	Details	Data
Site Drainage	Forecourt interceptor	The forecourt interceptor is a three chamber vented interceptor constructed from GRP. We completed a visual inspection of the chambers. In summary: ➤ Chamber 1 - In poor condition. ~20mm layer of hydrocarbon product covered the entire surface of the chamber. ➤ Chamber 2 - In poor condition. A thin layer of product was visible on the water surface. ➤ Chamber 3 - In average condition. Hydrocarbon sheen noted on the water surface. The interceptor drains in to the foul system which is was blocked at the time of our site visit. Site records indicate that the interceptor was last emptied by John Rome in May 2016.
	Other interceptors	We were unable to determine the discharge route from the jet wash interceptor as this was flooded at the time of our inspection. Interviews with site personnel suggested that the former arrangement of the site included a car wash, which stood in the location of the current shop building. During our walkover within the shop, a number of scars and inconsistencies were noted in the groundwork and it is possible there is a second 'car wash' interceptor underneath the shop.
Site Drainage	Foul	The foul water from the site building discharges to a combined sewer travelling off-site in a north west direction. The main site foul drain is reportedly blocked due to a collapsed drain at the adjacent property.
Other Information	Reported Leaks or Losses	Based on the Fairbanks wet-stock monitoring data we reviewed in the site records, there have been couple of anomalous wet-stock reports (October 2016 -2.69% / April 2016 -8.9%) where readings for diesel did not correlate with sales. There was no explanation of the result given or any corrective action undertaken. The site manager advised that there have not been any significant spills at the site in the past 2 years.
	Abandoned Tanks	The site has been a garage / petrol station since at least the 1960s and we understand that the current petroleum installation dates from before 1988. Given the age of the site we consider it is possible that there could be further abandoned tanks remaining under the forecourt.

Table Eleven: Site Walkover

Item	Details
Petroleum Officer Data Search	The Petroleum Officer provided details regarding the existing petroleum installation at the site, although information held on file was limited. The details received have been summarised in our walkover notes above.

Table Twelve: Information Provided by Petroleum Officer

3.2 Details of our Investigation

Item	Details	Data
Service Clearance	Underground utilities survey	We have carried out a survey using radio detection methods of utilities buried underneath the site. Our survey was suitable for identifying power cables, metallic fuel pipework, surface water and foul water drainage. The technique that we used is unable to detect any plastic pipework or fibre optic cabling present. The results of our survey are included in Attachment Two. We also contacted the various utility providers for information regarding the location of mains services in the site vicinity.
	Service Clearance	Prior to drilling all boreholes locations were subject to a final service check using a Cable Avoidance Tool (CAT) scanner.
Drilling	Drilling method	We completed our investigation between the 6 th and 7 th February 2017 using our Geoprobe direct-push drilling rig.
	Borehole details	We drilled five boreholes to a maximum depth of 7.2m below ground level. Borehole locations are provided in the figure included in Attachment Two.
	Monitoring wells	Three of the five boreholes were completed as groundwater monitoring wells (BH1, BH4 and BH5) to a maximum of 7.2 m depth. We encountered two existing wells at the site (denoted MW1 and MW2), although one of these (MW2) could not be accessed as the holding bolts were rusted shut.
Sampling procedures	Soil	Representative soil samples were recovered from each borehole in sealed liners and logged on site by a suitably qualified technician.
	Groundwater	We returned to the site to complete groundwater monitoring on the 14 th February 2017. Prior to sampling, resting groundwater levels were recorded using an oil / water interface probe. Samples were collected, using disposable bailers, once purging of standing water had been completed.
	Drinking water supply	We obtained a sample of the sites drinking water from the shop building for screening chemical analysis.
	Sample preservation	Sub-samples were preserved in glass jars or bottles and stored in cool boxes during transportation to the laboratory for subsequent analysis.

Table Thirteen: Drilling and Sampling Methodologies

Target / Rationale For Specific Borehole Locations	Location				
	BH1	BH2	BH3	BH4	BH5
Below ground tank farm			✓	✓	✓
Forecourt - fuel pumps / lines			✓	✓	
Forecourt interceptor	✓		✓		
Jet wash					✓
General site coverage	✓	✓			✓

Table Fourteen: Borehole Strategy

3.3 Site Geology

Item	Details		Data							
Geology encountered	Layer I	Made Ground	SOFT to FIRM dark brown or black gravelly CLAY OR MEDIUM DENSE brown clayey GRAVEL with occasional large brick fragments.							
Geology encountered	Layer II	Glacial Till	FIRM to STIFF orange brown grey mottled CLAY with frequent fine gravel							
	Layer III	Lower Pennine Coal Measures	STIFF to VERY STIFF grey brown friable sandy CLAY OR WEAK to MODERATELY WEAK grey highly weathered MUDSTONE with occasional bands of black coal measures and sub-angular grey gravel.							
Borehole	One		Two		Three		Four		Five	
Soil layer	from	to	from	to	from	to	from	to	from	to
Layer I	0.2	1.0	0.2	1.3	0.2	0.9	0.2	1.2	0.2	0.5
Layer II	1.0	2.5	1.3	2.2	-	-	1.2	3.9	0.5	2.7
Layer III	2.5	>6.0	2.2	>6.0	0.9	>5.0	3.9	>6.0	2.7	>7.2

All dimensions in metres below ground level

Table Fifteen: Soil Stratigraphy3.4 Groundwater Monitoring Data

Location	Groundwater Strike (mbgl)	Groundwater Rest Level (mbgl)	Permeability
BH1	~4.0	5.940	Insufficient groundwater encountered in the well to allow sampling for chemical analysis.
BH4	No Strike	5.023	Limited groundwater encountered. Permeability of 0.0288m/day recorded (low).
BH5	~1.8	3.344	Ground water encountered in the well during monitoring visit. Permeability of 0.000529m/day recorded (very low).
MW1	-	2.772	Slow recharge of groundwater noted in well following purging.
MW2	-	-	Unable to access well.
Groundwater Flow Direction		Based on our monitoring data, we have not been able to determine a definitive groundwater flow direction under the site	

Note: m bgl denotes metres below ground level

Table Sixteen: Groundwater Monitoring Data

3.5 Visual and Olfactory Signs of Hydrocarbon Contamination

Location	Soil	Groundwater
BH1	None identified	None noted.
BH2	None identified	Dry - no well installed.
BH3	Hydrocarbon odour noted in Made Ground	Dry - no well installed.
BH4	None identified	Hydrocarbon sheen noted.
BH5	None identified	None noted.
MW1	-	None noted.
MW2	-	Unable to access well

Table Seventeen: Visual and Olfactory Signs of Hydrocarbon Contamination

4 Chemical Analysis Results

4.1 Chemical Analysis Rationale

Analysis	Rationale	No of samples	
		Soil	Water
Total petroleum hydrocarbons (TPH) reported by carbon range	Representative of compounds present in petrol, diesel and lube oils	8	-
Total petroleum hydrocarbons (TPH) reported by carbon range and with aromatic and aliphatic speciation	Representative of compounds present in petrol, diesel and lube oils but with additional information regarding composition of contaminant source.	5	3
Benzene, toluene, ethylbenzene and xylenes (BTEX)	Representative of compounds present in petrol	4	3
Drinking water screen - analysis of tap water sample for TPH and BTEX	To verify quality of water supply	-	1
Polycyclic aromatic hydrocarbons (PAH)	Representative of compounds present in diesel and lube oil	5	3
Metals and Asbestos Screen	Representative of compounds commonly encountered in imported Made Ground.	5	-
Total Organic Carbon (TOC)	Site-specific data used within risk assessment process	3	-
Sulphates and pH	For use in identifying hazardous ground conditions that could impact on the proposed redevelopment.	2	3
Waste Acceptance Criteria (WAC) suite	To assist with the classification of soils for future offsite disposal		
The results of our environmental analysis are summarised in the tables below. Certificates for all chemical analysis completed are included in Attachment Three.			

Table Eighteen: Schedule of Analysis

4.2 Soil Analysis

Total Petroleum Hydrocarbon (TPH) – Reported by Carbon Band	Sample Details and result (mg/kg)							
	BH1	BH2	BH2	BH3	BH3	BH3	BH4	BH5
	3.6m	2.8m	4.8m	1.2m	2.8m	4.2m	5.0m	6.0m
C ₈₋₁₀ TPH Band	<0.5	<0.5	<0.5	7.44	1.13	<0.5	<0.5	<0.5
>C ₁₀₋₁₂ TPH Band	<0.5	<0.5	<0.5	3.03	0.892	<0.5	<0.5	<0.5
>C ₁₂₋₁₆ TPH Band	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.698
>C ₁₆₋₂₁ TPH Band	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
>C ₂₁₋₃₅ TPH Band	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Table Nineteen: TPH Analysis Results – Soil

Total Petroleum Hydrocarbon (TPH) – Reported by Carbon Band		Sample Details and Concentration (mg/kg)				
		BH1	BH2	BH3	BH4	BH5
		2.3m	3.7m	0.3m	1.6m	2.5m
Aliphatic Fraction	C ₆₋₈	<2.5	<2.5	12.3	<2.5	<2.5
	>C _{8-C10}	<2.5	<2.5	9.45	<2.5	<2.5
	>C _{10-C12}	<2.5	<2.5	148	<2.5	<2.5
	>C _{12-C16}	<5	<5	46.2	<5	<5
	>C _{16-C21}	<5	<5	15.2	<5	<5
	>C _{21-C35}	<10	<10	<10	<10	<10
Aromatic Fraction	C ₆₋₈	<1	<1	2.47	<1	<1
	>C _{8-C10}	<1	<1	16.8	<1	<1
	>C _{10-C12}	<1	<1	151	<1	<1
	>C _{12-C16}	<2.5	<2.5	19.5	<2.5	<2.5
	>C _{16-C21}	<2.5	<2.5	<2.5	2.68	<2.5
	>C _{21-C35}	<2.5	<2.5	<2.5	4.71	<2.5

Table Twenty: TPH Analysis (ali/aro) Results – Soil

MTBE, BTEX Compounds and Volatile TPH	Sample Details and Result (mg/kg)			
	BH2	BH3	BH4	BH5
	2.0m	0.3m	4.5m	2.5m
MTBE	<0.5	2.41	<0.5	<0.5
Benzene	<0.1	<0.1	<0.1	<0.1
Toluene	<0.1	2.23	<0.1	<0.1
Ethylbenzene	<0.1	1.02	<0.1	<0.1
p+m Xylene	<0.1	2.66	<0.1	<0.1
o Xylene	<0.1	1.02	<0.1	<0.1
C6-C8	<0.5	14.7	<0.5	<0.5
>C8-C10	<0.5	26.1	<0.5	<0.5
>C10-C12	<0.5	21.3	<0.5	<0.5

Table Twenty-one: MTBE, BTEX and Volatile TPH Analysis Results – Soil

Polycyclic Aromatic Hydrocarbon (PAH) Compound	Sample Details and Result (mg/kg)				
	BH1	BH2	BH3	BH4	BH5
	1.2m	1.3m	1.8m	1.1m	6.0m
Naphthalene	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	< 0.1	0.13	< 0.1	0.13	< 0.1
Anthracene	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	< 0.1	0.31	< 0.1	0.4	< 0.1
Pyrene	< 0.1	0.28	< 0.1	0.44	< 0.1
Benzo(a)anthracene	< 0.1	0.14	< 0.1	0.32	< 0.1
Chrysene	< 0.1	< 0.1	< 0.1	0.26	< 0.1
Benzo(b)fluoranthene	< 0.1	0.16	< 0.1	0.65	< 0.1
Benzo(k)fluoranthene	< 0.1	< 0.1	< 0.1	0.2	< 0.1
Benzo(a)pyrene	< 0.1	< 0.1	< 0.1	0.44	< 0.1
Indeno(1,2,3-cd)pyrene	< 0.1	< 0.1	< 0.1	0.42	< 0.1
Dibenzo(ah)anthracene	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	< 0.1	< 0.1	< 0.1	0.32	< 0.1
Total PAHs	< 1.6	< 1.6	< 1.6	3.6	< 1.6

Table Twenty-two: PAH Analysis Results – Soil

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Inorganic Element	Sample Details				
	BH1	BH2	BH3	BH4	BH5
	0.5m	0.5m	1.2m	0.5m	0.6m
Arsenic	7	13	13	11	19
Barium	58	138	42	157	107
Beryllium	< 0.5	0.8	0.5	1.3	0.9
Boron (Water Soluble)	< 1	2.9	< 1	1	3.2
Cadmium	2.4	6.8	< 0.2	29.1	2.9
Chromium	9	11	16	11	10
Chromium (Hexavalent)	< 2	< 2	< 2	< 2	< 2
Copper	16	34	15	50	32
Lead	1,860	943	154	891	1,020
Mercury (Total)	< 1	< 1	< 1	< 1	< 1
Nickel	9	13	10	20	13
Selenium	< 3	< 3	< 3	< 3	< 3
Vanadium	11	18	23	20	19
Zinc	992	1,450	51	4,810	525

Table Twenty-three: Heavy Metals Analysis Results – Soil

Analyte	Sample Details				
	BH1	BH2	BH3	BH4	BH5
	0.5m	0.5m	1.2m	0.5m	0.6m
Asbestos Screen	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected

Table Twenty-four: Asbestos Screening Analysis Results – Soil

Total Organic Carbon (TOC) Content	Sample Details and Results		
	BH1	BH2	BH5
	4.3m	1.3m	7.0m
Total Organic Carbon (TOC) %	0.1	2.3	1.4
Soil Organic Carbon (SOM)%*	0.2	3.9	2.4

* - SOM = Soil Organic Matter. Assumed to comprise 58% TOC - calculated as (TOC) x 1.72

Table Twenty-five: Total Organic Carbon Analysis Results - Soil Samples

4.3 Geotechnical Laboratory Testing - Soil Sampling

Rationale	No of soil samples/tests
Unconsolidated Undrained Triaxial Test: provides the undrained shear strength of cohesive soils.	3
Atterberg Limits: provides information about the plasticity of a cohesive soil.	3
The results of our geotechnical field testing are included on the relevant borehole logs.	

Table Twenty-six: Schedule of Analysis

Analyte	Unit	Sample Details		
		BH5	BH5	BH5
		2.0m	3.2m	3.7m
Bulk Density	Mg/m ³	2.27	2.18	2.16
Dry Density	Mg/m ³	1.97	1.96	1.84
Moisture Content	%	15	11	17
Axial Strain	%	16.2	4.02	13.1
Undrained Shear Strength	kN/m ²	77	160	117

Table Twenty-seven: UU Triaxial Test Results

Analyte	Sample Details and Results (%)		
	BH4	BH5	BH5
	2.5m	1.2m	5.0m
Liquid Limit	50	37	41
Plastic Limit	23	19	19
Moisture Content	24	15	11
Passing 425um Sieve	77	74	100

Table Twenty-eight: Atterberg Test Results

4.4 Groundwater Analysis

Total Petroleum Hydrocarbon (TPH) – Reported by Carbon Band		Sample Details and Concentration (µg/l)		
		BH4	BH5	MW1
		5.0m	3.3m	2.8m
Aliphatic Fraction	C ₆₋₈	<50	<50	<50
	>C ₈ -C ₁₀	<50	<50	<50
	>C ₁₀ -C ₁₂	<50	<50	<50
	>C ₁₂ -C ₁₆	79.3	<50	<50
	>C ₁₆ -C ₂₁	1,810	<50	<50
	>C ₂₁ -C ₃₅	47,800	<50	<50
Aromatic Fraction	C ₆₋₈	<50	<50	<50
	>C ₈ -C ₁₀	<50	<50	<50
	>C ₁₀ -C ₁₂	<50	<50	<50
	>C ₁₂ -C ₁₆	1,810	<50	<50
	>C ₁₆ -C ₂₁	169	<50	<50
	>C ₂₁ -C ₃₅	6,800	<50	<50

Table Twenty-nine: TPH Analysis (ali/aro) Results – Groundwater

MTBE, BTEX Compounds and Volatile TPH Groups	Sample Details and Concentration (µg/l)		
	BH4	BH5	MW1
	5.0m	3.3m	2.8m
MTBE	<50	<50	<50
Benzene	<10	<10	<10
Toluene	<10	<10	<10
Ethyl-benzene	<10	<10	<10
p+m Xylene	<10	<10	<10
o Xylene	<10	<10	<10
TPH C ₆₋₈	<50	<50	<50
TPH >C ₈ -C ₁₀	<50	<50	<50
TPH >C ₁₀ -C ₁₂	<50	<50	<50

Table Thirty: MTBE, BTEX and Volatile TPH Results – Groundwater

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Polycyclic Aromatic Hydrocarbon (PAH) Compound	Sample Details and Concentration (µg/l)		
	BH4	BH5	MW1
Naphthalene	<0.01	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01
Acenaphthene	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01
Benzo(a)anthracene	<0.01	<0.01	<0.01
Chrysene	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	<0.01	<0.01	<0.01
Benzo(a)pyrene	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	<0.01	<0.01	<0.01
Dibenzo(ah)anthracene	<0.01	<0.01	<0.01
Benzo(ghi)perylene	<0.01	<0.01	<0.01
Total PAHs	<0.16	<0.16	<0.16

Table Thirty-one: PAH Analysis Results – Groundwater4.5 Drinking Water Supply Analysis

Total Petroleum Hydrocarbon (TPH), MTBE and BTEX Compounds	Concentration (µg/l) – Tap Sample (Site Shop)
>C ₈ -C ₁₀	<10
>C ₁₀ -C ₁₂	<10
>C ₁₂ -C ₁₆	<10
>C ₁₆ -C ₂₁	<10
>C ₂₁ -C ₃₅	<10
MTBE	<5
Benzene	<1
Toluene	<5
Ethyl-benzene	<5
p+m Xylene	<5
o Xylene	<5

Table Thirty-two: BTEX and MTBE Analysis Results – Tap Sample

5 Conceptual Site Model

5.1 Summary of Investigation Findings

Details	Data
Geology and hydrogeology	We have proved the underlying geology to comprise a variable layer of Made Ground material to a maximum depth of 1.3m, generally overlying a thin layer of stiff grey brown mottled clay with frequent fine gravel that we interpreted to comprise Glacial Till. Underlying the Till we encountered more friable clay or highly weathered grey brown mudstone with occasional coal fragments that we interpreted as units of the Lower Pennine Coal Measures. This was proved to a maximum depth of 7.2m. We encountered groundwater strikes in three of our boreholes at variable depths, ranging between 1.8m and 4.0m. Two boreholes were dry on completion. Resting groundwater levels were recorded between 2.7m and 5.9m depths. We consider the groundwater we encountered to comprise water perched within more sandy or gravelly horizons in the underlying clay. Our investigation data suggests there is no continuous groundwater table under the site. Based on our monitoring data, we have not been able to determine a definitive groundwater flow direction.
Surface water features	As anticipated. No additional data obtained from site.
Site users and neighbours	As anticipated. Residential properties in all directions.
Identified contaminants	We have identified low concentrations of petrol range hydrocarbons in shallow Made Ground and underlying shallow soils in BH3. No detectable hydrocarbons were identified in deeper soil samples from BH3, however. Low concentrations of waste oil range hydrocarbons were identified in a single soil sample from BH4. We detected trace concentrations of various PAH compounds in soil samples obtained from BH2 and BH4. Given the presence of coal fragments in the underlying soils we consider it likely the source of the PAHs identified could well be coal. Elevated concentrations of lead were identified in underlying shallow Made Ground recovered from BH1, BH2, BH4 and BH5. Elevated concentrations of zinc were also reported from BH2 and BH4. We have not detected asbestos fibres in any of the shallow soil (predominantly Made Ground) samples that were screened. Elevated concentrations of hydrocarbons, generally consistent with waste oil and possibly weathered diesel, were identified in the groundwater sample collected from BH4. No detectable hydrocarbons were identified in the other groundwater samples obtained (BH5 and MW1).

Table Thirty-three: Summary of Investigation Findings

5.2 Conceptual Site Model

Contaminant	Pathway	Receptor	Viable Pollutant Linkage?
Low concentrations of total petroleum hydrocarbons identified in two soil samples only. Trace concentrations of PAHs recorded in shallow Made Ground from two borehole locations. Elevated concentrations of waste oil / diesel range fuels identified in groundwater sample recovered from BH4. No other detectable concentrations of hydrocarbons identified other groundwater samples.	Ingestion and dermal contact	Site workers	No - site covered with hard standing; this will act as a barrier and mitigate risk of impact
	Permeation of volatile hydrocarbons into drinking water supply service pipes		No - we have not identified detectable hydrocarbon concentrations in drinking water samples collected from the site
	Volatilisation of contaminants to indoor/outdoor air (either direct from soils or dissolved in groundwater)		Unlikely - only isolated low concentrations of hydrocarbons identified in soils. Low volatility waste oil range hydrocarbons identified in one groundwater sample only .
	Off-site migration of contaminants: volatilisation to indoor/outdoor air (vapours from on-site soils or via lateral migration of dissolved compounds)	Residential properties adjacent to the site	No - Only low concentrations of hydrocarbons identified in underlying soils, predominantly present in shallow Made Ground. Underlying geology predominantly clay and this will limit potential migration of contaminants. No consistent groundwater table identified under the site and therefore no active migration pathway present.
	Downward migration of contaminants to groundwater	Glacial Till - Unproductive Strata. Pennine Lower Coal Measures classified as Secondary (Class A) Aquifer	
	Off-site migration of contaminants dissolved in groundwater leading to direct impact of environmental receptors	River Clywedog - ~230m W No at risk groundwater or surface water abstractions identified.	

Table Thirty-four: Possible Pollutant Linkages

Item	Data
Has our qualitative assessment confirmed that a viable pollutant linkage(s) exist at the site?	Yes
We therefore do not consider further (quantitative) risk assessment to be required at this time. See below for our conclusions and any recommendations relating to the data produced during our investigation.	

Table Thirty-five: Results of Qualitative Risk Assessment

6 Generic Quantitative Risk Assessment

6.1 Summary of Viable Pollutant Linkages to be Assessed

Receptor		Viable Pollutant Linkages Requiring Further Assessment
Human Health	Commercial	Yes
	Residential	No - No continuous groundwater present and therefore no active migration pathway considered present.
Environmental	Surface Water Feature	
	Groundwater Resource	

Table Thirty-six: Summary of Viable Pollutant Linkages

6.2 Generic Acceptance Criteria – Methodologies

Receptor	Generic Risk Assessment Methodology: Human Health
Soil	Generic Acceptance Criteria (GAC) for contaminants in soil have been produced by a number of organisations. We have selected GACs from the following sources in order of preference: ➤ The Environment Agency, in the form of Soil Guideline Values (SGV); ➤ Land Quality Management Ltd (in conjunction with the Chartered Institute of Environmental Health) in the form of Suitable 4 Use Levels (S4UL)¹; and by ➤ Contaminated Land: Applications in Real Environments (CL:AIRE) (in conjunction with the Association of Geotechnical and Geoenvironmental Specialists (AGS) and Environmental Industries Commission (EIC). ➤ Defra (research project SP1010) Category 4 Screening Levels (C4SLs). When selecting GACs we have taken into account site conditions. For example SGVs have been published for SOM of 6% only, so on a site with 1% SOM we have used LQM S4ULs for 1% SOM in preference to the EA SGV for 6% SOM. GACs have been produced for a range of standard land uses: residential (with / without produce), allotments, commercial and public open spaces (residential / parks). For the purpose of this assessment we have considered all potential risks associated with typical retail filling station end use. As the filling station site is covered in hard standing we have excluded from our assessment contaminants where the vapour inhalation pathway contributed less than 1% of total exposure (see LQM/CIEH report) as we consider there to be no significant risk from the pathway. Excluded contaminants include metals and some PAHs. [¹Note: Copyright Land Quality Management Ltd reproduced with permission; Publication Number S4UL3461. All rights reserved].

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Receptor	Generic Risk Assessment Methodology: Human Health
Groundwater	No GACs have been published by regulators for groundwater with respect to the risk to human health. In order to allow us to screen for impacts to human health from impacted groundwater we have generated GACs using the BP RISC software. The CLEA software is not suitable for generating GACs for groundwater, however CLEA parameters have been used where possible within the RISC software. The calculated criteria for hydrocarbon compounds, other than benzene, exceed the relevant solubility limits. The risk assessment trigger level for these compounds can be considered free-phase product (i.e. neat fuel).
Full details of the derivation of our GACs are available on request.	

Table Thirty-seven: GACs: Methodology: Human Health Receptors

Generic Risk Assessment Assumptions
In carrying out our risk assessment we have adhered to the following assumptions: ➤ Contaminants of concern for our risk assessment for soil and/or groundwater are limited to those listed in the tables below. ➤ The results of the chemical analyses carried out on soil and groundwater samples have been used to determine concentrations of these contaminants at the site. ➤ Generic Assessment Criteria for total petroleum hydrocarbons carbon bands is based upon lowest value from published/calculated aliphatic and aromatic concentrations. ➤ The GAC for our assessment of xylene in soil is an average of those published for o-xylene, m-xylene and p-xylene.

Table Thirty-eight: Generic Acceptance Criteria: Assumptions

6.3 Human Health Assessment

Contaminant		Maximum concentration recorded in soil (mg/kg)	GAC for SOM of 2.5% (mg/kg)	Source of GAC	Does maximum concentration exceed GAC?
			Commercial Land Use		Commercial Land Use
TPH C ₈₋₁₀	Aliphatic	9.45	4,800 **	LQM CIEH S4UL	No
	Aromatic	16.8	8,100 **		No
TPH C ₁₀₋₁₂	Aliphatic	148	23,000 **		No
	Aromatic	151	28,000*		No
TPH C ₁₂₋₁₆	Aliphatic	46.2	82,000*		No
	Aromatic	19.5	37,000		No
TPH C ₁₆₋₃₅	Aliphatic	15.2	1,700,000		No
TPH C ₁₆₋₂₁	Aromatic	2.68	28,000		No
TPH C ₂₁₋₃₅	Aromatic	4.71	28,000		No

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Contaminant	Maximum concentration recorded in soil (mg/kg)	GAC for SOM of 2.5% (mg/kg)	Source of GAC	Does maximum concentration exceed GAC?
		Commercial Land Use		Commercial Land Use
Benzene	<0.1	47	LQM CIEH S4UL	No
Toluene	2.23	110,000 **		No
Ethylbenzene	1.02	13,000 **		No
Xylene	2.66	14,000		No
Acenaphthene	< 0.1	97,000*		No
Acenaphthylene	< 0.1	97,000*		No
Anthracene	< 0.1	640,000		No
Fluorene	< 0.1	68,000		No
Naphthalene	< 0.1	460*		No
Phenanthrene	0.13	22,000		No

Note: * GAC exceeds solubility saturation limit

**GAC exceeds vapour saturation limit

Table Thirty-nine: Results of Generic Risk Assessment - Human Health/Soil

Contaminant	Maximum Concentration Recorded in Groundwater (µg/l)	Generic Acceptance Criteria (µg/l) - Commercial End Use	Does Maximum Concentration Exceed Commercial GAC?
Benzene	<10	210,000	No
Toluene	<10	Free-phase	No
Ethylbenzene	<10	Free-phase	No
Xylene	<10	Free-phase	No
Total Petroleum Hydrocarbons	58,468	Free-phase	No - No free phase hydrocarbons identified in the single impacted well.

Table Forty: Generic Risk Assessment: Human Health – Groundwater

7 Conclusions and Recommendations

Conclusions
The results of our environmental assessment indicate the following: ➤ The site is located in an area of low to moderate environmental sensitivity with respect to underlying groundwater and nearby surface water receptors. The underlying Glacial Till (present as a relatively thin layer of clay only) is classified as Unproductive Strata and the underlying Lower Pennine Coal Measures unit is classified as a Secondary A Aquifer. There is River Clywedog ~230m to the south west. There are residential properties to the immediate south, east and west. ➤ The site has been used as a petrol station and/or garage since at least the early 1960s and possibly from as early as the 1930s. We understand that the site was last redeveloped during 1988, although the current tanks may pre-date this development. ➤ We have proved the underlying geology to comprise a variable layer of Made Ground material to a maximum depth of 1.3m, generally overlying a thin layer of stiff grey brown mottled clay with frequent fine gravel that we interpreted to comprise Glacial Till. Underlying the Till we encountered more friable clay or highly weathered grey brown mudstone with occasional coal fragments that we interpreted as units of the Lower Pennine Coal Measures. This was proved to a maximum depth of 7.2m. ➤ We encountered groundwater strikes in three of our boreholes at variable depths, ranging between 1.8m and 4.0m. Two boreholes were dry on completion. Resting groundwater levels were recorded between 2.7m and 5.9m depths. We consider the groundwater we encountered to comprise water perched within more sandy or gravelly horizons in the underlying clay. ➤ Our investigation data suggests there is no continuous groundwater table under the site. Based on our monitoring data, we have not been able to determine a definitive groundwater flow direction. ➤ We have identified low concentrations of petrol range hydrocarbons in shallow Made Ground and underlying shallow soils in BH3. No detectable hydrocarbons were identified in deeper soil samples from BH3, however. Low concentrations of waste oil range hydrocarbons were identified in a single soil sample from BH4. ➤ We detected trace concentrations of various PAH compounds in soil samples obtained from BH2 and BH4. Given the presence of coal fragments in the underlying soils we consider it likely the source of the PAHs identified could well be coal. ➤ Elevated concentrations of lead were identified in underlying shallow Made Ground recovered from BH1, BH2, BH4 and BH5. Elevated concentrations of zinc were also reported from BH2 and BH4. We have not detected asbestos fibres in any of the shallow soil (predominantly Made Ground) samples that were screened. ➤ Elevated concentrations of hydrocarbons, generally consistent with waste oil and possibly weathered diesel, were identified in the groundwater sample collected from BH4. No detectable hydrocarbons were identified in the other groundwater samples obtained (BH5 and MW1). ➤ The results of our Generic Quantitative Risk Assessment indicates that the concentrations of hydrocarbons identified in underlying soils and groundwater do not pose a potential long-term risk to future commercial site users. We do not consider offsite residential or environmental receptors to be at significant risk as we have not identified an active migration pathway from the site. On this basis, we consider the site to be suitable for continued commercial use.

Table Forty-one: Conclusions

Recommendations	
We make the following recommendations relating to the site:	
➤	As with any petrol filling station, additional areas of hydrocarbon impacted soil may be encountered during redevelopment works. In particular these include areas we have been unable to investigate due to the restrictions of working on an operational filling station (i.e. site buildings, petroleum installation and services). We therefore recommend that verification sampling of excavations be undertaken during the site demolition and decommissioning works to confirm no additional contamination is present.
➤	In order to further investigation the source of the identified waste oil impact in BH4, we recommend that additional soil sampling be completed in this area of the site during the decommissioning works. In the event that localised hydrocarbon impact is identified, we recommend that additional remedial excavation of impacted soils is undertaken to remove the source of the identified impact.
➤	As with any former petrol station site, in order to ensure no potential risks are posed to future site users, we recommend that future buildings are constructed with a hydrocarbon vapour barrier membrane in the floor slab. This will break any potential migration pathway for volatile contaminants to migrate to indoor air.
➤	Hydrocarbons present in shallow soils can permeate standard PVC water supply pipework and leach into drinking water leading to tainting and in extreme cases can pose a risk to human health. We have identified hydrocarbons in soil and water samples. We recommend that water supply pipework be constructed from a hydrocarbon impervious material (e.g. ductile steel or plastic/aluminium composite) and installed within clean fill material as precautionary measure and to protect from possible future impact.
Your attention is drawn to the Notice to Interested Parties included as Attachment One.	

Table Forty-two: Recommendations

8 Recommendations for Redevelopment Works

Based on our site investigation data, we make a number of recommendations relating to temporary works and construction issues at the site. These are contained in the following table.

Item	Details
Side slope stability	Foundation excavations are likely to be formed within shallow granular Made Ground or variable layers of clay overlying weathered mudstone. Excavations should therefore remain stable for short periods without support or being battered back. We recommend that a detailed inspection of the side slopes be carried out in order to assess fully any support measures required.
Foundations in soft ground	We recommend that Made Ground be replaced with suitably compacted inert fill material in the vicinity of proposed foundations to ensure a suitable bearing capacity.
Piling (sheets) into Dense/Hard Ground	We encountered weathered bedrock (Lower Pennine Coal Measures units) from around between 0.9m and 2.5m depths under the site. We were able to construct a borehole to a maximum depth of 7.2m using direct-push drilling methods. We consider driven sheet piles are likely to penetrate the underlying soils to sufficient depth to form a support measure for the tank farm excavation, although localised mudstone horizons could be present. Consideration of alternative support measures is recommended.

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Continued

Item	Details	
Piling (sheets) into Dense/Hard Ground	We encountered weathered bedrock (Lower Pennine Coal Measures units) from around between 0.9m and 2.5m depths under the site. We were able to construct a borehole to a maximum depth of 7.2m using direct-push drilling methods. We consider driven sheet piles are likely to penetrate the underlying soils to sufficient depth to form a support measure for the tank farm excavation, although localised mudstone horizons could be present. Consideration of alternative support measures is recommended.	
De-watering	(Perched) Groundwater was encountered in three of the boreholes we installed at depths ranging from 2.7m to 5.9m below ground level, with two boreholes remaining dry on completion. Recorded permeability of underlying soils was generally low. We consider de-watering of excavations for the new tank farm and interceptors (excavations below ~3m) may be required. Please note, however, that seasonal fluctuations in groundwater level due to extended periods of heavy rain may lead to the presence of groundwater being present at shallow depths under the site.	
Treatment of Wastewater Prior to Discharge	We have identified hydrocarbon impact of underlying groundwater in one borehole (BH4). Any waste water encountered in the vicinity of the existing tank farm or interceptor will require treatment prior to disposal or be removed from site by tanker and disposed of appropriately.	
Waste classification	Chemical analysis results indicate excavated soils that are sent to landfill are likely to be classified as:	Non-hazardous to Hazardous (lead concentrations).
	As with any petrol filling station site areas of soil with greater concentrations of hydrocarbon impact (or other potential contaminants) may be encountered during redevelopment works and lead to a higher classification. We recommend that we classify all potentially impacted soils prior to disposal. All waste soils and fill materials must be disposed of at an appropriately licensed disposal site. A registered waste haulage contractor must transport all waste soils. It is the responsibility of the site owner to ensure that wastes are safely transported and disposed of correctly.	
Asbestos in Made Ground	We undertook asbestos screening of the Made Ground samples, which did not identify any asbestos fragments or fibres. It is possible, but unlikely, that buried asbestos containing material could be encountered in Made Ground.	
Additional below ground tanks	The site has been a filling station and garage for several decades. It is therefore The site has been a garage / petrol station since at least the 1960s and we understand that the current petroleum installation dates from before 1988. Given the age of the site we consider it is possible that there could be further abandoned tanks remaining under the forecourt.	
Protection of construction workers	Construction and maintenance workers, particularly those working on below ground utilities, should be made aware of the potential for hydrocarbon impacted soil, should they encounter it. It is good policy to enforce strict hygiene practices during any below ground works. To minimise potential exposure of workers to potential hydrocarbon contaminants, site clothing should be removed after each working period. A clean area should be made available with washing facilities for use after each shift. Changing and washing areas should be positioned to ensure that no field equipment enters the clean area. Eating, drinking and smoking should be restricted to the clean area.	

Table Forty-three: Temporary Works and Construction Issues

Petrol Coedpoeth, Coedpoeth

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13 Triangle Business Park, Wendover Road
Stoke Mandeville, Bucks HP22 5BL

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**ATTACHMENT ONE:
NOTICE TO INTERESTED PARTIES**

Client: The Co-operative Group Ltd

Report	CP17129 CL 001
Date	March 2017
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NOTICE TO INTERESTED PARTIES

The purpose of our site assessment is to provide general information on the environmental and/or geotechnical conditions existing at the site and related to soil and/or groundwater. The Client or others specified the scope of the investigation and the validity of our conclusions is limited by the scope of work specified. We are not responsible for any such limitations or omissions.

Where stated in this report, we have used information supplied by third parties. While we have evaluated as far as possible the validity of this information, we cannot guarantee its accuracy in any way whatsoever.

No investigation technique is capable of completely identifying all of the contaminants that might be present in the soil or groundwater under a site. Where specified in our report, we have examined the ground by constructing a number of boreholes and/or trial pits. We recovered samples of soil and/or groundwater from available exposures.

The depth and spacing of our Sampling locations were selected to ensure with a reasonable probability that they would be representative of the actual conditions across the whole site. However, safety considerations relating to existing site infrastructure may have restricted our ability to investigate all potential contaminant sources. Specifically, we were unable to investigate the soil and groundwater condition immediately adjacent to the underground structures and/or buried services. These limitations must be borne in mind when considering the conclusions reached in this report.

Soil is intrinsically variable and the spread of contaminants within the soil is therefore subject to a degree of non-uniformity. For these reasons no sampling technique can completely eliminate the possibility of obtaining samples that are not representative of the actual conditions. Our sampling techniques are intended to reduce the possibility to an acceptable level, within the limits imposed by the scope of the investigation.

Groundwater levels and soil vapour levels that we report were accurate at the time of the investigation. Groundwater and soil vapour levels are variable. Long term monitoring may be required to ensure that the levels recorded during our investigation are representative of long term and possible 'worst case' conditions. In accepting our recommendations and/or conclusions the Client acknowledges that further, more detailed investigation would allow a more accurate assessment of site conditions to be made and that this would reduce any consequential risk to the Client.

This investigation was carried out to assess the significance of contamination resulting from use of the site as identified in this report. Unless we have indicated otherwise, no assessment of the potential impact of any other previous uses has been made. No investigation was carried out to determine whether or not any deleterious or hazardous materials (such as asbestos) have been used in the construction of the buildings present on the site. Unless otherwise stated no investigation or assessment has been made of the presence or otherwise of invasive plant species including but not limited to Japanese Knotweed.

We do not accept any responsibility for the cost of remedial works or other costs incurred in whatever way whatsoever as a result of any omissions, errors or other shortcomings in this report unless we have been given reasonable opportunity to verify ourselves that such faults exist and we have been given a reasonable opportunity to carry out works to remedy such faults ourselves using the most practicable means available to us. We do not accept liability for any consequential losses incurred by you while either we or others carry out any remedial works we deem necessary.

This report has been prepared for the Client, as specified on the cover page of this report. In accepting our recommendations and/or conclusions the Client accepts that the terms of our appointment were as detailed in the Proposal, or Proposals, that we provided to the Client before being appointed and that these terms supersede any other terms and/or conditions set out in any contracts agreed between ourselves and the Client, regardless of when such terms and/or conditions were agreed and/or signed.

Use of, and reliance on, this report by other third parties will be at such third parties own risk, and we are unable to accept any liability or responsibility to third parties.

Neither the whole nor any part of this report, or any reference to it, may be included in any published document circular or statement or published in any way without our prior written approval.

This report and its contents, together with any supporting correspondence or other documentation, remain the property of Subadra Consulting Limited until paid for in full.

Client: The Co-operative Group Ltd		Report	CP17129 CL 001
		Date	March 2017
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Petrol Coedpoeth, Coedpoeth

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**ATTACHMENT TWO:
SITE PLAN AND BOREHOLE LOGS**

Client: The Co-operative Group Ltd

Report	CP17129 CL 001
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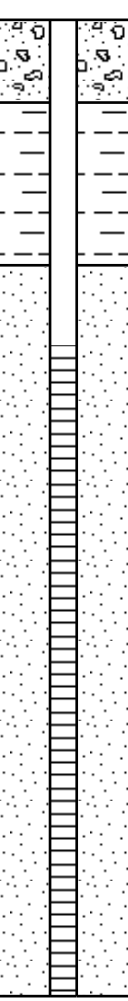
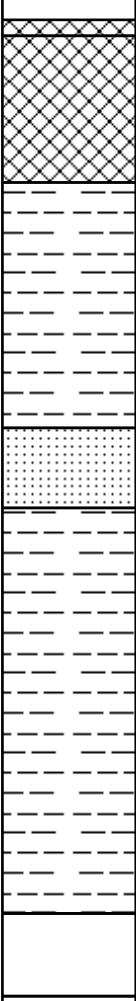
BH1

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13 Triangle Business Park, Wendover Road
Stoke Mandeville, Bucks HP22 5BL
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Project Name	Petrol Coedpoeth, Coedpoeth	Date	6th February 2017
Project Code	CP17129	Ground Level	+100.144m ASD
Drilling Method	Geoprobe	Coordinates	328080 351440

Depth (m)	Well	Water Level	Log	Sample	Chemical Analysis	Geotechnical Analysis	SPT 'N' or Su (kPa)	Description
0		At Rest 2.500m		S1@0.5m	Asb/Metals		Su=36@0.5m	0.0m to 0.1m Made Ground Tarmac.
1				S2@1.2m	PAH		Su=36@1.0m	0.1m to 1.0m Made Ground FIRM to STIFF brown CLAY with brick from 0.2-0.3m.
2				S3@2.3m	TPHCWG		Su=120@1.5m Su=120@1.8m Su=144@2.1m Su=150@2.4m	1.0m to 2.5m Till FIRM to STIFF grey brown CLAY with frequent fine gravel.
3				S4@3.1m			Su=150@2.7m Su=144@3.0m Su=120@3.3m	2.5m to 3.0m Pennine Lower Coal Measures MODERATELY WEAK grey highly weathered SANDSTONE.
4				S5@3.6m	TPH		Su=96@3.8m	3.0m to 5.5m Pennine Lower Coal Measures STIFF grey brown friable CLAY with frequent fine gravel.
5				S6@4.3m	TOC		Su=120@4.5m Su=24@5.0m	
6				S7@5.5m			Su=72@5.5m	5.5m to 6.0m Pennine Lower Coal Measures WEAK black COAL.
7								
8								



Well Diameter	23mm	Depth of Borehole	6.00m
Well Casing	2.00m	Depth to Groundwater	2.5m
Well Screen	4.00m	Logged By	WA

BH2

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Tel. 01296 739400 Email: consultants@subadra.com

Project Name	Petrol Coedpoeth, Coedpoeth	Date	6th February 2017
Project Code	CP17129	Ground Level	
Drilling Method	Geoprobe	Coordinates	328080 351440

Depth (m)	Well	Water Level	Log	Sample	Chemical Analysis	Geotechnical Analysis	SPT 'N' or Su (kPa)	Description
0		Dry						0.0m to 0.1m Made Ground Tarmac.
1				S1@0.5m	Asb/Metals		Su=72@0.8m	0.1m to 1.3m Made Ground MEDIUM DENSE grey GRAVEL with firm brown black clay fill and red brick bands.
2				S2@1.3m	PAH/TOC		Su=72@1.4m	1.3m to 2.2m Till FIRM to STIFF light brown mottled grey CLAY with frequent fine gravel.
3				S3@2.0m	BTEX		Su=84@1.8m	
4				S4@2.8m	TPH		Su=96@2.5m Su=96@2.8m Su=120@3.2m	2.2m to 6.0m Pennine Lower Coal Measures STIFF to VERY STIFF grey CLAY with frequent fine gravel. Coal band at 5.8m - 5.85m.
5				S5@3.7m	TPHCWG		Su=144@3.8m Su=150@4.3m Su=150@5.0m Su=150@5.5m	
6				S6@4.8m	TPH			
7				S7@5.6m				
8								

 Prism.NET www.prismerp.co.uk	Well Diameter	No well	Depth of Borehole	6.00m
	Well Casing		Depth to Groundwater	
	Well Screen		Logged By	WA

BH3

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13 Triangle Business Park, Wendover Road
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Project Name	Petrol Coedpoeth, Coedpoeth	Date	6th February 2017
Project Code	CP17129	Ground Level	
Drilling Method	Geoprobe	Coordinates	328080 351440

Depth (m)	Well	Water Level	Log	Sample	Chemical Analysis	Geotechnical Analysis	SPT 'N' or Su (kPa)	Description
0		Dry		S1@0.3m	BTEX/TPHCWG/WAC		Su=48@0.5m	0.0m to 0.1m Made Ground Block Paving.
1				S2@1.2m	Asb/Metals/TPH		Su=72@1.0m Su=98@1.3m	0.1m to 0.9m Made Ground MEDIUM DENSE brown medium to fine sub-angular GRAVEL with firm brown clay.
2				S3@1.8m	PAH		Su=120@1.8m	0.9m to 5.0m Pennine Lower Coal Measures STIFF grey brown CLAY with frequent fine gravel. From 3.8m Clay becomes more stiff and friable.
3				S4@2.8m	TPH		Su=120@2.6m	
4				S5@3.5m			Su=120@3.5m	
5				S6@4.2m	TPH			
6				S7@5.0m				
7				S8@5.5m				
8								

 Prism.NET www.prismerp.co.uk	Well Diameter	No well	Depth of Borehole	5.00m
	Well Casing		Depth to Groundwater	
	Well Screen		Logged By	WA

BH4

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13 Triangle Business Park, Wendover Road
Stoke Mandeville, Bucks HP22 5BL
Tel. 01296 739400 Email: consultants@subadra.com

Project Name	Petrol Coedpoeth, Coedpoeth	Date	7th February 2017
Project Code	CP17129	Ground Level	+100.016m ASD
Drilling Method	Geoprobe	Coordinates	328080 351440

Depth (m)	Well	Water Level	Log	Sample	Chemical Analysis	Geotechnical Analysis	SPT 'N' or Su (kPa)	Description
0								0.0m to 0.1m Made Ground Tarmac.
				S1@0.5m	Asb/Metals			0.1m to 0.3m Made Ground Concrete.
1				S2@1.1m	PAH		Su=98@1.2m	0.3m to 1.2m Made Ground FIRM brown CLAY.
				S3@1.6m	TPHCWG		Su=120@1.5m	1.2m to 2.4m Till
2							Su=120@1.8m	FIRM to STIFF brown mottled grey slightly sandy CLAY with frequent fine gravel.
				S4@2.5m			Su=120@2.1m	
							Su=120@2.4m	
3							Su=144@2.7m	2.4m to 3.9m Till
							Su=98@3.0m	STIFF brown mottled grey CLAY with frequent fine gravel.
				S5@3.7m			Su=144@3.3m	
							Su=144@3.6m	
4							Su=150@3.9m	3.9m to 6.0m Pennine Lower Coal Measures
				S6@4.5m	BTEX			WEAK grey brown highly weathered MUDSTONE. Clay grading to highly weather MUDSTONE with COAL MEASURES present from 4.0m - 4.2m and 4.7m - 4.9m.
5		At Rest 5.100m		S7@5.0m	BTEX/PAH/ pH/SO4/ TPHCWG			
				S8@5.8m				
6								
7								
8								

 Prism.NET www.prismerp.co.uk	Well Diameter	23mm	Depth of Borehole	6.00m
	Well Casing	3.00m	Depth to Groundwater	5.1m
	Well Screen	3.00m	Logged By	WA

BH5

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13 Triangle Business Park, Wendover Road
Stoke Mandeville, Bucks HP22 5BL
Tel. 01296 739400 Email: consultants@subadra.com

Project Name	Petrol Coedpoeth, Coedpoeth	Date	7th February 2017
Project Code	CP17129	Ground Level	+100.567m ASD
Drilling Method	Geoprobe	Coordinates	328080 351440

Depth (m)	Well	Water Level	Log	Sample	Chemical Analysis	Geotechnical Analysis	SPT 'N' or Su (kPa)	Description
0								0.0m to 0.3m Made Ground Concrete.
1				S1@0.6m	Asb/Metals		Su=76@0.6m Su=98@0.8m	0.3m to 0.5m Made Ground FIRM black gravelly CLAY.
2		Strike 1.800m		S2@1.2m		Att	Su=98@1.2m	0.5m to 2.7m Till STIFF orange brown mottled grey slightly sandy CLAY with frequent fine gravel.
3				S3@1.5m	WAC			
4				S4@2.0m		UU(1)	Su=120@2.0m	
5				S5@2.5m	BTEX/TPHCWG		Su=120@2.4m	
6				S6@3.2m		UU(1)		2.7m to 4.0m Pennine Lower Coal Measures STIFF grey friable CLAY with frequent fine gravel. Highly weathered MUDSTONE present as friable grey CLAY.
7				S7@3.7m	BTEX/PAH/ pH/SO4/ TPHCWG	UU(1)		
8		At Rest 5.000m		S8@5.0m		Att/pH/ SO4		4.0m to 7.2m Pennine Lower Coal Measures MODERATELY WEAK grey highly weathered MUDSTONE. With COAL MEASURES present from 4.0m - 4.6m.
9				S9@6.0m	PAH/TPH			
10				S10@7.0m	TOC			



Well Diameter	23mm	Depth of Borehole	7.20m
Well Casing	3.00m	Depth to Groundwater	5.0m
Well Screen	4.20m	Logged By	WA

Petrol Coedpoeth, Coedpoeth

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**ATTACHMENT THREE:
CHEMICAL ANALYSIS CERTIFICATES**

Client: The Co-operative Group Ltd

Report

CP17129 CL 001

Date

March 2017

Page

Attachment Three - 1

Report No 02674



E: lab@astanalysis.co.uk T: 01296 739 423
13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project Name	Petrol Coedpoeth, Coedpoeth	Sampled	7th February 2017
Project Code	CP17129	Report Approved By	 Duty Reporting Manager
Sample Type	Soil		

Soil - TPH Banded - 16th February 2017

Analyte	Unit	Method Detection Limit	Sample Details									
			BH1	BH2	BH2	BH3	BH3	BH3	BH4	BH5		
			S5	S4	S6	S2	S4	S6	S7	S9		
			3.6m	2.8m	4.8m	1.2m	2.8m	4.2m	5.0m	6.0m		
C8-10 TPH Band	mg/kg	0.5	<0.5	<0.5	<0.5	7.44	1.13	<0.5	<0.5	<0.5		
>C10-12 TPH Band	mg/kg	0.5	<0.5	<0.5	<0.5	3.03	0.892	<0.5	<0.5	<0.5		
>C12-16 TPH Band	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.698		
>C16-21 TPH Band	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
>C21-35 TPH Band	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		

	Notes:	Method: IH QM:E9.5 based on TNRCC 1005 by GC-FID
		1. MCerts 2. UKAS 17025 3. Analysis subcontracted

	Chain of Custody No	14385	Analysed	KC 16/02/2017
	Received	DB 13/02/2017	Reported	KC 16/02/2017
	Prepared		Page	One of One

Report No 02720



E: lab@astanalysis.co.uk T: 01296 739 423
13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project Name	Petrol Coedpoeth, Coedpoeth	Sampled	7th February 2017
Project Code	CP17129	Report Approved By	<i>Katharine Oak</i>
Sample Type	Soil		Duty Reporting Manager

Soil - TPH Ali-Aro - 23rd February 2017

Analyte	Unit	Method Detection Limit	Sample Details									
			BH1	BH2	BH3	BH4	BH5					
			S3	S5	S1	S3	S5					
			2.3m	3.7m	0.3m	1.6m	2.5m					
C6-8 Aliphatic TPH	mg/kg	NA	<2.5	<2.5	12.3	<2.5	<2.5					
>C8-10 Aliphatic TPH	mg/kg	NA	<2.5	<2.5	9.45	<2.5	<2.5					
>C10-12 Aliphatic TPH	mg/kg	NA	<2.5	<2.5	148	<2.5	<2.5					
>C12-16 Aliphatic TPH	mg/kg	NA	<5	<5	46.2	<5	<5					
>C16-21 Aliphatic TPH	mg/kg	NA	<5	<5	15.2	<5	<5					
>C21-35 Aliphatic TPH	mg/kg	NA	<10	<10	<10	<10	<10					
C6-8 Aromatic TPH	mg/kg	NA	<1	<1	2.47	<1	<1					
>C8-10 Aromatic TPH	mg/kg	NA	<1	<1	16.8	<1	<1					
>C10-12 Aromatic TPH	mg/kg	NA	<1	<1	151	<1	<1					
>C12-16 Aromatic TPH	mg/kg	NA	<2.5	<2.5	19.5	<2.5	<2.5					
>C16-21 Aromatic TPH	mg/kg	NA	<2.5	<2.5	<2.5	2.68	<2.5					
>C21-35 Aromatic TPH	mg/kg	NA	<2.5	<2.5	<2.5	4.71	<2.5					

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	Notes:	Method: IH: QM E9.5 based on TNRCC 1005 by GC-FID
		1. MCerts 2. UKAS 17025 3. Analysis subcontracted

	Chain of Custody No	14386	Analysed	
	Received	DB 13/02/2017	Reported	KC 23/02/2017
	Prepared		Page	One of One

Report No 02670



E: lab@astanalysis.co.uk T: 01296 739 423
13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project Name	Petrol Coedpoeth, Coedpoeth	Sampled	7th February 2017
Project Code	CP17129	Report Approved By	<i>Katharine Clark</i> Duty Reporting Manager
Sample Type	Soil		

Soil - BTEX and MTBE - 16th February 2017

Analyte	Unit	Method Detection Limit	Sample Details									
			BH2	BH3	BH4	BH5						
			S3	S1	S6	S5						
			2.0m	0.3m	4.5m	2.5m						
MTBE ²	mg/kg	0.5	<0.5	2.41	<0.5	<0.5						
Benzene ²	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1						
Toluene ²	mg/kg	0.1	<0.1	2.23	<0.1	<0.1						
Ethylbenzene ²	mg/kg	0.1	<0.1	1.02	<0.1	<0.1						
p+m Xylene ²	mg/kg	0.1	<0.1	2.66	<0.1	<0.1						
o Xylene ²	mg/kg	0.1	<0.1	1.02	<0.1	<0.1						
C6-C8 ²	mg/kg	0.5	<0.5	14.7	<0.5	<0.5						
>C8-C10 ²	mg/kg	0.5	<0.5	26.1	<0.5	<0.5						
>C10-C12 ²	mg/kg	0.5	<0.5	21.3	<0.5	<0.5						

	Notes:	Method: IH QM:E9.4 based on US EPA 5021 by GC-FID
		1. MCerts 2. UKAS 17025 3. Analysis subcontracted

	Chain of Custody No	14387	Analysed	KC 16/02/2017
	Received	DB 13/02/2017	Reported	KC 16/02/2017
	Prepared		Page	One of One

Report No 02743



E: lab@astanalysis.co.uk T: 01296 739 423
13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project Name	Petrol Coedpoeth, Coedpoeth	Sampled	7th February 2017
Project Code	CP17129	Report Approved By	
Sample Type	Soil		

Soil - PAHs - 28th February 2017

Analyte	Unit	Method Detection Limit	Sample Details									
			BH1	BH2	BH3	BH4	BH5					
			S2	S2	S3	S2	S9					
			1.2m	1.3m	1.8m	1.1m	6.0m					
Naphthalene ^{2,3}	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1					
Acenaphthylene ^{2,3}	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1					
Acenaphthene ^{2,3}	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1					
Fluorene ^{2,3}	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1					
Phenanthrene ^{2,3}	mg/kg	0.1	< 0.1	0.13	< 0.1	0.13	< 0.1					
Anthracene ^{2,3}	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1					
Fluoranthene ^{2,3}	mg/kg	0.1	< 0.1	0.31	< 0.1	0.40	< 0.1					
Pyrene ^{2,3}	mg/kg	0.1	< 0.1	0.28	< 0.1	0.44	< 0.1					
Benzo(a)anthracene ^{2,3}	mg/kg	0.1	< 0.1	0.14	< 0.1	0.32	< 0.1					
Chrysene ^{2,3}	mg/kg	0.1	< 0.1	< 0.1	< 0.1	0.26	< 0.1					
Benzo(b)fluoranthene ^{2,3}	mg/kg	0.1	< 0.1	0.16	< 0.1	0.65	< 0.1					
Benzo(k)fluoranthene ^{2,3}	mg/kg	0.1	< 0.1	< 0.1	< 0.1	0.20	< 0.1					
Benzo(a)pyrene ^{2,3}	mg/kg	0.1	< 0.1	< 0.1	< 0.1	0.44	< 0.1					
Indeno(1,2,3-cd)pyrene ^{2,3}	mg/kg	0.1	< 0.1	< 0.1	< 0.1	0.42	< 0.1					
Dibenzo(ah)anthracene ^{2,3}	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1					
Benzo(ghi)perylene ^{2,3}	mg/kg	0.1	< 0.1	< 0.1	< 0.1	0.32	< 0.1					
Total PAHs ^{2,3}	mg/kg	2	< 1.6	< 1.6	< 1.6	3.6	< 1.6					



Notes:

Method: Speciated EPA16 PAHs

1. MCerts
2. UKAS 17025
3. Analysis subcontracted



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Chain of Custody No	14388	Analysed	
Received	DB 13/02/2017	Reported	KC 28/02/2017
Prepared		Page	One of One

Report No 02740



E: lab@astanalysis.co.uk T: 01296 739 423
13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project Name	Petrol Coedpoeth, Coedpoeth	Sampled	7th February 2017
Project Code	CP17129	Report Approved By	
Sample Type	Soil		

Soil - Metals - CLEA Suite Plus Chromium VI - 28th February 2017

Analyte	Unit	Method Detection Limit	Sample Details									
			BH1	BH2	BH3	BH4	BH5					
			S1	S1	S2	S1	S1					
			0.5m	0.5m	1.2m	0.5m	0.6m					
Arsenic ^{2,3}	mg/kg	0	7	13	13	11	19					
Barium ^{2,3,3}	mg/kg	10	58	138	42	157	107					
Beryllium ^{2,3,3,3}	mg/kg	1	< 0.5	0.8	0.5	1.3	0.9					
Boron (Water Soluble) ^{2,3,3,3,3}	mg/kg	1	< 1	2.9	< 1	1.0	3.2					
Cadmium ^{2,3}	mg/kg	0	2.4	6.8	< 0.2	29.1	2.9					
Chromium ^{2,3}	mg/kg	0	9	11	16	11	10					
Chromium (Hexavalent) ^{2,3,3}	mg/kg	2	< 2	< 2	< 2	< 2	< 2					
Copper ^{2,3}	mg/kg	0	16	34	15	50	32					
Lead ^{2,3}	mg/kg	0	1860	943	154	891	1020					
Mercury (Total) ^{2,3,3}	mg/kg	1	< 1	< 1	< 1	< 1	< 1					
Nickel ^{2,3}	mg/kg	0	9	13	10	20	13					
Selenium ^{2,3,3}	mg/kg	3	< 3	< 3	< 3	< 3	< 3					
Vanadium ^{2,3,3,3}	mg/kg	0	11	18	23	20	19					
Zinc ^{2,3}	mg/kg	0	992	1450	51	4810	525					

Notes:

Method: CLEA metals suite plus Chromium(VI)

1. MCerts
2. UKAS 17025
3. Analysis subcontracted



Chain of Custody No	14384	Analysed	
Received	DB 13/02/2017	Reported	KC 28/02/2017
Prepared		Page	One of One

Report No 02741



E: lab@astanalysis.co.uk T: 01296 739 423
13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project Name	Petrol Coedpoeth, Coedpoeth	Sampled	7th February 2017
Project Code	CP17129	Report Approved By	
Sample Type	Soil		

Soil - Asbestos Screen - 28th February 2017

Analyte	Unit	Method Detection Limit	Sample Details									
			BH1	BH2	BH3	BH4	BH5					
			S1	S1	S2	S1	S1					
			0.5m	0.5m	1.2m	0.5m	0.6m					
Asbestos Screen ^{2,3}	N/a		Not Detected	Not Detected	Not Detected	Not Detected	Not Detected					

	Notes:	Method: Asbestos screen
		1. MCerts 2. UKAS 17025 3. Analysis subcontracted

 Prism.NET www.prismerp.co.uk	Chain of Custody No	14383	Analysed	
	Received	DB 13/02/2017	Reported	KC 28/02/2017
	Prepared		Page	One of One

Report No 02742



E: lab@astanalysis.co.uk T: 01296 739 423
13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project Name	Petrol Coedpoeth, Coedpoeth	Sampled	7th February 2017
Project Code	CP17129	Report Approved By	
Sample Type	Soil		

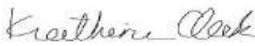
Soil - TOC - 28th February 2017

Analyte	Unit	Method Detection Limit	Sample Details									
			BH1	BH2	BH5							
			S6	S2	S10							
			4.3m	1.3m	7.0m							
TOC ^{2,3}	%	0	0.1	2.3	1.4							

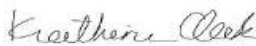
	Notes:	Method: Total organic carbon
		1. MCerts 2. UKAS 17025 3. Analysis subcontracted

 Prism.NET www.prismerp.co.uk	Chain of Custody No	14389	Analysed	
	Received	DB 13/02/2017	Reported	KC 28/02/2017
	Prepared		Page	One of One

E: lab@astanalysis.co.uk T: 01296 739 423
13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Waste Acceptance Criteria Analytical Certificate - BS EN 12457/2																																	
Report No:		17-14390		Landfill Waste Acceptance Criteria Limits <table border="1"> <thead> <tr> <th>Inert Waste Landfill</th> <th>Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill</th> <th>Hazardous Waste Landfill</th> </tr> </thead> <tbody> <tr> <td>3%</td> <td>5%</td> <td>6%</td> </tr> <tr> <td>--</td> <td>--</td> <td>10%</td> </tr> <tr> <td>6</td> <td>--</td> <td>--</td> </tr> <tr> <td>1</td> <td>--</td> <td>--</td> </tr> <tr> <td>500</td> <td>--</td> <td>--</td> </tr> <tr> <td>100</td> <td>--</td> <td>--</td> </tr> <tr> <td>--</td> <td>>6</td> <td>--</td> </tr> <tr> <td>--</td> <td>To be evaluated</td> <td>To be evaluated</td> </tr> </tbody> </table>			Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill	3%	5%	6%	--	--	10%	6	--	--	1	--	--	500	--	--	100	--	--	--	>6	--	--	To be evaluated	To be evaluated
Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill																															
3%	5%	6%																															
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6	--	--																															
1	--	--																															
500	--	--																															
100	--	--																															
--	>6	--																															
--	To be evaluated	To be evaluated																															
Site Reference:		Petrol Coedpoeth																															
Project / Job Ref:		CP17129																															
TP / BH No:	BH/S1	Depth (m)	0.30																														
Sample No:		sCP17129.002015																															
Date Sampled:	07/02/2017	Reporting Date:	01/03/2017																														
Determinand	Unit	MDL																															
TOC ^s	%	< 0.1	2.6																														
Loss on Ignition ^s	%	<0.01	8.2																														
BTEXS	mg/kg	<0.05	2.26																														
Sum of PCBs ^s	mg/kg	<0.7	< 0.1																														
Mineral Oil (C10-C40) ^s	mg/kg	<10	< 10																														
Total PAH ^s	mg/kg	<1.7	< 1.7																														
pH ^s	pH Units	+ / - 0.1	9																														
Acid Neutralisation Capacity ^s	mol/kg (+/-)	<1	<1																														
Eluate Analysis			10:1 mg/l	Converted 10:1 mg/kg	Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg (mg/kg)																												
Arsenic ^s		0.04	0.4	0.5	2	25																											
Barium ^s		0.03	0.3	20	100	300																											
Cadmium ^s		< 0.0005	< 0.005	0.04	1	5																											
Chromium ^s		< 0.005	< 0.05	0.5	10	70																											
Copper ^s		0.01	0.1	2	50	100																											
Mercury ^s		< 0.0005	< 0.01	0.01	0.2	2																											
Molybdenum ^s		0.054	0.54	0.5	10	30																											
Nickel ^s		< 0.007	< 0.07	0.4	10	40																											
Lead ^s		0.048	0.48	0.5	10	50																											
Antimony ^s		0.030	0.30	0.06	0.7	5																											
Selenium ^s		0.006	0.06	0.1	0.5	7																											
Zinc ^s		0.014	0.14	4	50	200																											
Chloride ^s		77	767	800	15000	25000																											
Fluoride ^s		< 0.5	< 5	10	150	500																											
Sulphate ^s		54	543	1000	20000	50000																											
TDS ^s		306	3062	4000	60000	100000																											
Phenol Index ^s		< 0.01	< 0.1	1	-	-																											
DOC ^s		33.6	336	500	800	1000																											
Leach Test Information																																	
Sample Mass (kg)	0.17																																
Dry Matter (%)	54.4																																
Moisture (%)	84																																
Results are expressed on a dry weight basis, after correction for moisture content where applicable. Stated limits are for guidance only and Fast Analysis cannot be held responsible for any discrepancies with current legislation U denotes UKAS accredited test S denotes subcontracted test n.d. Result not determined																																	
Released By			Kate Clark	Laboratory Manager																													

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13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Waste Acceptance Criteria Analytical Certificate - BS EN 12457/2																																	
Report No:		17-14390		Landfill Waste Acceptance Criteria Limits <table border="1"> <thead> <tr> <th>Inert Waste Landfill</th> <th>Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill</th> <th>Hazardous Waste Landfill</th> </tr> </thead> <tbody> <tr> <td>3%</td> <td>5%</td> <td>6%</td> </tr> <tr> <td>--</td> <td>--</td> <td>10%</td> </tr> <tr> <td>6</td> <td>--</td> <td>--</td> </tr> <tr> <td>1</td> <td>--</td> <td>--</td> </tr> <tr> <td>500</td> <td>--</td> <td>--</td> </tr> <tr> <td>100</td> <td>--</td> <td>--</td> </tr> <tr> <td>--</td> <td>>6</td> <td>--</td> </tr> <tr> <td>--</td> <td>To be evaluated</td> <td>To be evaluated</td> </tr> </tbody> </table>			Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill	3%	5%	6%	--	--	10%	6	--	--	1	--	--	500	--	--	100	--	--	--	>6	--	--	To be evaluated	To be evaluated
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3%	5%	6%																															
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500	--	--																															
100	--	--																															
--	>6	--																															
--	To be evaluated	To be evaluated																															
Site Reference:		Petrol Coedpoeth																															
Project / Job Ref:		CP17129																															
TP / BH No:	BH5/S	Depth (m)	1.50																														
Sample No:		sCP17129.002033																															
Date Sampled:	07/02/2017	Reporting Date:	01/03/2017																														
Determinand	Unit	MDL																															
TOC ^s	%	< 0.1	0.8																														
Loss on Ignition ^s	%	<0.01	3.6																														
BTEXS	mg/kg	<0.05	< 0.05																														
Sum of PCBs ^s	mg/kg	<0.7	< 0.1																														
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Total PAH ^s	mg/kg	<1.7	< 1.7																														
pH ^s	pH Units	+ / - 0.1	8.3																														
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Lead ^s		< 0.005	< 0.05	0.5	10	50																											
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Selenium ^s		< 0.005	< 0.05	0.1	0.5	7																											
Zinc ^s		< 0.005	< 0.05	4	50	200																											
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Fluoride ^s		< 0.5	< 5	10	150	500																											
Sulphate ^s		2	15	1000	20000	50000																											
TDS ^s		97	970	4000	60000	100000																											
Phenol Index ^s		< 0.01	< 0.1	1	-	-																											
DOC ^s		23	230	500	800	1000																											
Leach Test Information																																	
Sample Mass (kg)	0.10																																
Dry Matter (%)	91.2																																
Moisture (%)	9.8																																
Results are expressed on a dry weight basis, after correction for moisture content where applicable. Stated limits are for guidance only and Fast Analysis cannot be held responsible for any discrepancies with current legislation U denotes UKAS accredited test S denotes subcontracted test n.d. Result not determined																																	
Released By			Kate Clark	Laboratory Manager																													

E: lab@astanalysis.co.uk T: 01296 739 423
13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Report No:	17-14390
Site Reference:	Petrol Coedpoeth
Project / Job Ref:	CP17129
Date Sampled:	07/02/2017 Reporting Date: 01/03/2017

			Sample Details	
Soil PAHs (EPA 16)	Unit	Detection limit	BH/S1	BH5/S
			0.3m	1.5m
Naphthalene ^s	mg/kg	0.1	0.28	< 0.1
Acenaphthylene ^s	mg/kg	0.1	< 0.1	< 0.1
Acenaphthene ^s	mg/kg	0.1	< 0.1	< 0.1
Fluorene ^s	mg/kg	0.1	< 0.1	< 0.1
Phenanthrene ^s	mg/kg	0.1	< 0.1	< 0.1
Anthracene ^s	mg/kg	0.1	< 0.1	< 0.1
Fluoranthene ^s	mg/kg	0.1	< 0.1	< 0.1
Pyrene ^s	mg/kg	0.1	< 0.1	< 0.1
Benzo(a)anthracene ^s	mg/kg	0.1	< 0.1	< 0.1
Chrysene ^s	mg/kg	0.1	< 0.1	< 0.1
Benzo(b)fluoranthene ^s	mg/kg	0.1	< 0.1	< 0.1
Benzo(k)fluoranthene ^s	mg/kg	0.1	< 0.1	< 0.1
Benzo(a)pyrene ^s	mg/kg	0.1	< 0.1	< 0.1
Indeno(1,2,3,cd)pyrene ^s	mg/kg	0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene ^s	mg/kg	0.1	< 0.1	< 0.1
Benzo(ghi)perylene ^s	mg/kg	0.1	< 0.1	< 0.1
Total	mg/kg	0.1	< 1.6	< 1.6
CLEA Metals				
Arsenic (As) ^s	mg/kg	< 2	7	11
Barium (Ba) ^s	mg/kg	< 5	95	130
Beryllium (Be) ^s	mg/kg	< 0.5	< 0.5	0.8
W/S Boron ^s	mg/kg	< 1	1.5	< 1
Cadmium (Cd) ^s	mg/kg	< 0.2	0.5	0.3
Chromium (Cr) ^s	mg/kg	< 2	8	17
Chromium (hexavalent) ^s	mg/kg	< 2	< 2	< 2
Copper (Cu) ^s	mg/kg	< 4	26	29
Lead (Pb) ^s	mg/kg	< 3	352	141
Mercury (Hg) ^s	mg/kg	< 1	< 1	< 1
Nickel (Ni) ^s	mg/kg	< 3	5	30
Selenium (Se) ^s	mg/kg	< 3	< 3	< 3
Vanadium (V) ^s	mg/kg	< 2	11	15
Zinc (Zn) ^s	mg/kg	< 3	131	71
Asbestos Screen ^s	N/a	N/a	Not Detected	Not Detected

Report No 02765



E: lab@astanalysis.co.uk T: 01296 739 423
13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project Name	Petrol Coedpoeth, Coedpoeth	Sampled	7th February 2017
Project Code	CP17129	Report Approved By	
Sample Type	Soil		

Soil - Water Soluble Sulphate - 1st March 2017

Analyte	Unit	Method Detection Limit	Sample Details									
			BH4	BH5								
			S4	S8								
			2.5m	5.0m								
W/S Sulphate as SO ₄ (2:1) ^{2,3}	mg/l		31	21								

	Notes:	Method: Water soluble sulphate
		1. MCerts 2. UKAS 17025 3. Analysis subcontracted

 Prism.NET www.prismerp.co.uk	Chain of Custody No	14391	Analysed	
	Received	DB 13/02/2017	Reported	KC 01/03/2017
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Report No 02667



E: lab@astanalysis.co.uk T: 01296 739 423
13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project Name	Petrol Coedpoeth, Coedpoeth	Sampled	7th February 2017
Project Code	CP17129	Report Approved By	 Duty Reporting Manager
Sample Type	Soil		

Soil - pH - 15th February 2017

Analyte	Unit	Method Detection Limit	Sample Details									
			BH4	BH5								
			S4	S8								
			2.5m	5.0m								
pH	NA	NA	8.3	8.2								

Notes:

Method: pH analysis of soils

1. MCerts
2. UKAS 17025
3. Analysis subcontracted



Chain of Custody No	14392	Analysed	
Received	DB 13/02/2017	Reported	KC 15/02/2017
Prepared		Page	One of One

Report No 02750



E: lab@astanalysis.co.uk T: 01296 739 423
13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project Name	Petrol Coedpoeth, Coedpoeth	Sampled	7th February 2017
Project Code	CP17129	Report Approved By	
Sample Type	Soil		

Soil - Atterberg Limits - 28th February 2017

Analyte	Unit	Method Detection Limit	Sample Details									
			BH4	BH5	BH5							
			S4	S2	S8							
			2.5m	1.2m	5.0m							
Liquid Limit	%	NA	50	37	41							
Plastic Limit	%	NA	23	19	19							
Moisture Content	%	NA	24	15	11							
Passing 425um Sieve	%	NA	77	74	100							

	Notes:	Method: Atterberg limits
		1. MCerts 2. UKAS 17025 3. Analysis subcontracted

 www.prismerp.co.uk	Chain of Custody No	14393	Analysed	
	Received	DB 13/02/2017	Reported	KC 28/02/2017
	Prepared		Page	One of One

Report No 02766E: lab@astanalysis.co.uk T: 01296 739 423
13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project Name	Petrol Coedpoeth, Coedpoeth	Sampled	7th February 2017
Project Code	CP17129	Report Approved By	
Sample Type	Soil		

Soil - UU Triaxial - Single Stage - 1st March 2017

Analyte	Unit	Method Detection Limit	Sample Details									
			BH5	BH5	BH5							
			S4	S6	S7							
			2.0m	3.2m	3.7m							
Length	mm	NA	76.5	78.2	77.9							
Diameter	mm	NA	37.3	37.6	37.3							
Bulk Density	Mg/m3	NA	2.27	2.18	2.16							
Dry Density	Mg/m3	NA	1.97	1.96	1.84							
Moisture Content	%	NA	15	11	17							
Axial Strain	%	NA	16.16	4.02	13.08							
Undrained Shear Strength	kN/m2	NA	77	160	117							

Notes:

Method: UU Triaxial - Single stage

1. MCerts
2. UKAS 17025
3. Analysis subcontracted



Chain of Custody No	14394	Analysed	
Received	DB 13/02/2017	Reported	KC 01/03/2017
Prepared		Page	One of One

Report No 02773E: lab@astanalysis.co.uk T: 01296 739 423
13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project Name	Petrol Coedpoeth, Coedpoeth	Sampled	14th February 2017
Project Code	CP17129	Report Approved By	
Sample Type	Water		Duty Reporting Manager

Water - TPH Ali-Aro - 1st March 2017

Analyte	Unit	Method Detection Limit	Sample Details									
			BH4	BH5	MW1							
			5.0m	3.3m	2.7m							
C6-8 Aliphatic TPH	ug/l	NA	<50	<50	<50							
>C8-10 Aliphatic TPH	ug/l	NA	<50	<50	<50							
>C10-12 Aliphatic TPH	ug/l	NA	<50	<50	<50							
>C12-16 Aliphatic TPH	ug/l	NA	79.3	<50	<50							
>C16-21 Aliphatic TPH	ug/l	NA	1810	<50	<50							
>C21-35 Aliphatic TPH	ug/l	NA	47800	<50	<50							
C6-8 Aromatic TPH	ug/l	NA	<50	<50	<50							
>C8-10 Aromatic TPH	ug/l	NA	<50	<50	<50							
>C10-12 Aromatic TPH	ug/l	NA	<50	<50	<50							
>C12-16 Aromatic TPH	ug/l	NA	1810	<50	<50							
>C16-21 Aromatic TPH	ug/l	NA	169	<50	<50							
>C21-35 Aromatic TPH	ug/l	NA	6800	<50	<50							

--	--	--



Notes:

Method: IH: QM E9.5 based on TNRCC 1005 by GC-FID

1. MCerts
2. UKAS 17025
3. Analysis subcontracted



Chain of Custody No	14457	Analysed	
Received	DB 20/02/2017	Reported	KC 01/03/2017
Prepared		Page	One of One

Report No 02701



E: lab@astanalysis.co.uk T: 01296 739 423
13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project Name	Petrol Coedpoeth, Coedpoeth	Sampled	14th February 2017
Project Code	CP17129	Report Approved By	<i>Katharine Clark</i> Duty Reporting Manager
Sample Type	Water		

Water - BTEX and MTBE - 23rd February 2017

Analyte	Unit	Method Detection Limit	Sample Details									
			BH4	BH5	MW1							
			5.0m	3.3m	2.7m							
MTBE ²	µg/l	50	<50	<50	<50							
Benzene ²	µg/l	10	<10	<10	<10							
Toluene ²	µg/l	10	<10	<10	<10							
Ethylbenzene ²	µg/l	10	<10	<10	<10							
p+m Xylene ²	µg/l	10	<10	<10	<10							
o Xylene ²	µg/l	10	<10	<10	<10							
C6-C8 ²	µg/l	50	<50	<50	<50							
>C8-C10 ²	µg/l	50	<50	<50	<50							
>C10-C12 ²	µg/l	50	<50	<50	<50							

	Notes:	Method: IH QM:E9.4 based on US EPA 5021 by GC-FID
		1. MCerts 2. UKAS 17025 3. Analysis subcontracted

	Chain of Custody No	14455	Analysed	RC 22/02/2017
	Received	DB 20/02/2017	Reported	KC 23/02/2017
	Prepared		Page	One of One

Report No 02748



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13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project Name	Petrol Coedpoeth, Coedpoeth	Sampled	14th February 2017
Project Code	CP17129	Report Approved By	<i>Katharine Clark</i>
Sample Type	Water		Duty Reporting Manager

Water - PAHs - 1st March 2017

Analyte	Unit	Method Detection Limit	Sample Details									
			BH4	BH5	MW1							
			5.0m	3.3m	2.7m							
Naphthalene	ug/l	NA	<0.01	<0.01	<0.01							
Acenaphthylene	ug/l	NA	<0.01	<0.01	<0.01							
Acenaphthene	ug/l	NA	<0.01	<0.01	<0.01							
Fluorene	ug/l	NA	<0.01	<0.01	<0.01							
Phenanthrene	ug/l	NA	<0.01	<0.01	<0.01							
Anthracene	ug/l	NA	<0.01	<0.01	<0.01							
Fluoranthene	ug/l	NA	<0.01	<0.01	<0.01							
Pyrene	ug/l	NA	<0.01	<0.01	<0.01							
Benzo(a)anthracene	ug/l	NA	<0.01	<0.01	<0.01							
Chrysene	ug/l	NA	<0.01	<0.01	<0.01							
Benzo(b)fluoranthene	ug/l	NA	<0.01	<0.01	<0.01							
Benzo(k)fluoranthene	ug/l	NA	<0.01	<0.01	<0.01							
Benzo(a)pyrene	ug/l	NA	<0.01	<0.01	<0.01							
Indeno(1,2,3-cd)pyrene	ug/l	NA	<0.01	<0.01	<0.01							
Dibenzo(ah)anthracene	ug/l	NA	<0.01	<0.01	<0.01							
Benzo(ghi)perylene	ug/l	NA	<0.01	<0.01	<0.01							
Total PAHs	ug/l	NA	<0.16	<0.16	<0.16							



Notes:

Method: Speciated EPA16 PAHs

1. MCerts
2. UKAS 17025
3. Analysis subcontracted



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Chain of Custody No	14456	Analysed	
Received	DB 20/02/2017	Reported	KC 01/03/2017
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Report No 02708



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13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project Name	Petrol Coedpoeth, Coedpoeth	Sampled	14th February 2017
Project Code	CP17129	Report Approved By	
Sample Type	Water		Duty Reporting Manager

Water - pH - 23rd February 2017

Analyte	Unit	Method Detection Limit	Sample Details									
			BH4	BH5	MW1							
			5.0m	3.3m	2.7m							
pH	NA	NA	6.7	6.7	6.8							

Notes:

Method: pH Analysis

1. MCerts
2. UKAS 17025
3. Analysis subcontracted



Chain of Custody No	14459	Analysed	
Received	DB 20/02/2017	Reported	KC 23/02/2017
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Report No 02709



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13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project Name	Petrol Coedpoeth, Coedpoeth	Sampled	14th February 2017
Project Code	CP17129	Report Approved By	
Sample Type	Water		Duty Reporting Manager

Water - Sulphate - 23rd February 2017

Analyte	Unit	Method Detection Limit	Sample Details									
			BH4	BH5	MW1							
			5.0m	3.3m	2.7m							
Sulphate	mg/L	NA	<60	<60	<60							

Notes:

Method: Sulphate in water analysis

1. MCerts
2. UKAS 17025
3. Analysis subcontracted



Chain of Custody No	14458	Analysed	
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Report No 02698

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13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project Name	Petrol Coedpoeth, Coedpoeth	Sampled	7th February 2017
Project Code	CP17129	Report Approved By	
Sample Type	Water		Duty Reporting Manager

Water - DW BTEX and MTBE - 22nd February 2017

Analyte	Unit	Method Detection Limit	Sample Details									
			Tap									
			0.0m									
MTBE ^{2,3}	ug/l	10	< 10									
Benzene ^{2,3}	ug/l	0	< 1									
Toluene ^{2,3}	ug/l	10	< 5									
Ethylbenzene ^{2,3}	ug/l	10	< 5									
p+m Xylene ^{2,3}	ug/l	10	< 10									
o Xylene ^{2,3}	ug/l	10	< 5									

	Notes:	Method: BTEX and MTBE with low LORs
		1. MCerts 2. UKAS 17025 3. Analysis subcontracted

	Chain of Custody No	14401	Analysed	
	Received	DB 13/02/2017	Reported	KC 22/02/2017
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Report No 02685



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13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Project Name	Petrol Coedpoeth, Coedpoeth	Sampled	7th February 2017
Project Code	CP17129	Report Approved By	 Duty Reporting Manager
Sample Type	Water		

Water - TPH Banded - 23rd February 2017

Analyte	Unit	Method Detection Limit	Sample Details									
			Tap									
			0.0m									
C8-10 TPH Band	µg/l	10	<10									
>C10-12 TPH Band	µg/l	10	<10									
>C12-16 TPH Band	µg/l	10	<10									
>C16-21 TPH Band	µg/l	10	<10									
>C21-35 TPH Band	µg/l	10	<10									

	Notes:	Method: IH QM:E9.5 based on TNRCC 1005 by GC-FID
		1. MCerts 2. UKAS 17025 3. Analysis subcontracted

	Chain of Custody No	14400	Analysed	RC 22/02/2017
	Received	DB 13/02/2017	Reported	KC 23/02/2017
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