

URS

Site Protection Monitoring Programme Review

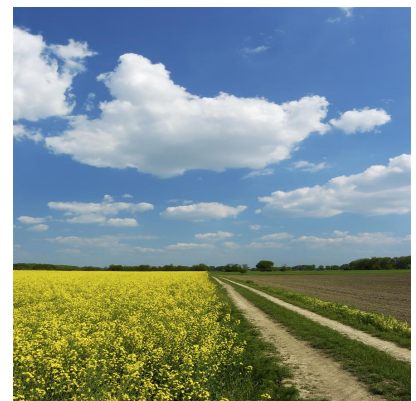
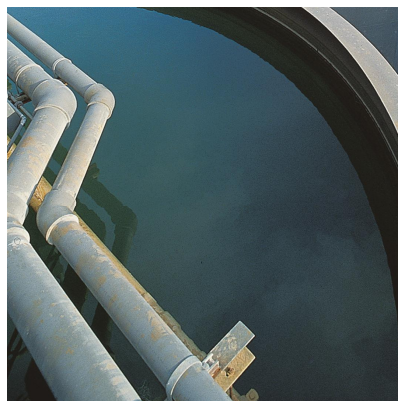
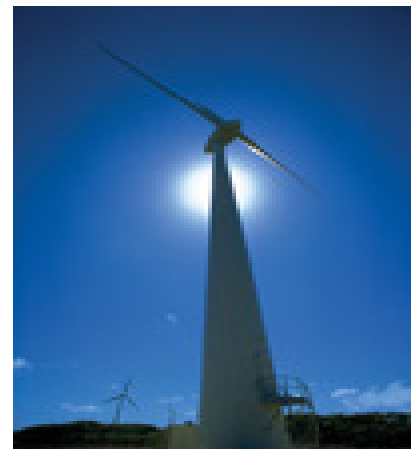
Final Report

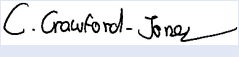


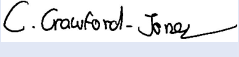


28th January 2015

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Prepared for:
Cabot Carbon Limited

UNITED
KINGDOM &
IRELAND



REVISION SCHEDULE					
Rev	Date	Details	Prepared by	Reviewed by	Approved by
1	15 th January 2015	Draft Report	Ceri Crawford-Jones Project Manager	Joanne Foy Project Director	Mark Webb Associate
					
2	28 th January 2015	Final with amendments to SPMP	Ceri Crawford-Jones Project Manager	Joanne Foy Project Director	Mark Webb Associate
					

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1 INTRODUCTION

1.1 Background

URS Infrastructure & Environment UK Ltd (URS) has been commissioned by Cabot Carbon Limited (“Cabot”) to undertake a review of the existing Site Protection and Monitoring Programme (SPMP) in place at the Barry facility to identify changes required as a result of the Industrial Emissions Directive (IED). The site location is presented in Figure 1.

The original Site Condition Report was prepared in 2005, with the original SPMP being developed during 2006 by URS Corporation Ltd (URS). This report presents a structured review of the risks to soil and groundwater posed by the installation and a review of the SPMP to reflect the requirements of the Industrial Emissions Directive.

1.2 Baseline Data and Subsequent Modifications

During the design of the SPMP in 2006 the site was divided into different zones (Zone 1 to Zone 6) and each zone targeted for different analytical suites. These zones, as later amended are presented in Figure 2 along with monitoring well locations. Since the original SPMP in 2006 the following changes have been made to the groundwater sampling.

The baseline data sampling included general groundwater quality indicators (chemical oxygen demand (COD), biological oxygen demand (BOD), chloride, bromide, nitrate, nitrite, phosphate, sulphate (water and acid soluble) sulphide, pH and alkalinity) and glycols at selected wells which were selected because many of these parameters were identified in Table D1 of the ASR as potential contaminants associated with current and historical operations at the facility. This suite of analytes was undertaken for groundwater samples collected from across the site in an attempt to obtain a representative level of impact at the time of sampling. These compounds would also be used to assess groundwater trends over time to indicate potential failures in the sites pollution prevention infrastructure. Since the collection of the baseline data in 2006 the following changes have been made

- Monitoring frequency:
 - The SPMP was designed to with a requirement for an annual groundwater monitoring round. However, in 2009 Cabot negotiated with the Environment Agency (EA) to reduce the monitoring requirements to a full suite of analysis once every two years. Based on correspondence with the EA, the agreed requirement for 2009 was limited to sampling of two monitoring locations (BH108 and BH110). A full monitoring round was therefore completed in 2010 and 2012. The 2012 report recommended that this bi-annual programme be maintained.
- Analytes:
 - Addition of acidity and sodium in 2011.
- Monitoring Wells:
 - In 2008, monitoring well BH10 was added to the network of wells sampled.

- In 2012 two monitoring wells that had been lost or destroyed were replaced (BH11 with BH11A and BH5 with BH5A).

1.3 **Structure of the SPMP Review**

The SPMP review has included the following sequential elements:

- Review of the site inventory against the relevant hazardous substances list in the IED (Section 2 of this report);
- Assessment of likelihood of pollution by those identified relevant hazardous substances on the basis of the current site infrastructure and the current site monitoring and maintenance programmes (Section 3 of this report);
- Review and update of the existing SPMP (groundwater sampling element) to confirm the monitoring well network and analytes included are appropriate for the release scenarios and receptors identified in the assessment of likelihood of pollution (Section 4 of this report).

2 REVIEW OF RELEVANT HAZARDOUS SUBSTANCES

‘Relevant Hazardous Substances’ are substances or mixtures as defined in Article 3 of European Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures, otherwise known as ‘the CLP Regulation’.

The current site inventory has been reviewed to identify substances which fall under this classification with sufficient quantities stored on site to pose a potential risk to soil and groundwater (e.g. small quantities of maintenance substances have not been included). The site inventory has been supplied to URS by Cabot and has not been independently verified.

The findings of this review are summarised into Table 2.1.

This Table updates table D1 as presented in the original Site Application Site Report.

Table 2.1 – Identification of Relevant Hazardous Substances

Material	Chemical Composition	Handling Area and zone*	Typical Inventory	Toxicity/Environmental Harm	Relevant Hazardous Substance
Mixed Chlorosilane feedstock	SiCl ₄ , SiHCl ₃ (typical but not limited to)	Zone 1: Process building (vapour) Zone 5: Vapouriser and pipe work from DCL (liquid)	No storage - Limited to pipework and process vessel contents.	Harmful. Stable but reacts violently with water to release chlorine gas. Soluble low persistence Flammable Liquid R14 Reacts violently with water. R35 Causes severe burns. R37 Irritating to respiratory system.	No
Silicon Tetrachloride feedstock	Silicon tetrachloride	Zone 1: Process building (vapour) Zone 5 Vapouriser and pipe work from DCL (liquid)	No storage - Limited to pipework and process vessel contents.	Liquid - Hydrolyses in contact with water - No reported environmental risk phrases	No
Hydrogen	H ₂ Gas	Zone 1: Process building pipe work from DCL	No storage - Limited to pipework and process vessel contents.	Gas – no risk to soil or groundwater	No

Table 2.1 – Identification of Relevant Hazardous Substances

Material	Chemical Composition	Handling Area and zone*	Typical Inventory	Toxicity/Environmental Harm	Relevant Hazardous Substance
Sodium Hydroxide	NaOH	Zone 5: Tank Farm, Acid plant	< 55,000 kg 600 kg day tank	This substance may be hazardous to the environment; special attention should be given to water organisms. Soluble. Low persistence. Stable Corrosive R35 - Causes severe burns. Harmful to aquatic life	Yes
Hydrogen Peroxide	H ₂ O ₂	Zone 5: Acid plant	>800 kg	The substance is toxic to aquatic organisms. Miscible in water. Low persistence. Stable Corrosive Oxidising R5 Heating may cause an explosion R8 Contact with Combustible Material may cause fire R20 / 22 Harmful By Inhalation and if swallowed	Yes
Polydimethylsiloxane (PDMS Oil)	Silicone oil	Zone 4: Treated silica plant, chemical storage adjacent to acid plant	3 Totes of 1,000 kg each	Insoluble, stable, persistent, non-volatile. No significant hazard to the environment. Silicone Liquid - Not Hazardous No adverse effects on aquatic organisms	No

Table 2.1 – Identification of Relevant Hazardous Substances

Material	Chemical Composition	Handling Area and zone*	Typical Inventory	Toxicity/Environmental Harm	Relevant Hazardous Substance
Diesel	Highly refined mineral oil	Zone 6: Compound	< 1,500 kg	Negligible solubility. Relatively persistent. Stable. Harmful to aquatic organisms Petroleum Oil - Hydrocarbon	Yes
LPG	Liquified Petroleum Gas – Stored under pressure	Zone 1: North of warehouse	>800kg	Vaporises on release – no risk to soil and groundwater	No
Nalco Stabrex ST40	Alkaline liquid, water bromine NaOH	Zone 5: Water treatment chemicals banded store	<1600 l	Relatively stable, soluble oxidizing biocide. Harmful to aquatic organisms.	Yes
Nalco 72215	Sodium hydroxide (5 – 10%)	Zone 5: Water treatment chemicals banded store	<260 l	Relatively stable, soluble, low persistence. Not classified as harmful to aquatic organisms	No
Nalco 2510	2,2 Dibromo 3 nitropropionamide Polyethylene glycol	Zone 5: Water treatment chemicals banded store	<260 l	Relatively stable, soluble oxidizing biocide. Harmful to aquatic organisms. Low persistence	Yes
Nalco 72100	Carbohydrazide <10%	Zone 5: Water treatment chemicals banded store	<260 l	R52 / 53 Harmful to aquatic organisms may cause long term adverse effects in the aquatic environment	Yes
Nalco Tri-Act 2813	2, Diethylaminoethanol	Zone 5: Water treatment chemicals banded store	<260 l	Relatively stable, soluble corrosive, low persistence. Harmful to aquatic organisms	Yes

Table 2.1 – Identification of Relevant Hazardous Substances

Material	Chemical Composition	Handling Area and zone*	Typical Inventory	Toxicity/Environmental Harm	Relevant Hazardous Substance
Nalco 3D Trasar 3DT265	2-phosphono-1,2,4-butanetricarboxylic acid, sodium salt 1,2,4Butanetricarboxylic acid, 2-phosphono-, sodium salt PBTC, monosodium salt	Zone 3: Water treatment chemicals bunded store	<260 l	Relatively stable, soluble, low persistence. Low toxicity	No
32% Hydrochloric Acid (intermediate)	HCl	Zone 5: Tank Farm, Acid plant, process building (gas)	2 tanks of < 52,000kg each	Soluble, corrosive liquid, toxic Oxidising Liquid Corrosive , Irritant R34 Causes Burns R37 Irritating to Respiratory System	Yes
19% Hydrochloric Acid (intermediate)	HCl	Zone 5: Tank Farm, Acid plant, process building (gas)	2 tanks of , 80,000kg each 600 kg day tank		Yes
Sodium Hypochlorite (intermediate)	NaClO	Zone 5: Acid plant	>800 kg	Stable, incompatible with strong acids oxidizer, corrosive toxic	Yes

Table 2.1 – Identification of Relevant Hazardous Substances

Material	Chemical Composition	Handling Area and zone*	Typical Inventory	Toxicity/Environmental Harm	Relevant Hazardous Substance
Process wastewater	HCl, Cl ₂ , NaCl, NaOCl, NaHCO ₃ , Na ₂ CO ₃ , CH ₂ O	Zone 5: Acid pit, process wastewater tank and process waste water sewer. Zone 4: Treated plant and associated storage	No storage - Limited to drainage, sumps and pipework contents. Annual throughput of 48,000 tonnes	Potential mixture of aqueous effluent containing a range of the chemicals used at site Soluble corrosive liquid , potentially toxic	Yes
Silica	SiO ₂	Zone 1: Site		Non-hazardous insoluble solid.	No
CAB-O SIL Product	Silicon Dioxide, Synthetic Amorphous Silica, Pyrogenic (Fumed) Amorphous Silica	Zone 1: Product Storage Silos		Solid powder - Silicon Dioxide, Synthetic Amorphous Silica, Pyrogenic (Fumed) Amorphous Silica Non-hazardous insoluble solid.	No

Table 2.1 – Identification of Relevant Hazardous Substances

Material	Chemical Composition	Handling Area and zone*	Typical Inventory	Toxicity/Environmental Harm	Relevant Hazardous Substance
Liquid waste	As above, for example: HCl, NaCl Cl ₂ , NaOCl, NaHCO ₃ , Na ₂ CO ₃ Alkaline liquid, water, bromine, NaOH, Modified amino compound, 2, Diethylaminoethanol, 2,2 Dibromo 3 nitropropionamide, Disodium Tetraborate, H ₂ O ₂ , oil, NaOH	Zone 2: Waste storage compound	<22,000 kg	Potential mixture of liquid wastes containing a range of the chemicals used at site Potentially toxic as above	Yes
Compressor Oils	Highly Refined Mineral Oils	Zone 1: Process Plant Compressors	>800 kg	Negligible solubility. Relatively persistent. Stable. Harmful to aquatic organisms Petroleum Oil - Hydrocarbon	Yes
Argon Liquid	Liquified Argon	Zone 1.		Inert Compressed Gas	No
Katalco - Catalysts	Solid Catalyst used in Process	Zone 1: Within Process buildings	>800 kg	Solid materials – used in process - Insoluble	No
Monoethylene Glycol	Monoethylene Glycol liquid	Zone 1: Coolant additive	>800 kg	R22 - Harmful If Swallowed Not classified as environmentally hazardous	No
Nitrogen	Compressed or refrigerated Nitrogen Gas	Outside of Installation Boundary	>800 kg	Compressed / refrigerated Gas – no risk to soil or groundwater	No

Table 2.1 – Identification of Relevant Hazardous Substances

Material	Chemical Composition	Handling Area and zone*	Typical Inventory	Toxicity/Environmental Harm	Relevant Hazardous Substance
Salt	NaCl - Solid	Zone 1: Process buildings	<800 kg	No significant environmental risk	No
Therminol 66	Heat transfer fluid Terphenyls, hydrogenated	Zone 1: Process buildings	>800 kg	R50 / 53 - May cause long-term adverse effects in the aquatic environment	Yes

Note: * zone based on original site zones from the SPMP Design report (Reference 2) as amended.

3 ASSESSMENT OF LIKELIHOOD OF POLLUTION

Following the revision of the list of relevant hazardous substances, a review of the potential for a pollution incident to occur was undertaken for only those substances identified as relevant hazardous substances. This assessment replaces Appendix D2 of the original Site Condition Report. Where the original D2 assessment included additional substances these have been removed for clarity.

This review updates the Source, Pathway Receptor risk assessment for the installation and reviews the adequacy of the materials storage and containment infrastructure to reflect any changes to site operations since Appendix D2 to the original Application Site Report was prepared. The findings of this assessment are presented in Appendix A.

The revised assessment identified the following credible risks to soil and groundwater:

Table 3.1 – Credible Pollution Risks from the Installation			
Material	Site Zone	Release Scenario	Receptor at Risk
Effluent containing dilute formaldehyde	Zone 4	Failure of drainage system leading to release to ground	Groundwater and surface water
Process Waste Water (containing HCl, Cl ₂ , NaCl, NaOCl, NaHCO ₃ , Na ₂ CO ₃)	Zone 5	Failure or overflow of pipework or in ground drainage structures, particularly from valves, flow meters and other related (flanged) equipment	Groundwater and surface water.

These risks both relate to the potential for loss of containment from below ground process drains at the site, and due to the lack of secondary containment provisions these cannot be excluded as having little likelihood of pollution.

However, following the failure of the below ground Katalco effluent pipe in 2009, the site has introduced a number of additional maintenance and inspection regimes to manage the integrity of the process drains. These include:

- Replacement of the below ground Katalco effluent pipe with an above ground pipeline;
- CCTV inspection of all below ground process drains on a rolling 3 yearly basis;
- Subsequent maintenance and repair programme to maintain the integrity of the process drains should any areas of concern be identified by the CCTV survey.

These measures reduce the likelihood of a failure of the process drains, and hence reduce the potential for a loss of containment of process wastewaters to groundwater.

Whilst URS has not independently verified these programmes, copies of hardstanding, bund and drainage inspection schedules and selected reports from this inspection work have been provided to URS for this review and are available on site.

It is noted that where no changes to the declared inspection programme have been identified to URS it has been assumed to be that quoted in the original Appendix D2.

In view of the improvements in the management and control of the credible pollution risks, it is considered that the likelihood of a loss of containment from these systems is reduced when compared to that considered during the development of the original site SPMP. Whilst it is not possible to discount these systems as a potential source of pollution, it is reasonable to conclude that the frequency of sampling could now be reduced in line with the reduced likelihood of failure.

4 REVIEW OF THE SITE PROTECTION MONITORING PROGRAMME

4.1 Review of Sampling Locations

The review presented above has concluded that a credible risk of pollution to soil and groundwater exists in the event of failure of the process drainage systems on site. It is noted that given the nature of the identified substances, where loss to ground occurs, it is likely that this would be indicated within the groundwater quality alongside the soil quality.

The locations of the existing SPMP groundwater monitoring wells are presented in Figure 2.

The existing SPMP monitoring wells were established to provide the site condition baseline for the permit, and in order to provide a robust record of the site condition throughout the lifetime of the permit, it is advised that these all be retained for sampling as part of the SPMP throughout the lifetime of the permit. It is noted that Cabot has maintained the monitoring network and where loss of monitoring wells was identified, has replaced them.

URS has reviewed the existing network of available monitoring wells and found that it includes:

Table 4.1 – Monitoring Well Network

Rationale/Well group	Site Zone	Monitoring wells	Included in baseline sampling in 2006?
Adjacent to underground drainage structures determined to present a potential risk	Zone 1	BH6, BH7, BH9, BH10, BH110, BH11A	Yes, however in 2012 BH11A replaced BH11.
	Zone 5	BH8	
Wells between the drainage structures and the primary surface water receptor (River Cadoxton)	Zone 1	BH1, BH105, BH5A, BH3	Yes, however in 2012 BH5A* replaced BH5.
Wells within the remainder of the site	Outside of installation boundary	BH108, BH113	Yes

* BH5A was moved to a more practicable location than BH5 due to restrictions regarding plant and underground services.

As the only credible pollution risks identified relate to the below ground process drains in Zones 4 and 5, it is the monitoring wells in close proximity to these locations which should be used to confirm that no loss of containment from these structures has occurred (7 wells as shown above, including those in adjacent zones). The remaining site monitoring wells are also important as they provide background information on the general site condition, provide

information on water quality between the potential source and the primary surface water receptor and allow for comparison to the baseline levels. This comparison to baseline levels is considered essential to maintain.

The existing monitoring well network is therefore considered to provide suitable and sufficient coverage of the main risks to soil and groundwater at the installation. No additions to the existing 13 monitoring wells are proposed as an appropriate number and distribution are present around the potential source.

4.2 Review of Chemical Determinands Assessed

URS has reviewed the determinands which should be analysed for in the groundwater samples collected from the monitoring wells. This is based on the revised risk assessment provided above. It is recognised that not all identified contaminants can be directly analysed for in groundwater samples (e.g. sodium hypochlorite), however the analytical suite has been designed such that release of these materials would be detected through other changes in groundwater chemistry (e.g. pH) or through detection of breakdown products. This combination of analytes allows detection of the chemicals identified to be present within the waste water.

Table 4.2 indicates which determinands should be analysed in the proposed SPMP.

Table 4.2 – Review of Chemical Determinands		
Determinant	Existing SPMP data	To be Included in Revised SPMP
Chloride	Included, decreasing trend noted.	Yes. Would be released as a breakdown product of many of the identified relevant hazardous substances with a reasonable likelihood of pollution.
Sodium	Included from 2011	
Alkalinity	Average alkalinity has increased slightly from November 2010.	Yes, alkalinity is a good indicator of groundwater quality and could be affected by release of the identified compounds as demonstrated in 2009 when the underground Katalco pipe (since replaced) was found to have leaked.
Biological Oxygen Demand (BOD)	Has been identified as a statistical outlier in previous SPMP rounds.	Yes, good indicator of groundwater quality and could be affected by release of the identified compounds.
Chemical Oxygen Demand (COD)	Included	
pH	Included	

Table 4.2 – Review of Chemical Determinands		
Determinant	Existing SPMP data	To be Included in Revised SPMP
Acidity as hydrochloric acid	Included from 2011	
Nitrate	Included	Yes, good indicator of groundwater quality.
Nitrite	Included	
Phosphate	Included	
Sulphate (water and acid soluble)	Included	
Sulphide	Included	
Metals (USEPA 13)	Included	Yes, metals may be mobilised from made ground or other soils with changes in pH. Their presence may therefore be an indicator of a change in pH in the ground due to loss of process waste water. Metals were found to be an indicator when there was a release from an underground pipe in 2009, however this may have been associated with trace metals within the liquid released rather than mobilisation from ground
Formaldehyde	Not included	Yes (selected wells only), present within the currently identified relevant hazardous substances with a reasonable likelihood of pollution
Bromide	Included	Yes completes the anions and cations suite.
Glycol	Included	No. previous results were below method detection limit (MDL) and not present within currently identified relevant hazardous substances with a reasonable likelihood of pollution

In addition to the laboratory analysis listed above, field measurements of the groundwater (pH, temperature, redox potential and dissolved oxygen) will be collected during purging.

To ensure sampling and analytical quality assurance and quality control, a selection of samples should be collected and analysed for quality assurance purposes. Field quality insurance should include groundwater field duplicates, a trip blank sample and a rinsate blank.

4.3 Review of Sampling Frequency

The existing SPMP for the installation specifies a sampling frequency of every 2 years for all 13 sample points specified within the SPMP. The Industrial Emissions Directive specifies that groundwater samples should be taken at least every 5 years and soils at least every 10 where a credible risk of pollution exists. This review has demonstrated that there is no credible risk of pollution posed by the majority of the site with only the below ground process drains in zones 4 and 5 presenting a credible risk to the environment due to the lack of secondary containment provisions. The site has introduced a number of additional inspection and maintenance procedures since the development of the original SPMP to reduce the likelihood of a loss of containment from the below ground process drains in these Zones.

Where a credible risk has been demonstrated above, the material that would be released to ground is process waste water containing a number of soluble chemicals. Release of these chemicals would result in detectable changes to the groundwater either with an increase in the concentration of the released chemical, breakdown products or through groundwater quality indicators such as pH. Given that the chemicals identified as being within the waste water can be detected in groundwater, routine soil sampling is not considered necessary. It is therefore proposed that soil sampling is limited to sampling in response to a known or suspected release of chemicals.

Given the additional measures introduced at the site it is reasonable to conclude that the frequency of groundwater sampling should now be reduced in line with the reduced likelihood of failure and the increased likelihood of detection of a failure. It is therefore proposed to reduce the frequency of groundwater monitoring to every 5 years.

5 PROPOSED AMENDED SITE PROTECTION MONITORING PROGRAMME

5.1 Proposed Revisions

As detailed above there is no proposed change to the number of monitoring wells to be included, however there are some proposed changes to the groundwater analysis suite and the frequency of sampling. These changes are summarised as:

- Removal of glycols from the sampling suite as these are not anticipated to be associated with the identified hazardous substances with a reasonable likelihood of pollution.
- Addition of formaldehyde to the sampling suite for all monitoring wells adjacent to the drainage network and between this network and the primary receptor as this may be present within the waste water, for which a reasonable likelihood of pollution has been identified.
- Reduction of the frequency of sampling from every 2 to every 5 years. Given the other changes above, it is proposed that the following rounds are scheduled:
 - A reduced sampling round to be undertaken in 2015 to tie in with the currently 2 year programme (which is currently on hold pending this review). This reduced round would include only the seven wells identified as being adjacent to the drainage structures, but would include the new analytical suite.
 - A full round to be undertaken in late 2017 including all wells and analytes. This would be approximately 5 years after the 2012 round and therefore start the 5 year programme.
 - The 5 year programme for all wells and analytes introduced following the 2017 round.

5.2 Proposed Scope of SPMP

The proposed scope detailed in Table 5.1 and 5.2 below summarises the information included in the sections above.

Table 5.1 – Proposed Scope for interim SPMP groundwater monitoring in 2015			
Well Group	Site Zone	Monitoring wells	Analysis
Adjacent to underground drainage structures determined to present a potential risk	Zone 1	BH6, BH7, BH9, BH10, BH110, BH11A	BOD, COD, Metals ¹ , Anions and Cations ² , acidity, sodium and formaldehyde
	Zone 5	BH8	

Notes:

1 - Metals include: Arsenic, Boron, Cadmium, Chromium, Copper, Lead, Nickel, Selenium, Zinc.

2 - Anions and Cations include: Sulphide, Chloride, Nitrate, Nitrite, Bromide, Phosphate, Sulphate, pH, Alkalinity

Table 5.2 – Proposed Scope for 5 yearly programme of SPMP groundwater monitoring – 1st round to be completed in late 2017

Well Group	Site Zone	Monitoring wells	Analysis
Adjacent to underground drainage structures determined to present a potential risk	Zone 1	BH6, BH7, BH9, BH10, BH110, BH11A	BOD, COD, Metals ¹ , Anions and Cations ² , acidity, sodium and formaldehyde
	Zone 5	BH8	
Wells between the drainage structures and the primary surface water receptor (River Cadoxton)	Zone 1	BH1, BH105, BH5A, BH3	
Wells within the remainder of the site	Outside of installation boundary	BH108, BH113	

Notes:

1 - Metals include: Arsenic, Boron, Cadmium, Chromium, Copper, Lead, Nickel, Selenium, Zinc.

2 - Anions and Cations include: Sulphide, Chloride, Nitrate, Nitrite, Bromide, Phosphate, Sulphate, pH, Alkalinity

6

REFERENCES

1. Application Site Report - Cabot Carbon, July 2005 Final - URS Report Number – 4438449- Issue 1 – July 2005 - URS.
2. Design of a Site Protection and Monitoring Programme - Reference Data to be Collected: IPPC Permit BU2110IS - Cabot Carbon Ltd. - URS Report R0862/44382675 Rev2 – 31 May 2006 - URS
3. European Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures
4. Environment Agency – Environmental Permitting Regulations – Horizontal Guidance Note H5 - Site condition report – guidance and templates – Version 3 – April 2013.

FIGURES

Figure 1: Site Location

Figure 2: Site Layout, Zones and Monitoring Wells



Cabot Carbon Ltd

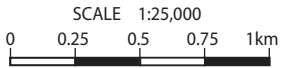


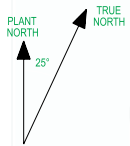
SITE LOCATION

Title SITE LOCATION MAP
 Location CABOT CARBON LTD, BARRY SOUTH WALES
 Client CABOT CARBON LTD










URS	App'd: CCJ	Drawn: LCS	Date: JANUARY 2015
	Status: FINAL		Ref: CCJ/CDF/LCS/BRS
	Scale: AS SHOWN		Job No: 47072112
	Drng. Size: A4		FIGURE 1

Based upon an Ordnance Survey map with the permission of the Controller of Her Majesty's Stationery Office. Crown Copyright reserved License No. AL 100017812.





Key

-  Monitoring Well Location
-  Former Monitoring Well Location
-  Installation boundary
-  Zone 1: Area of low environmental risk
-  Zone 2: Waste storage compound
-  Zone 3: Water treatment chemical store
-  Zone 4: Treated silica plant and storage
-  Zone 5: Acid plant, storage pipework & drainage
-  Zone 6: Diesel-fired generator

Title	CURRENT SITE LAYOUT	App'd:	CCJ	Drawn:	LCS	Date:	JANUARY 2015
Location	BARRY SOUTH WALES	Status:	FINAL	Ref:	CCJ/CDF/LCS/BRIS	Job No:	47072112
Client	CABOT CARBON LTD	Scale:	1:1500	Drg. Size:	A4	FIGURE 2	



APPENDIX A – ASSESSEMENT OF LAND POLLUTION POTENTIAL: UPDATED TABLE D2

Appendix D2 Assessment of Likelihood of Pollution - 2015 update

Site Operation or Site Zone	Substance	Relevant Activity	Potential for Pollution from the relevant activity	1. Records of pollution	2. Existence of pollution prevention measures	Nature of Primary Containment	Testing and Inspection of Primary Containment	Nature of Secondary Containment	Testing and Inspection of secondary containment	Nature of Tertiary Containment	Testing and Inspection of Tertiary Containment	3. Adequacy of pollution prevention measures	4. Are the proposed integrity testing of pollution prevention measures adequate	5. Is there an adequate documented management system to demonstrate operator management and competence with the relevant activity	The assessment on the likelihood of pollution and hence the need to collect reference samples will be made on the questions set in the GREEN columns on this table and supported by the information provided. To make the case that there is little likelihood of pollution the Applicant will need to provide the following answers: Green Column 1 - No past pollution incidents or spillages Green Column 2 - Yes pollution prevention measures exist for each relevant activity Green Column 3 - Yes pollution prevention measures are adequate Green Column 4 - Yes adequate integrity testing undertaken or proposed Green Column 5 - Yes there is an adequate management system IF THE ABOVE CRITERIA CANNOT BE SATISFIED THEN THERE IS THE REASONABLE POSSIBILITY OF POLLUTION AND THE OPERATOR WILL NEED TO COLLECT REFERENCE DATA IN THE SITE PROTECTION AND MONITORING PROGRAMME	
Name Unit Operation and refer to the relevant section of the Permit Site Report containing its description	Name substance, provide CAS RN if appropriate as well as manufacturers product name. Volume stored. For mixtures provide breakdown of polluting substances and percentage by volume.	Detail the relevant activity for each substance where the location, pollution risk or pollution prevention measures differ	Detail the failure mechanism and potential pollution arising from the loss of primary containment	Detail any incidents of pollution or spills from the relevant activity. This can be based on visual assessment during site reconnaissance, installation or other records and data sources. Have measures been put in place to ensure no further pollution incidents?	Do pollution prevention measures exist for each element of the relevant activity?	Detail the nature of the storage vessel, including volume, location and provide unique reference number and indicate which site plan it is shown on	Provide details of a testing and inspection programme or reference to a separate document, e.g. pressure tests, leak tests, material thickness checks etc.	Detail the nature of the secondary containment.	Provide details of a testing and inspection programme or reference to a separate document, e.g. pressure tests, leak tests, material thickness	Detail the nature of the tertiary Containment	Provide details of a testing and inspection programme or reference to a separate document, e.g. pressure tests, leak tests, material thickness checks etc.	Yes / No	Yes / No	Yes / No	Little Likelihood of pollution ?	Reasonable Possibility of Pollution ?
Zone 1 (Areas of low environmental risk)	Limited substances are handled in this zone that have the potential to cause land pollution. It is noted that the methyltrichlorosilane (a relevant hazardous substance) is present in the vapour phase within the process building, however this is unlikely to cause land pollution and therefore has been discounted. It is included in Zone 5 below.	N/A	N/A	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes	Yes	Yes	Yes	
Zone 2 (Waste Storage Compound)	Liquid wastes including HCl, NaOCl, NaCl, Cl ₂ , alkaline liquid, water, bromine, NaOH, modified amino compound, 2, Diethylaminoethanol, 2,2 Dibromo 3 nitropropionamide, Disodium Tetraborate, H ₂ O ₂ , oil, Katalaco	Storage	Unlikely failure of primary containment resulting in spillage to bund with subsequent loss to ground and migration to groundwaters and surface waters.	None	Yes	Various can include IBCs, drums or other appropriate containers	Visual inspection	Bunded storage area, however kerb that forms bund is not complete - short section where it is not present to allow vehicle access to store. It is noted however that the bund is very extensive compared to the volumes held in individual containers.	Visual inspection of bund every three years. Waste pumped out of sump as required for disposal.	Partial - concrete hardstanding with some areas of open ground. Hardstanding drains to surface water discharge point W3 via interceptor TK49.	Visual inspection of hardstanding and inspection, drop test and CCTV of drainage lines every 5 years.	Yes - whilst the secondary containment is not complete, this is not considered to be a major issue given the size of containers present and volumes of material stored.	Yes	Yes	Yes	Yes
Zone 3 (Water treatment chemical store)	Naalco Stabrex ST40, Naalco 2510, Naalco 72100, Naalco Tri-Act 2813. Includes: Alkaline liquid, water, bromine NaOH, 2,2 Dibromo 3 nitropropionamide, polyethylene glycol, Carbohydrazide <10%, 2, Diethylaminoethanol.	Storage - all except ST40	Unlikely failure of primary containment could result in spillage to bund with subsequent loss to ground via bund drainage followed by migration to groundwater and surface waters.	None	Yes	Stand alone IBCs - from 260 litres to 1600 litres	Visual inspection	Integrated bund around individual tanks	Visual inspection	Chemical resistant bund - below ground ¹	See note 1	Yes	Yes	Yes	Yes	
		Storage - ST40						Chemical resistant bund - below ground ¹	See note 1	None	N/A					
		Transfer	Unlikely failure of pump or line during transfer could result in spillage to bund with subsequent loss to ground via bund drainage followed by migration to groundwater and surface waters.	None	Yes	Transfer metered pump	Visual inspection	Chemical resistant bund below line connections to tanks - below ground ¹ . No secondary containment around narrow diameter pipes to plant.	See note 1	None	N/A	Yes	Yes	Yes	Yes	
		Use in Plant	Unlikely failure of plant could result in loss through water treatment plant or through underground drainage to ground with subsequent migration to groundwater and surface waters	None	Yes	Plant	Visual inspection and Planned Preventative Maintenance	Concrete epoxy coated bund ¹	See note 1	Not comprehensive	N/A	Yes	Yes	Yes	Yes	
Zone 4 (Treated plant and associated storage)	Effluent containing dilute formaldehyde	Scrubber (below ground)	Unlikely failure of plant resulting in spillage to process waste water to bund or drain with subsequent loss to ground and migration to groundwater and surface waters.	None	Yes	Plant	Visual inspection	Uncoated concrete bund	Annual visual inspection	None - below ground	N/A	Yes	Yes (PPM)	Yes	Yes	
		Waste water drainage	Failure of drainage system leading to release to ground with subsequent migration to groundwater and surface water.	None	Yes	Drainage system	Leak testing and CCTV survey of chemical waste line from Treated Plant to Tank Farm every 3 years. This inspection measure was introduced following the drainage leak incident to manage the condition of the process drains, thus reducing the risk of potential failure.	None	N/A	None	N/A	No - no secondary or tertiary containment	Yes	Yes	Yes	
		Compressor oils	Unlikely failure of primary containment resulting in spillage within storage area and subsequent loss to ground and migration to groundwater and surface waters.	None	Yes	Supplier provided containers/original packaging	Visual inspection	Shipping container with internal bund.	Visual inspection	Partial - concrete hardstanding with some areas of open ground. Hardstanding drains to surface water discharge point W3 via interceptor TK49.	Visual inspection of hardstanding and inspection, drop test and CCTV of drainage lines every 5 years.	Yes - storage above ground with below ground drainage only used in event of failure of secondary containment	Yes	Yes	Yes	Yes
	Therminol 66 (Terphenyls hydrogenated)	Storage	Unlikely failure of primary containment resulting in spillage within storage area and subsequent loss to ground and migration to groundwater and surface waters.	None	Yes	Supplier provided containers/original packaging	Visual inspection	Containers with internal bund.	Visual inspection	Partial - concrete hardstanding with some areas of open ground. Hardstanding drains to surface water discharge point W3 via interceptor TK49.	Visual inspection of hardstanding and inspection, drop test and CCTV of drainage lines every 5 years.	Yes - storage above ground with below ground drainage only used in event of failure of secondary containment	Yes	Yes	Yes	Yes
		Use in plant	Unlikely plant failure	None	Yes	Plant	Planned preventative maintenance	Bund around plant and bund in area where the drums are temporarily placed to allow transfer to the plant.	Visual inspection	Concrete hardstanding	Visual inspection	Yes	Yes	Yes	Yes	

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															Little Likelihood of pollution ?	Reasonable Possibility of Pollution ?	
Name Unit Operation and refer to the relevant section of the Permit Site Report containing its description	Name substance, provide CAS RN if appropriate as well as manufacturers product name. Volume stored. For mixtures provide breakdown of polluting substances and percentage by volume.	Detail the relevant activity for each substance where the location, pollution risk or pollution prevention measures differ	Detail the failure mechanism and potential pollution arising from the loss of primary containment	Detail any incidents of pollution or spills from the relevant activity. This can be based on visual assessment during site reconnaissance, installation or other records and data sources. Have measures been put in place to ensure no further pollution incidents?	Do pollution prevention measures exist for each element of the relevant activity ?	Detail the nature of the storage vessel, including volume, location and provide unique reference number and indicate which site plan it is shown on	Provide details of a testing and inspection programme or reference to a separate document, e.g. pressure tests, leak tests, material thickness checks etc.	Detail the nature of the secondary containment.	Provide details of a testing and inspection programme or reference to a separate document, e.g. pressure tests, leak tests, material thickness	Detail the nature of the tertiary Containment	Provide details of a testing and inspection programme or reference to a separate document, e.g. pressure tests, leak tests, material thickness checks etc.	Yes / No	Yes / No	Yes / No			
Zone 5 (Acid plant associated storage, pipe work and drainage)	Liquid chlorosilane feedstock	Piped transfer from DCL	Unlikely pipe breach could lead to discharge to hardstanding, soil (in unsurfaced areas), groundwater, or surface water either directly or via groundwater flow.	None	Yes	Chemical resistant pipe work	Visual inspection	None	N/A	Not comprehensive	N/A	Yes - no secondary or tertiary containment, however all pipework is above ground so losses would be quickly noted.	Yes	Yes	Yes		
		Vapourisation within D11 and D15 vapourisers	Unlikely plant failure, could lead to discharge to bunded area with subsequent loss to ground and migration to groundwater and surface waters.	None	Yes	Plant	Planned preventative maintenance	Covered, purpose designed concrete base and walls.	Annual visual inspection	None	N/A	Yes	Yes	Yes	Yes		
	Sodium hydroxide	Tanker offloading	Coupling failure or tanker spillage could cause spillage to hardstanding with subsequent migration to ground via runoff to unsurfaced areas or via drainage systems followed by migration to groundwater or surface water.	None	Yes	Tanker or transfer hose	N/A	Hardstanding - epoxy coated ²	Visual inspection of hardstanding area, also see note 2	None	N/A	Yes - no tertiary containment however failure during tanker off-loading would be quickly noted.	Yes	Yes	Yes	Yes	
		Storage	Unlikely failure of primary containment or overfill could result in spillage to bunded area with subsequent loss to ground followed by migration to groundwater and surface waters.	None	Yes	20,000 litre Carbon steel tank	Visual inspection	Bund - epoxy coated ³	Annual visual inspection, also see note 3	Not comprehensive	Visual inspection	Yes	Yes	Yes	Yes	Yes	
		Piped transfer	Unlikely failure of pipe work could result in spillage to hardstanding, land or surface water. Potential risk from valves, flowmeters and other related (flanged) equipment.	None	Yes	Chemical resistant pipe work	Visual inspection	Not comprehensive	Visual inspection	Not comprehensive	Visual inspection	Yes - no secondary or tertiary containment, however all pipework is above ground so losses would be quickly noted.	Yes	Yes	Yes	Yes	
		In plant processes	Unlikely plant failure, could lead to discharge to bunded area with subsequent loss to ground followed by migration to groundwater and surface waters.	None	Yes	Plant	Planned preventative maintenance	Bund - epoxy coated ¹	Annual visual inspection of bund, also see note 1	Not comprehensive	Visual inspection	Yes	Yes	Yes	Yes	Yes	
	Hydrogen peroxide	Storage	Unlikely failure of primary containment could result in spillage to bunded area with subsequent loss to ground followed by migration to groundwater and surface waters.	None	Yes	1,000 litre IBC	Visual inspection	Bund - epoxy coated ¹	Annual visual inspection of bund, also see note 1	None	N/A	Yes	Yes	Yes	Yes	Yes	
		Transfer to TK11	Unlikely failure of transfer pipes could result in spillage to bunded area or below ground channel with subsequent loss to ground followed by migration to groundwater and surface waters.	None	Yes	IBC/piping	Visual inspection	Bund - epoxy coated and below ground channel in which the pipe runs ¹	Annual visual inspection of bund, also see note 1	None	N/A	Yes - secondary containment is partly below ground however this is a very short section (<5m)	Yes	Yes	Yes	Yes	
	Hydrochloric acid	Tanker offloading	Coupling failure or tanker spillage could cause spillage to hardstanding with subsequent migration to ground via runoff to unsurfaced areas or via drainage systems followed by migration to groundwater or surface water.	None	Yes	Tanker or transfer hose	N/A	Hardstanding - epoxy coated ²	Visual inspection of hardstanding area, also see note 2	None	N/A	Yes - no tertiary containment however failure during tanker off-loading would be quickly noted.	Yes	Yes	Yes	Yes	
		Storage	Unlikely failure of primary containment or overfill could result in spillage to bunded area, with subsequent loss from drainage network to ground followed by migration to groundwater and surface water.	None	Yes	Tank	Visual inspection	Bund - epoxy coated for main tanks ³ or chemical resistant for the HCL Demin tank ¹	Annual visual inspection of bund, also see note 1 and 3	Not comprehensive	N/A	No	Yes	Yes	Yes	Yes	
		Vapourisation	Unlikely failure of plant could result in spillage to bunded area with subsequent loss to ground followed by migration to groundwater and surface waters.	None	Yes	Plant	Planned preventative maintenance	Bund - epoxy coated ¹	Annual visual inspection of bund, also see note 1	Not comprehensive	N/A	No	Yes	Yes	Yes	Yes	
		Piped transfer	Unlikely failure of pipe work could result in spillage to hardstanding, land or surface water. Potential risk from valves, flowmeters and other related (flanged) equipment.	None	Yes	Chemical resistant pipe work	Visual inspection	Not comprehensive	Visual inspection	Not comprehensive	N/A	Yes - no secondary or tertiary containment, however all pipework is above ground so losses would be quickly noted.	Yes	Yes	Yes	Yes	
		In plant processes	Unlikely failure of plant could result in spillage to bunded area with subsequent loss to ground followed by migration to groundwater and surface waters.	None	Yes	Plant	Planned preventative maintenance	Bund - epoxy coated ¹	Annual visual inspection of bund, also see note 1	Not comprehensive	N/A	Yes	Yes	Yes	Yes	Yes	

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	Sodium Hypochlorite (intermediate)	In plant processes	Unlikely failure of plant could result in spillage to bunded area with subsequent loss to ground followed by migration to groundwater and surface waters.	None	Yes	Plant	Planned preventative maintenance	Bund - epoxy coated ¹	Annual visual inspection of bund, also see note 1	Not comprehensive	N/A	Yes	Yes	Yes	Yes		
	Process wastewater	Above ground storage (D14)	Unlikely failure of pit could result in spillage to ground with migration to groundwater and surface waters.	None	Yes	Tank	Visual inspection	Bund - epoxy coated ³	Annual visual inspection of bund, also see note 3	Not comprehensive	N/A	Yes	Yes	Yes	Yes		
		Piped transfer (above ground)	Unlikely failure of pipe work could result in spillage to hardstanding land or surface water. Potential risk from valves, flowmeters and other related (flanged) equipment.	None	Yes	Chemical resistant pipe work	Visual inspection	None	N/A	Not comprehensive	Visual inspection	Yes - no secondary or tertiary containment, however all pipework is above ground so losses would be quickly noted.	Yes	Yes	Yes	Yes	
		Piped transfer and containment in below ground structures	Unlikely failure or overflow of pipe work or in ground drainage structures could result in spillage to land. Potential risk from valves, flowmeters and other related (flanged) equipment.	Yes - 2009/2010 - minor leak from an underground line from the Katalco plant to the acid pit identified. Cabot reported that the line was excavated and replaced with an above ground line removing the potential for a similar leak from this line to occur without being observed in the future.	Yes	Chemical resistant pipe work	Leak testing and CCTV survey of various chemical drains every 3 years with subsequent maintenance as required. This inspection measure was introduced across the entire site following the previous incident to manage the condition of the process drains, thus reducing the risk of potential failure.	None	N/A	None	No - no secondary or tertiary containment	Yes	Yes	Yes	Yes	Yes	
Zone 6 (Standby generator and diesel storage)	Diesel	Tanker offloading	Coupling failure or tanker spillage could cause spillage to hardstanding with subsequent migration to ground via runoff to unsurfaced areas or via drainage systems followed by migration to groundwater or surface water.	None	Yes	Tanker or transfer hose	N/A	None	N/A	Hardstanding ⁴	Visual inspection and inspection programme of drainage, also see note 4	Yes - whilst part of secondary containment is below ground, loss of diesel during offloading would be noted quickly.	Yes	Yes	Yes	Yes	
		Storage	Unlikely failure of primary containment could result in spillage to bund with subsequent loss to ground followed by migration to groundwater and surface waters.	None	Yes	500 gallon steel tank	Visual inspection	Bund ⁴ Drainage to interceptor is not automatic - is via a manually controlled valve.	Visual inspection	Drainage and interceptor - classed as tertiary containment as drainage from bund is not automated.	See note 4	Yes	Yes	Yes	Yes	Yes	
		Transfer to combustion plant	Unlikely failure of pipe work could lead to spillage to hardstanding with subsequent loss to ground either directly or via drains followed by migration to groundwater or surface water. Potential loss from valves, flowmeters and other related (flanged) equipment.	None	Yes	Pipe work	Visual inspection	Bund ⁴ Drainage to interceptor is not automatic - is via a manually controlled valve.	Visual inspection	Drainage and interceptor - classed as tertiary containment as drainage from bund is not automated.	See note 4	Yes	Yes	Yes	Yes	Yes	

Notes:

1 - bund or pit referenced drains automatically to acid area chemical waste pit (TK11) which is pumped to D-14 process waste water tank and then to DCL treatment plant. Annual inspection and clean of TK11 and D-14. Inclusion of chemical drains in testing programme - every 3 years.

2 - bund, pit or hardstanding referenced drains automatically to TK40 which is automatically pumped to D14. Annual visual inspection and clean of TK40 and D14. Leak testing and CCTV survey of chemical waste drainages every 3 years.

3 - bund referenced drains automatically acid pit TK12 which is automatically pumped to D14. Overflow (if any) would be routed to acid overflow pit TK40. Annual visual inspection and clean of TK12, TK40 and D14. Leak testing and CCTV survey every 3 years of acid overflow line from TK-12 to TK-40.

4 - hardstanding or bund referenced drains to interceptor TK44. Daily visual inspection of TK44 and opening of discharge valve only if confirmed as rainwater only. Clean of TK44 every 3 years. Leak testing and CCTV of drainage lines every 3 years.