Appendix 13. Soils Geology and Groundwater

13.1. URS Phase 1 and 2 Environmental Site Assessment

Phase 1 and 2 Environmental Site Assessment

ESB Great Island Power Generating Station

06 November 2009
Final

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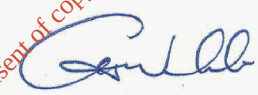
Approved by	Graham Webb		06 Nov 2009	Project Director

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EXECUTIVE SUMMARY

URS Ireland Limited (URS) is pleased to present this report to the Electricity Supply Board (ESB), detailing the findings of a Phase 1 and 2 Environmental Site Assessment (ESA) undertaken at the ESB Great Island Power Generating Station, Campile, Co. Wexford.

ESB is in the process of divesting this asset and has engaged URS to undertake the ESA to support the divestment process. The objective of the ESA was to assess the current environmental status of the site, with particular reference to soil, sediment, surface water and groundwater quality.

The Phase 1 assessment comprised a review of information pertaining to environmental soil and groundwater quality on the site, with particular focus on site history, site environmental sensitivity, site operations, and materials storage.

The Phase 2 environmental sampling locations were selected on the basis of the Phase 1 ESA results, observations made during site walkover inspections and information gathered from key site personnel. The sampling approach was influenced by the absence of overburden across many areas of the site, access issues associated with site infrastructure and/or health and safety protocols, the steep gradients between site tiers and the density of vegetation across large areas of the site.

Environmental soil samples were collected through hand augering, test pitting and bore drilling. Monitoring wells were installed at strategic locations and groundwater samples collected and analysed. Samples of surface waters and sediments were also collected and analysed for key contaminants of concern.

Based on the results and observations of the Phase 1 and 2 ESA, the following conclusions were drawn:

- From the perspective of human health and potential risks posed by environmental soil and groundwater quality to commercial site users, the site is considered suitable for the continued industrial use.
- A conservative assessment of the soil analytical data collected during the ESA identified potential risks to controlled waters (i.e. groundwater and surface water) from a number of metals as well as polycyclic aromatic hydrocarbons (PAH) and hydrocarbon indicator compounds. However, URS has concluded that across the majority of the site these potential risks are not significant.
- It is considered that concentrations of PAH in the shallow soil near the southern site boundary and (to a lesser extent) in sediment and surface water samples, warrant some further assessment focussing on identification of likely source(s) and depending on the outcome a (probably limited) Quantitative Risk Assessment (QRA) to assess in more detail potential risks to the local ecosystems (estuary).
- Elevated concentrations of coliforms were detected in groundwater and surface waters in both the former landfill area and the station grounds. The primary source is considered likely to be agricultural practices in areas upgradient of the site, rather than historic or current site practices, however, there are likely to be some site-derived contributions in particular from the septic tank located on the lower tier.

- Elevated concentrations of ammonia in the former disposal area wells, in particular on the western cell, have not been delineated – however, access to drill in downgradient locations would be difficult to achieve. Some further assessment of estuarine waters and sediment quality downgradient of the waste disposal areas would be warranted.

- The presence of asbestos containing materials (ACM) in the subsurface is considered unlikely, except in the capped landfill, where ACM is known to exist.

In summary, no remedial action is currently considered necessary at the site under a continued industrial land use scenario, from the perspective of environmental soil and groundwater quality; however, some requirement for further assessment has been identified.

1. INTRODUCTION & OBJECTIVES

URS Ireland Limited (URS) is pleased to present this report to the Electricity Supply Board (ESB), detailing the findings of a Phase 1 and 2 Environmental Site Assessment (ESA) undertaken at the ESB Great Island Power Generating Station, Campile, Co. Wexford.

The works were carried out in accordance with URS Proposal No. 3052214 dated 6 June 2008, which was submitted as part of ESB Tender No. PG108T613 and the subsequent scope of work e-mailed to ESB on 24 September 2008.

ESB is in the process of divesting this asset and has engaged URS to undertake the ESA to support the divestment process. The station location is presented on Figure 1 and the area to be divested is shown outlined in red in Figure 2 (hereafter referred to as "the site").

The site, which includes a former waste disposal area and a large area of undeveloped 'wetland' occupies an approximate area of 74.5 ha, while the station grounds proper occupy an approximate area of 30 ha.

The site currently operates as a heavy fuel oil (HFO) burning power-generating station and is located near Campile, on the eastern bank of the River Suir, to the north of its confluence with the Campile River.

An Integrated Pollution Prevention Control (IPPC) licence (Reg. No. P0606-02) was issued to the site by the Environmental Protection Agency (EPA) on 18 January 2005.

The objective of the ESA was to assess the current environmental status of the site, with particular reference to soil, sediment, surface water and groundwater quality. The buildings and structures located on site (and the materials contained in them) were not included in this ESA.

2. PHASE 1 ASSESSMENT – SCOPE AND METHODOLOGY

A Phase 1 Assessment of the site was undertaken by URS in late September 2008.

The Phase 1 assessment comprised a review of information pertaining to environmental soil and groundwater quality on the site, with particular focus on the following:

- Site history;
- Site environmental sensitivity;
- Site operations; and
- Materials storage.

Components of the study included:

- A preliminary walkover inspection of the subject areas on 17 September 2008;
- A desktop review of information from the following sources:
  - Geological Survey of Ireland (GSI) for site geology and hydrogeology;
  - Environmental Protection Agency (EPA);
  - National Parks and Wildlife Service (NPWS) for information pertaining to surrounding Special Areas of Conservation (SACs), Special Protection Areas (SPAs) or Natural Heritage Areas (NHAs);
  - Ordnance Survey of Ireland (OSI) for aerial photographs; and
  - IPPC licence application documents and Annual Environmental Reports (AERs) provided by ESB.
- A review of previous environmental site investigation reports undertaken at the site including:
  - An Environmental Impact Assessment of Great Island Generating Station upon the Local Soil and Groundwater Quality, ESBI, July 1996 (ESBI, 1996);
  - ESB Power Generation - Great Island Generating Station - Investigation of Possible Land Contamination, Phase 1, ESBI, October 2000, Ref. P004E001-R3 –Final (ESBI 2000);
  - ESB Power Generation - Great Island Generating Station – Investigation of Possible Land Contamination, Phase 2, ESBI, February 2002, Ref. P004E013 – R3 – Final (ESBI, 2002);
  - Environmental Risk Assessment and Remediation Plan (Final Rev 4) – Former Waste Disposal Areas at Great Island Generating Station, Co. Wexford – 44871-010-447, June 2003 (URS, 2003).
  - Environmental Liabilities Risk Assessment Report – ESB Great Island Generating Station, Co. Wexford – TMS Consulting (Ref. TMS #06036 Rev. 1) – May 2006 (TMS 2006).

3. PHASE 1 FINDINGS

3.1 Site Description

The site layout is presented in Figure 2. The area containing the power generation buildings and infrastructure ("the Station Grounds") comprises a series of tiered benches cut into the bedrock, which step down toward the River Suir estuary. A former waste disposal area, comprising two rectangular shaped cells, lies to the east of the Station Grounds. Beyond that lies a heavily vegetated undeveloped area known as the Wetlands.

3.1.1 Station Grounds - Lower Tier

A sea wall bounds the lowest tier of the Station Grounds, which is partially underlain by made ground. The main building, associated chimney stacks, cooling water pump house and process water treatment (steam purification) facility are located on the lowest tier.

A jetty connects the HFO unloading facilities with the site. A major pipeline delivers HFO from the jetty to the main oil tank farm, (located on the upper tier). An oil 'stripping' tank, located on the lower tier, collects excess HFO from the pipeline after each unloading event. Located to the north of the stripping tank are two storage tanks containing light and heavy fuel wastes. These tanks are contained within below-ground vaults.

A concrete lined water channel runs across the eastern portion of the lower tier and conducts cooling water to the cooling water outlet.

The lower tier is generally flat and lies between approximately 3 m and 4 m above Ordnance Datum (m OD).

3.1.2 Station Grounds – Middle & Upper Tiers

In the far western portion of the site, the station car park and entrance to the main station building occupy a 'middle' tier, which in turn steps down to the foreshore area. Across the remainder of the Station Grounds, a heavily vegetated steep slope separates the lower and upper tiers.

The HFO Tank Farm is located on the upper tier and contains seven above ground storage tanks. Each of five primary storage tanks has a 17,000 tonne capacity; the other two tanks are test and transfer tanks and have smaller capacities. A separate 50 tonne bunded storage tank stores diesel used as fuel for boiler start up. A pumping station in this area is used to transfer the HFO between tanks and into the transfer tank, where it is heated to enable it to be gravity fed to the boiler units. The HFO Tank Farm is bunded and concrete lined. Drainage is routed through oil interceptors and discharged to the estuary.

The larger of two switching yards is located to the north of the HFO Tank Farm. The 220 kV compound is a fenced compound containing two main bunded transformers, both of which have associated transformer oil tanks. The remainder of the compound contains

switching gear, electricity pylons and overhead wires. There is an amenities building and toilet block in the southern portion of the compound.

The 110 kV switching yard is located to the west of the 200 kV yard. Part of the plant associated with the 110kV switching yard is housed internally. A separate 38 kV transformer compound is located within the 110 kV compound. The switching yards have unsealed hardcore surfaces. A subsurface oil filled cable runs between the two switching yards. This cable is fitted with alarms that detect pressure loss.

A water reservoir, which feeds the steam generation processes, is located to the north of the 220 kV switching yard. A heavily forested area is located to the east of the 220 kV switching yard. The remainder of the upper tier generally comprises open green space, traversed by power cables supported by pylons leading from the switching compounds.

With the exception of the two switching compounds, which have flat surfaces, the upper tier has a gently undulating surface, with surface elevations ranging between approximately 25 m OD and 35 m OD.

3.1.3 Former Waste Disposal Area and Wetlands

The two cells that make up the former waste disposal area are known as Cell 1 (eastern) and Cell 2 (western). They occupy approximate areas of 2.25 ha and 1.35 ha respectively. The cells are connected to the Station Grounds by an unformed roadway and are separated by a gully, which periodically conducts surface waters to an unnamed stream that forms the southern boundary of the cells and discharges to a pond located to the south west. This pond appears to discharge to the estuary.

Most of the waste material contained within the two cells was deposited during construction of the power station and comprises surplus soil and rock. Prior to 1994, the northern half of Cell 1 also received various waste streams arising from operation of the station; this area was capped as a remediation measure in 2005.

The Wetlands to the east of the former waste disposal area are undeveloped and heavily vegetated. There is no access road into the area and no formal access point on the boundary. The Wetlands occupy an approximate area of 25 ha.

3.1.4 Foreshore Lease Areas

The site includes an area of foreshore leased by ESB. This area includes the mud flats to the west of the former waste disposal areas, the sea wall structure and the reclaimed land behind (to the north of) the wall and the portion of the Estuary occupied by the HFO unloading jetty structure.

3.1.5 Surrounding Land Use

Land-use in the vicinity of the site at the time of the site inspection was predominantly agricultural and can be summarised as follows:

Site Boundary	Land Use
North	Railway track and agricultural lands beyond.
South	River Suir Estuary.
East	Agricultural Lands
West	River Barrow

3.2 Regional Setting

3.2.1 Solid Geology and Hydrogeology

According to the GSI[1], the geology underlying the site comprises Ordovician Volcanics consisting of the Campile Formation with undifferentiated felsic volcanics. The Campile Formation is described as pale coloured rhyolites in grey and brown slaty mudstones with occasional andesites.

The Campile Formation is considered a Regionally Important Fissured bedrock aquifer, with known well yields[1] ranging from 400-2,000m^3/d. Groundwater in the west of the site (Station Grounds and beyond) is described by the GSI as extremely vulnerable, due to the importance of the groundwater resource and the presence of rock at/near the ground surface. Only an interim assessment of groundwater vulnerability has been carried out by the GSI in the east of the site (former waste disposal area and beyond), and this has indicated high to low vulnerability. Groundwater at the site is expected to achieve good status in accordance with the Water Framework Directive[2].

The GSI wells database[3] indicates that there are eleven wells within a three-kilometre radius of the site.

- Ten of the identified wells are located at the site and were installed during an ESBI investigation (ESBI, 1996). The wells range in depth from 3.2m bgl (metres below ground level) to 18m bgl. Bedrock was not met in nine of the wells; bedrock was presumed at a depth of 9m in one of the wells located in the east of the site.

[1] Sleeman, A.S. ed. (1994) Geology of South Wexford. A Geological Description to Accompany the Bedrock Geology 1:100,000 Map Series, Sheet 23, South Wexford. Geological Survey of Ireland, Dublin.

[2] http://maps.epa.ie/InternetMapViewer/mapviewer.aspx

[3] http://www.gsi.ie/Mapping.htm

- A well used for domestic supply is located approximately 2.7km to the southwest of the site, across the estuary.

3.2.2 Subsoil Geology and Hydrogeology

Previous investigation reports (see Section 3.5) have identified a distinction between the subsurface conditions encountered beneath the western (Station Grounds) and eastern (former waste disposal area and their environs) portions of the site.

According to the GSI, subsoil geology beneath the Station Grounds consists of made ground and bedrock outcrop. In addition, up to 5m thickness of fill material consisting of sand and gravel was encountered beneath the more southern portions of lower tier of the Station Grounds in the ESBI investigation (ESBI, 1996). Natural soils to the east of the Station Grounds (i.e. beneath the former landfills) consist of marine/estuarine silts and clays. The following subsoil profile was inferred from historical reports in the vicinity of the former waste disposal area.

Approx. depth (m)	Soil Description
0 – 5m	Made ground: Gravel fill material.
5 – 18m	Natural ground: Clayey sandy silt.
18 – 24.5m	Natural ground: Sand and gravel.
24.5 – 27m	Natural ground: Yellow-brown glacial till.
>27m	Weathered volcanic bedrock.

Based on the results of intrusive investigations (ESBI, 1996) it was considered that the dominant shallow groundwater flow direction was towards the estuary. Permeability testing and groundwater modelling were also undertaken by ESBI to characterise the shallow groundwater pathways to the estuary.

It was concluded that the main groundwater flow pathway in the west of the site (Station Grounds) was through the made ground to the estuary. Although wells in the east of the site screened in the silt yielded little water, it was conservatively predicted through numerical modelling that the main groundwater pathway in the east of the site was percolation through the made ground and silt to the sand and gravel layer, with subsequent horizontal migration to the estuary.

Due to the site location on the estuary it is likely that groundwater flow (at least close to the estuary) is tidally influenced. Groundwater quality data compiled by ESBI indicates that groundwater at the site is brackish.

3.2.3 Surface Water Hydrology

The following water bodies are located near the site.

- The site is located on eastern bank of the Suir and Barrow River system – the confluence of these rivers is located to the south west of the site and the Barrow-Nore-Suir Estuary is located to the south.
- The Campile River, located to the south of the site, also drains into the same system.
- An unnamed stream flows through the southern portion of the site, between the former waste disposal area and the Wetlands, and appears to discharge into the Suir, via a natural pond.
- Water in the Barrow-Nore-Suir estuary is described by the EPA[4] as being of 'moderate' quality.
- Water quality in the River Suir is described by the EPA as being '*at risk of not achieving good status*' under the Water Framework Directive, while waters in the Campile River and the Barrow-Nore-Suir Estuary are described as being '*possibly at risk of not achieving good status*' under the directive.

There is a network of surface water drains across the site, with up to eleven (11) emission points, where surface water is discharged to the estuary. Surface water from the vicinity of the transformer units in the 220kV switching yard discharges into the main tank farm surface water system, which in turn discharges via a settlement tank and interceptor system at SW1, to the south.

A network of surface water drains that service the 110 kV switching yard connect to a surface water discharge point at SW10. There is no dedicated oil interceptor for surface water draining from the 110kV switching yard, however, it is noted there are no transformers in the 110 kV yard.

3.2.4 Protected Areas

According to the NPWS[5], the River Barrow estuary is a proposed Natural Heritage Area. The River Barrow and River Suir are designated as Special Areas of Conservation.

Groundwater beneath the site is protected as Drinking Water under the Water Framework Directive.

3.3 Site Development History

The station was constructed on agricultural land and in the southern portions on lands partly reclaimed from the estuary through construction of a sea wall and filling using quarried materials (thought likely to have been taken from other areas of the site).

[4] http://maps.epa.ie/InternetMapViewer/mapviewer.aspx

[5] http://www.npws.ie/

The power station was constructed in two stages. Stage 1 involved the commissioning of two 60 MW Units in 1967 and 1968 and Stage 2 involved the commissioning of a 120 MW Unit in 1972.

On site disposal of surplus excavated material, construction wastes and station waste was practised until 1994 in the former waste disposal area located in the eastern portion of the site. As mentioned earlier, the northern portion of Cell 1 was capped in 2005 as a remediation measure.

3.4 Aerial Photograph Review

A review of historical aerial photographs obtained from OSI is presented below:

IGNS 0695 (Flown 14/05/1977): The station was established and broadly similar to the current site layout. Agricultural fields bound the site to the north and east. The area east of the 220 kV switchyard and tank farm consist of grassed fields.

No evidence of land surface disturbance is evident in the lands to the east of the 220 kV compound. Some vegetation (trees/shrubs) is evident immediately adjacent to the north-eastern corner of the 220 kV switch yard.

There is no evidence of surface disturbance there, however, a drainage ditch has been constructed around the southern and western perimeters.

OSI 9846 (Flown 02/08/1981): No major changes are evident since 1977. Vegetation across the site is more established than in the previous photograph, particularly in the area directly east of the 220 kV switching yard, which appears to be newly forested.

No evidence of land surface disturbance is evident in the lands to the east of the compound in this photograph.

OSI website (2000): Vegetation across the site is generally more established. The former grassed fields east of the 220 kV switchyard and tank farm are heavily forested.

Further drainage features appear to have been added some time after 1977 (this area was not covered by the 1981 photograph).

3.5 Environmental Site Assessments – Previous Reports

3.5.1 ESBI 1996

This ESBI investigation (ESBI, 1996) was undertaken to assess the level and distribution of subsurface contamination at the site. A number of sources were identified which posed a potential risk of contamination:

- A transformer oil spill, disused underground petrol tank and stained tarmac area in the main station area; and
- The disposal of heavy metal-contaminated sludge, waste fuel oil and domestic waste in the former waste disposal area.

The investigation concluded that no contamination had resulted from the transformer oil spill or underground petrol tank. There was evidence that minor heavy metal and hydrocarbon soil contamination had occurred in the stained tarmac areas and in the former waste disposal area where sludge and waste oil disposal is know to have occurred.

3.5.2 ESBI, 2000 – Phase 1 Investigations

ESBI undertook Phase 1 investigations at several ESB generating stations ca. 2000. The process categorised the facilities according to the potential for the presence of contamination. The Phase 1 investigation for Great Island (ESBI, 2000) categorised the former waste disposal area as Class B – being areas where asbestos is known to be present over a large area.

3.5.3 ESBI, 2002 – Phase 2 Investigations – Former Waste Disposal Area

The Phase 2 investigation reported in 2002 comprised a grid based sampling programme (10 m 'herring-bone' grid) across the former waste disposal area. Samples were collected at 43 locations from depth intervals of up to 5.3 m bgl.

The waste materials encountered included brick, plastic, glass, wood, metal, ceramics, cloth, rubber, clinker, paper and concrete. Possible asbestos was visually identified in the soil at four sampling locations. Asbestos was confirmed to be present in these samples through laboratory testing.

From a total of 110 soil samples, 27 samples were found to have detectable levels of asbestos fibres. These were further divided into 15 samples where 'trace' levels were detected and 12 where more 'major' levels were detected. None of the 12 major detections had visual evidence recorded in the field and it was concluded that 'disseminated' asbestos fibres were potentially present across the investigation area – in particular around the perimeter and in the western most part of the investigation area.

Chemical testing was carried out on 106 samples. 'Significant' contamination (copper, nickel and zinc) was reported in 6% of those samples. Vanadium was elevated in several of the samples. 'Slight' hydrocarbon concentrations were also reported in approximately 40% of the samples. There was a marked correlation between the samples where chemical and asbestos contamination was recorded.

3.5.4 URS, 2003 – Risk Assessment – Former Waste Disposal Area

URS completed an environmental risk assessment of the former waste disposal area in 2003. The objectives of the study were to assess potential impacts on relevant environmental receptors from contamination (including asbestos) identified in the former waste disposal area and assess remedial options for the area. The findings are summarised below:

- The two cells in the waste disposal area were developed during two main phases of construction at the station in the mid-1960 and early 1970s, through the placement of excess rock spoils and buildings materials. The northern portion of Cell 1

(eastern cell), known as the 'Station Dump', was used thereafter for ad hoc disposal of wastes generated through site operations. Such wastes were thought to have comprised asbestos, fuel oil, boiler washings, laboratory waste, building rubble and canteen waste.

- The materials deposited in the cells are typically 5 m thick and were placed directly on natural alluvial/estuarine silts. The silt unit is approximately 10 m thick and is underlain by natural sandy gravels.
- Three distinct, water-bearing zones have been identified:
  - Localised, non-continuous water in the base of the fill units,
  - An aquifer with an hydraulic gradient encountered within the silt; and
  - A deeper aquifer within the natural sandy gravels.
- The investigations reported slightly elevated concentrations of metals in the fill materials and no impacts in the underlying natural materials;
- 180 samples were tested for asbestos, with two positive identifications;
- Minor environmental impacts to groundwater were described and included hydrocarbon sheen in water in the fill units near the former station dump and a limited zone of suspected HFO within soils and perched water bodies in the fill also in the former station dump area;
- The risk assessment concluded that the areas outside of the former station dump (northern portion of Cell 1) did not pose a risk to human health of workers or to the Suir estuary. It was noted that the elevated arsenic levels and the presence of the hydrocarbons in the fill in these areas would require further assessment should a change in land use be considered in the future.
- A preliminary evaluation of remedial design identified capping of the northern portion as the preferred remedial option. This remediation approach was implemented in 2005 with EPA agreement.

ESBI were appointed to undertake the detailed design, procurement of contractors and construction supervision of the capping works.

URS were commissioned by ESB to undertake a review of the ESBI tender documents and to provide a construction quality assurance role during construction of the landfill cap. Site visits were carried out by URS over the course of the construction works, which were undertaken between June and August 2008. It was concluded that the landfill caps were constructed in accordance with the contract documents.

3.6 Site Operations

The following summary of site operations is based on information gathered during the site walkovers completed on 17 and 29 September 2008, information provided during

discussions with site personnel, and information provided in the identified previous reports (see Section 3.5), in particular the ELRA prepared by TMS (TMS, 2006).

3.6.1 Power Generation – General Process

Steam is generated in oil-fired boilers at Great Island. The steam is used to drive steam turbines, which power the electricity generators. Exhaust steam is condensed using cooling water, which is taken from the estuary treated with chlorine and returned to the estuary at a slightly elevated temperature.

Transformers are used to raise the voltage of the generated electricity making it suitable for long distance transmission.

There are three electricity-generating units at Great Island. Electricity from Units 1 and 2 is transferred to the indoor 110 kV transformers via underground oil filled cables. Electricity from Unit 3 is transferred to the 220 kV transformers via over ground cables.

3.6.2 Fuel Storage

HFO Tank Farm

HFO is pumped from the oil delivery jetty to the Tank Farm, located on the upper tier, via an above ground pipeline. From the jetty, the pipeline is routed in an eastward direction along the top of the seawall as far as the HFO 'stripping' tank. This tank collects excess HFO draining by gravity from the pipeline after fuel unloading events. The oil is stored in the tank until the next unloading event when it is pumped up to the tank farm.

At the stripping tank, the pipeline turns northwards, running 'uphill' to the tank farm located on the upper tier. Before the stripping tank, a short (6m) section of the pipeline runs underground where it crosses under a service roadway.

The tank farm contains a total of seven HFO tanks. Each of five primary storage tanks has a 17,000 tonne capacity; the other two tanks are test and transfer tanks and have smaller capacities. A pumping station is used to transfer the HFO between tanks and into the transfer tank, where it is heated to enable it to be gravity fed to the boiler units.

A separate 50 tonne bunded storage tank stores diesel used in as fuel during boiler start up. The Tank Farm is bunded and concrete lined. Drainage is routed through oil interceptors and discharged to the estuary.

Transformer Yards

The high voltage transformers are all oil filled. Their capacities vary between 13.82m^3 and 59.8m^3 (TMS, 2006). Oil filled cables run between the 220 kV and 110 kV switching yards. These are equipped with alarms that detect pressure loss.

Propane

Propane is stored on-site and is used in the boiler ignition process.

Waste Fuel Storage

Waste HFO is stored in a 50,000 litre (L) tank located north of the HFO stripping tank. Waste Light Fuel Oil (LFO) is stored in a 18,000 L tank located in the same area. These two tanks are located within below-ground concrete vaults which provide secondary containment.

3.6.3 Water Treatment

Water is used in two separate processes on-site.

- Town supply water (stored in a the reservoir in the north of the site) is treated on-site to make it suitable for boiler use. A condensate polisher (containing beds of resins) captures the soluble solids in the condensate. Dissolved oxygen is removed from the condensate through the addition of hydrazine. A deaeration tank removes oxygen, nitrogen and carbon dioxide. Ammonia is also added to lower the pH.

- Water for the cooling system is taken from the estuary at the pump house and is used to condense steam from the turbines. Chlorine may be added as a biocide. The condensate is then returned to the estuary via the culverted discharge channel located on the lower tier of the Station Grounds.

3.7 Materials Storage

Chemicals used for water conditioning include ammonia, hydrazine, sodium hydroxide, sulphuric acid and phosphate. Most of these are stored in (or near) the water treatment plant, located on the lower tier of the Station Grounds.

Chemicals used on site in the water treatment process include sodium hydroxide and sulphuric acid. These chemicals are stored in bunded areas in the vicinity of the water treatment plant on the central portion of the site.

3.8 Reported Incidents & IPPC Compliance

According to the ELRA prepared by TMS consultants (TMS, 2006) an overflow from the oil-stripping tank occurred in the 1970s during a delivery, with resulting discharge of oil into the estuary. An extensive clean up was carried out and unloading procedures were reviewed and improved.

In 1992, one of the five oil tanks in the HFO Tank Farm leaked into the concrete bund. The spill was contained.

4. PHASE 2 ASSESSMENT

The environmental sampling locations were selected on the basis of the Phase 1 ESA results, observations made during site walkover inspections and information gathered from key site personnel. The locations of the sampling points are presented in Figure 3 and are described below.

The sampling approach was influenced by the absence of overburden across some many areas of the site, access issues associated with site infrastructure and/or health and safety protocols, the steep gradients between site tiers and the density of vegetation across large areas of the site. For these reasons, the approach was largely based on characterisation of groundwater quality in the downgradient portion of the site and shallow soil characterisation in areas where access allowed. These assessments were supported by detailed inspections of inaccessible areas as well as review of historical aerial photographs.

The locations of the monitoring wells installed on the lower tier were selected so as to provide reasonable coverage of the foreshore but were also biased towards key infrastructure including the waste oil tanks, the Oil Stripping tank and the process water treatment plant.

4.1 Soil and Groundwater Sampling

The scope of work carried out during the Phase 2 investigation comprised the following:

- Drilling of seven boreholes (BH201 to BH207) using an air rotary drilling rig;
- Collection of fill and overburden samples during drilling using a split spoon sampler;
- Collection of groundwater samples from:
  - The newly installed monitoring wells (BH201 to BH206). Monitoring well BH207 was a dry well;
  - Two existing groundwater monitoring wells (BH2 and BH3) on the Station Grounds;
  - Three existing wells on the more western of the two landfill cells (MW101, MW102 and MW107);
  - Five existing wells on the eastern landfill cell (MW104, MW106, MW200, MW201 and MW202).
- Surveying the elevations of newly installed groundwater monitoring wells (as well as existing wells where required);
- Excavation of seventeen shallow trial pits (TP101 to TP117) and collection of soil samples;
- Excavation of three hand augered samples from the bund walls around the HFO Tank Farm;

- Walkover inspections of the accessible heavily forested areas;
- Inspection of licensed surface waters discharge points and collection of samples (where water was present) from five points (SW1, SW5, SW6, SW8 and SW10);
- Collection of seven sediment samples (SS01 to SS04 and SS10 to SS12) from the foreshore areas to the west of the former landfill cells and to the west of the Station Grounds (as access would allow);
- Detailed walkover inspection and collection of eight hand augered samples from across the 220 kV compound;
- Detailed walkover inspection and excavation of one[6] trial pit from the 110 kV compound;
- Elevated photographic survey of the site; and
- 'Bracketing' sampling around hand augered sample HA04.

The drilling, trial pitting and hand augering works took place during week ending 3 October 2008. Groundwater, surface water and sediment sampling took place during the following week.

A second site visit was undertaken on 31 October 2008 when a groundwater sample from existing monitoring well BH2, which was previously covered by a site vehicle, was collected. Bracketing soil samples were collected from around hand auger sample point HA04, where elevated concentrations had been recorded. The elevated survey and survey of the well heads also took place at this time.

4.2 Laboratory Analysis

Soil and water samples selected for chemical analysis were sent under chain of custody procedures to Alcontrol Laboratories in Dublin. Analysis for asbestos in soils was undertaken by Envirochem at their laboratory in Southampton, England. Both laboratories were UKAS accredited for the respective analysis completed by them.

The soil samples were analysed for the following parameters:

Analyte	No. of Samples – Soils	No. of Samples – Sediments
Total Petroleum Hydrocarbons (TPH) Criteria Working Group (CWG) Analysis	51	7
Benzene, Toluene, Ethylbenzene, Xylene (BTEX) Compounds	51	7

[6] Access to the internal switching yard was not possible – this trial pit was excavated in the grassed area to the north of the internal switching yard building.

Analyte	No. of Samples – Soils	No. of Samples – Sediments
Total Organic Carbon (TOC)	47	0
Metals (As, Ba, Cd, Cr, Cu, Hg, Mo, Ni, Pb, Se, Sb, V, Zn)	47	7
Speciated Polycyclic Aromatic Hydrocarbons (PAHs)	26	7
Total Phenols	24	7
Total Cyanide	24	7
Chloride, Fluoride and Sulphate	17	7
Polychlorinated biphenyls (PCBs)	15	4
Volatile organic compounds (VOCs)	2	1
Asbestos in Soil	30	0

The groundwater samples were analysed for the following parameters:

Analyte	No. of Samples - Groundwater	No. of Samples - Surface Water
TPH CWG Analysis	15	5
BTEX Compounds	15	5
Metals (As, Cd, Co, Cr, Cu, Hg, Mo, Ni, Pb, Sb, Se, V, Zn)	15	5
PAHs	12	5
Total Phenols	15	5
Total Cyanide	15	5
PCBs	15	5
VOCs	6	5
SVOCs	4	5
Anions/cations: aluminium, boron, barium, calcium, chloride, iron, potassium, manganese, sodium, sulphate, alkalinity, total hardness, total dissolved solids	15	5
Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD),	15	5
Nutrients: ammoniacal nitrogen, nitrate, nitrite, phosphate	14	5
Total and faecal coliforms	10	5

5. PHASE 2 METHODOLOGY

The intrusive investigation methodologies were based on the British Standard for the Investigation of Potentially Contaminated Sites (BS 10175:2001).

5.1 Soil Sampling

5.1.1 Trial Pitting

A four tonne '*mini*'-excavator was used to advance the trial pits. Excavation progressed at each location until natural soils under the fill units were confirmed although refusal or unstable ground conditions limited the location and depth of excavation in some places.

A URS field engineer supervised all excavation works. Each trial pit was one excavator bucket in width (nominal 750mm) and approximately 3m in length and the location was scanned using a cable avoidance tool prior to excavation.

The field engineer then logged, sampled and photographed the excavation as it progressed. The excavations were backfilled with the excavated material before moving to the next location.

5.1.2 Hand Augering

A hand auger was used to collect near surface soil samples where access was restricted such as in the transformer compound. The hand auger was cleaned prior to sampling. Samples were collected directly from the hand auger for logging and analysis.

5.1.3 Borehole Drilling

Where overburden or made ground was encountered during borehole drilling, a representative sample was obtained from the drill arisings and placed into laboratory supplied sample jars. Samples were collected at nominal 1.0m intervals until bedrock was reached using a split barrel sampler. Samples collected for asbestos analysis were placed in a ziploc bag.

The sample containers were labelled with a unique sample number and placed in a suitable container for transportation. The field engineer wore single-use disposable nitrile gloves during sample collection and sample handling.

Soil from each investigation location was visually examined for evidence of contamination and screened using a photoionisation detector (PID) for the presence of volatile compounds. Drill arisings were also inspected for the presence of suspected asbestos containing materials (SACM). Samples were selected for analysis based on evidence of contamination. The URS engineer noted the location on a plan, noted the sample depth and the sample number(s) and recorded the position using a portable GPS.

5.2 Groundwater Monitoring Well Installation

Air rotary drilling techniques were used to advance boreholes into bedrock. Air rotary drilling utilises compressed air and a 'down-hole' percussive hammer to pulverise the

rock and blow the cutting back to the top of the hole. Glover Site Investigation Ltd were contracted to undertake the drilling works.

The boreholes were advanced until groundwater was encountered and a monitoring well was then installed within the completed borehole, with the well screen extended across the observed water table.

The monitoring wells were constructed using 50mm diameter HDPE standpipe with a nominal 3m - 4m screened interval. The screened section was surrounded by a washed gravel filter pack. A bentonite seal was placed at the surface to minimise the potential for surface and shallow groundwater entry. The monitoring well head-works were completed using flush mounted trafficable covers

Following completion, the monitoring wells were developed to enhance the wells' ability to exclude fine-grained material.

5.3 Groundwater Sampling

Prior to sample collection, an interface probe was used to measure depth to groundwater and to assess the presence of free phase oil product in the wells. The monitoring wells were purged of at least three annular volumes of water using manual inertial lift pumps dedicated to each well to ensure representative groundwater samples were collected.

The collected water was placed directly into laboratory supplied sample containers appropriate to the proposed analytes (with appropriate preservatives if required).

In addition to the collected samples, in-situ water quality parameters (temperature, pH, electrical conductivity, redox-potential and dissolved oxygen) were recorded. Standard environmental sampling techniques were adopted to minimise the risk of cross contamination between sampling locations and to ensure quality of samples upon receipt at the laboratory.

Field duplicate samples were collected during the groundwater and surface water sampling at a rate of one duplicate for every 10 primary samples.

All sample bottles were labelled with a unique sample number for each monitoring well and placed in a cool box dedicated for water samples.

5.4 Elevated Photograph Survey and Monitoring Well Survey

In order to record the condition of the site prior to divestment, an elevated photograph survey was undertaken by Murphy Surveys Ltd. The elevated panoramic photographs were taken using a high spec digital camera namely a Canon G7. The camera was mounted on a telescopic mast that is capable of reaching 15m in height, thus allowing an overview of the portion of the site at the survey location. Panoramic photographs were taken at several locations around the site.

Murphy Surveys also carried out an elevation survey of each of the newly installed monitoring wells to National Grid (IG75) using a Trimble real-time RTK GPS solution.

The elevated panoramic photographs are presented in Appendix A together with other photographs taken at site surface level. A map showing the locations from where the images were captured is presented in Figure 6.

6. PHASE 2 FINDINGS

6.1 Site Geology

Boreholes and trial pit logs are presented in Appendix B.

Overburden encountered in the trial pits excavated on the upper tier of the Station Grounds generally comprised a thin layer of fine-grained sandy and silty topsoil overlying weathered bedrock. The thickness of the overburden was typically less than 0.5 m.

Borehole BH207, excavated near the 220 kV switching yard, encountered 1.75 m of loose brown clay overlying bedrock.

On the lower tier, up to 6.5 m of fill material was encountered along the southern margin, within the reclaimed foreshore area. The localised fill material comprised a lower layer of clays with occasional boulders, underlying an upper layer of boulders. Similar conditions were encountered at boreholes BH202, BH203 and BH204.

At the other boreholes located on the lower tier (BH201, BH05 and BH206) up to 3 m of natural clays overlying bedrock were encountered. These locations are to the north, or near the northern margins of, the reclaimed area.

6.2 Site Hydrogeology

6.2.1 Groundwater Occurrence

On the lower tier, a water strike was recorded in BH202, in the fill material at a depth of 4.7 m bgl. Similar 'perched' water was not encountered in the fill material in the other boreholes and its occurrence in BH202 is considered likely to be isolated.

Groundwater strikes in the fractured bedrock were recorded in each of the wells drilled in the lower tier at depths ranging between 7 m and 17 m bgl.

No groundwater was encountered in monitoring well BH207, located on the upper tier, south of the 220 kV switching yard. This bore was advanced to 19 m BGL through fractured bedrock and a monitoring well was installed to 12 m BGL. Subsequent gauging indicated the well had remained dry following installation. Groundwater was not encountered in any of the trial pits excavated on the upper tier.

6.2.2 Inferred Groundwater Flow Direction

Groundwater table elevations are presented on Figures 4 and 5 for the lower tier and former waste disposal area of the site respectively. As stated above, groundwater was not encountered in the well within the upper tier.

Groundwater was inferred to flow through the bedrock aquifer in a south-to-south-eastward direction beneath the southern portion of the site. It is noted this area is almost entirely sealed with concrete or buildings.

Groundwater (likely 'perched' water) was encountered in the fill materials at only one location. A flow direction for this upper water bearing unit was not therefore inferred.

With regard to the former waste disposal area there is insufficient data to infer groundwater flow direction; however, previous studies (Section 3.5) inferred three distinct, water-bearing zones including:

- Localised, non-continuous water at the base of the fill units,
- An aquifer with an hydraulic gradient encountered beneath the silt/fill interface; and
- A deeper aquifer in the underlying natural sandy gravels.

Groundwater modelling (URS, 2003) suggested groundwater flow in this area of the site was towards the estuary.

6.3 Field Evidence of Contamination

During the intrusive site investigation no evidence of contamination in the form of staining or odours was observed, with the exception of a localised area of surface staining on the southern boundary of the 220 kV switching compound (HA04).

6.4 Field Parameters

Measurements of pH, electrical conductivity (EC) and temperature were made on groundwater and surface water samples collected in the field. The data are presented in Tables 22 and 23 respectively. Also presented in this table, for comparison with EC results, are total dissolved solids (TDS) laboratory results.

6.4.1 Surface Waters

For surface waters sampled in the field the EC results are typical of fresh waters, with the exception of SW8, located on the south-western corner, where the EC reading exceeded the IGV for this parameter. It is possible there is some seawater influence in this sample. It is noted the sodium and chloride concentrations were also markedly elevated in this sample, which is consistent with the presence of estuarine waters.

PH in these surface water samples was generally typically neutral. Elevated temperature ranges (14 to 35° C) are likely related to the site processes.

6.4.2 Groundwater Samples

EC (and TDS) results from the western cell (MW101, MW102 and MW107), which ranged from 10,600 to 37,100 µS/cm, appear to be influenced by brackish waters from the estuary. This is consistent with elevated concentrations of some of the anion and cation concentrations recorded in groundwater.

EC results from the eastern cell are within normal ranges for fresh water, with the exception of MW202 and MW201, where results of 2,930 and 5,350 µS/cm were recorded. Sodium, chloride and other anions and cations were more elevated in these

than in the other wells on the eastern cell, indicating the probably presence of estuarine waters, however, there is also potential the elevated EC to be related to leachate in the former waste cell.

PH in the groundwater samples (measured in the field) in the western former cell (MW101, MW102 and MW107) was generally typical of neutral to slightly alkaline conditions. A pH reading of 9.3 was recorded in MW101, which is slightly outside of normal ranges for groundwater.

6.5 Site Inspections

As described in Section 5, site walk over inspections were undertaken in areas that were inaccessible for investigation by intrusive means. These included the forested areas to the east of the station grounds and in the north-western corner of the site. No evidence of contamination was encountered during these inspections.

In two locations within the forested area east of the station grounds, discarded blue polythene wrapping was noted (see Photograph X). These were to the north of the area, near the access roadway and immediately the east of the HFO tank farm boundary.

A more detailed inspection of these two areas suggested some minor clearing works had been performed there, as there were several sawed logs in the vicinity. There was no evidence that the former contents of the wrapping was present at these locations.

No suspected asbestos containing material (SACM) was encountered at these locations.

7. ANALYTICAL RESULTS

7.1 Data Assessment Criteria

In order to assess the environmental quality of data gathered through intrusive investigations, criteria were chosen as guidelines against which the analytical results could be compared. These assessment guidelines and the rationale for their use are described below.

7.1.1 Chemical Parameters

Soil Quality

The soil analytical samples were compared with Stage 2 Generic Assessment Criteria (GAC). The GAC are conservative screening criteria protective of human health (assuming on-going industrial use of the site) and controlled waters (groundwater and surface waters).

If the concentrations are below the GAC, then the risks to human health and controlled waters are considered negligible. If the concentrations are above the GAC, there is a potential risk to human health and / or controlled waters.

URS considers that the GACs are consistent with the principles of human health and controlled waters protection in Irish Environmental Protection Agency, UK DEFRA and UK Environment Agency guidance.

Metal concentrations in soil have been compared against background data for Irish soil published by the EPA[7]. The published data was based on test samples collected from across the Republic of Ireland and to remove the effect of statistical outliers, the 95 percentile values were used as screening criteria. It should be noted that these 95-percentile values represent Irish background levels and are not indicators of environmental risk.

The Dutch Screening (S) and Intervention (I) Values are also presented in the data tables for soil and sediment results. These criteria have been presented to provide continuity with preceding environmental assessment reports for the site and are referenced in the discussion sections where pertinent to the current works. The DIVs represent levels above which there may be a risk to human receptors and above which more detailed site-specific risk assessment may be required. With regard to PAH compounds, the Dutch criteria provide a DIV for the sum of ten PAH compounds.

Groundwater Quality

Groundwater analytical results were assessed by comparing them to the EPA Interim Guideline Values (IGVs). These guidelines were developed using a number of existing water quality guidelines in use in Ireland including existing national Environmental Quality

[7] Environmental Protection Agency, *Towards a National Soil Database (2001-CD/S2-M2)*, 2007

Standards (EQSs), proposed common indicators for the EU Groundwater Directive, Drinking Water Standards and GSI trigger values.

Surface Water Quality The Environmental Protection Agency Environmental Quality Standards (EQS) for Waters (Draft), which provide guidance on the ecological quality of surface water, have been used to assess surface water results. Where available the EQS for estuarine waters has been applied.

7.1.2 Asbestos in Soil

The assessment of asbestos in soil was based on the presence or absence of asbestos as confirmed by a UKAS accredited laboratory. ESB has adopted a generic "asbestos-safe" level for residual asbestos fibres in soil of 0.1%. URS has verified that the adopted "asbestos-safe" level is protective of human health, based on the CLEA CLR10 human health exposure assumptions used in the UK, combined with toxicological data taken from the USEPA IRIS database.

The laboratory used to perform the analysis of soil samples indicated that a 'No Asbestos Detected' result was consistent with a detection limit of less that 0.01%, which is consistent with the method used by the laboratory (MDHS 77).

7.2 Soil Analytical Results

The soil data collected from trial pits and during drilling of boreholes are presented in Tables 1 to 7. There were no exceedances of the human health GACs. Exceedances of the other selected guidelines are discussed in the following.

7.2.1 Hydrocarbon Compounds

Hydrocarbon indicator compounds (Table 1) were generally not detected in soils (above the laboratory method detection limit (MDL)), with the following exceptions:

220 kV Compound

- A total TPH concentration of 7,861 mg/kg was recorded in sample HA04 collected from within the 220 kV compound. The concentration of aromatic fractions detected was 653 mg/kg, while the aliphatic fractions (C_{12} to C_{35}) totalled 7,208 mg/kg. This was above the DIV of 5,000mg/kg. No BTEX compounds were detected in this sample.
- All speciated aromatic and aliphatic hydrocarbon concentrations in sample HA04 were below human health GACs for soil, however, the detected concentrations exceeded some of the controlled waters GACs for soils.
- No hydrocarbon indicator compounds were detected in additional 'bracketing' samples collected from around HA04 (samples HA12 to HA15).

Station Grounds – Upper Tier – Trial Pit Samples

- A total TPH concentration of 3,284 mg/kg was recorded in a soil sample collected from a depth of 1.5 m in trial pit TP106, located at the northern site boundary, south of the railway track. TPH was not detected in the sample collected from a shallower depth of 0.5 m in TP106. The TPH fractions represented were aromatic, the highest concentrations (3,037 mg/kg) from the C_{12}-C_{16} range. The TPH concentrations exceeded the respective GACs for controlled waters.

- A total TPH concentration of 1.14 mg/kg was recorded in trial pit TP108 at a depth of 0.3 m. The location is at the site boundary, near a small boat jetty.

- A total TPH concentration of 0.133 mg/kg was recorded at TP113 at a depth of 0.5 m, located immediately north of the 110 kV compound.

- A total TPH concentration of 0.613 mg/kg was recorded in TP117 in a sample collected from 0.5 m depth. The trial pit is located on the lower tier, near the western foreshore. TPH was not detected in the sample collected from 1.5 m in the same pit.

Borehole Samples – Lower Tier

- TPH concentrations that exceeded the GAC for controlled waters was recorded in soil samples collected from the boreholes excavated in the southern portion of the station grounds, near the sea wall. These included BH203 and BH204, where concentrations ranging between 15.17 and 987.58 mg/kg were recorded.

- In BH205, located to the west of the power generation building, similar concentrations of total TPH aliphatic fractions were detected, but aromatic fractions (C_{12} to C_{35}) predominated.

7.2.2 PAH Compounds

220 kV Compound

- PAH were detected in sample HA04. The total PAH concentration for the sum of 16 PAH compounds (Total 16 EPA PAH) was 2.761 mg/kg. All of the individual PAH compounds exceeded the respective controlled waters GACs. None were detected in the bracketing sampling completed around HA04 (HA12 to HA15).

Station Grounds – Upper Tier – Trial Pit Samples

- PAHs were detected in trial pit TP106 in a sample collected from a depth of 1.5 m BGL. TP106 is located at the northern site boundary. The concentrations did not exceed GACs.

- PAHs were also detected in the sample collected from 0.3 m depth in TP108. These concentrations exceeded controlled waters GACs.

- PAHs were detected in the 0.5 m sample collected from TP115 and TP117, located in the centre and western portions of the station grounds respectively.

Borehole Samples – Lower Tier

- An elevated concentration (15.451 mg/kg) of PAHs was detected in soils collected from borehole BH203 at a depth of 3.0 m in a unit of soft gravely clays. The component PAHs exceeded respective GACs for controlled waters. Relatively lower concentrations (< 0.5 mg/kg) were detected in samples BH201 and BH204.

7.2.3 Heavy Metals

With the exception of antimony, cadmium, mercury and selenium all of the other heavy metals concentrations in samples collected from across all areas of the site exceeded the GACs for controlled waters. Also presented on Table 3 are typical regional background concentrations. The concentrations are discussed further in Section 8.

7.2.4 Other Analytes

- Phenols were detected at low levels in several samples collected from across the site. Given the apparent random distribution of these detections across the site and the lack of an immediately identifiable source, these results were queried with the laboratory and an internal investigation was completed. It was concluded by the laboratory the low level concentrations were related to a batch of filters used in sampling handling. The data were removed from the summary tables presented herein. The low level occurrences are not related to the site.

- Chloride was detected at several locations, however, no GACs are derived for comparison for this compound. Fluoride concentrations marginally exceeded GACs for controlled waters at eight sampling locations (HA05, HA11, TP101, TP103, TP117, BH201, BH204).

- PCBs and VOCs were not detected in any of the soil samples analysed.

- No suspected asbestos containing material was identified during the program. No asbestos was identified through laboratory analysis of the collected soil samples.

7.3 Sediment Analytical Results

7.3.1 Hydrocarbon Compounds

Hydrocarbon indicator compounds were detected in all of the seven sediment samples. Both aliphatic and aromatic fractions were represented, but the majority of the total TPH concentration was represented by aliphatic heavy end (C_{21} to C_{35}) fractions. Higher concentrations (50 to 200 mg/kg) were recorded in samples SS01, SS02 and SS03, collected from the foreshore to the west of the former landfill cells, near the cooling water outlet. The remaining four samples, which were collected from the foreshore area to the west of the Station Grounds recorded lower (< 5 mg/kg) concentrations. The samples collected near the landfill mostly contained aliphatic fractions, which were absent from the samples collected west of the station grounds.

7.3.2 PAH Compounds

PAH were detected in all sediment samples. No exceedances of the controlled waters GACs were recorded.

7.3.3 Heavy Metals

Mercury and selenium were not detected (above the MDL) in the sediment samples analysed. Molybedenum was detected at concentrations that did not exceed GACs in four of the samples, chiefly those from the western foreshore. Nearly all other heavy metal results exceeded the respective GACs for controlled waters.

Also presented on Table 3 are typical regional background concentrations. The concentrations are discussed further in Section 8.

7.3.4 Other Parameters

Chloride concentrations were elevated in the collected samples. No GACs exist for comparison.

7.4 Groundwater

The groundwater results are divided between the wells located on the former waste disposal areas and those recently installed on the Station Grounds.

7.4.1 Hydrocarbons

Hydrocarbon indicator compounds were not detected in the groundwater samples.

7.4.2 PAH Compounds

PAHs were not detected in the wells located in the former waste disposal area.

PAHs were detected in one of the wells located on the Station Grounds (existing well BH2). Some of the PAHs (benzo(a)pyrene and benzo(b) and benzo(k)fluoranthene) exceeded IGVs.

7.4.3 Heavy Metals

Metal concentrations in excess of the IGVs were detected for arsenic. All other metal concentrations were below their respective IGVs (where present).

The arsenic concentrations observed are discussed further in Section 8.

7.4.4 Volatile Organic Compounds

VOCs were not detected in any of the targeted wells, which included two wells in the former waste disposal area (MW104 and MW107) and four wells in the Station Grounds (BH201, BH206, BH2 and BH3).

7.4.5 Semi-Volatile Organic Compounds

SVOC were not detected (above the MDL) in the four wells for which this analysis was scheduled (BH2, BH202, BH203 and BH205).

Trace concentrations of tentatively identified compounds (TIC) were reported for one well (BH2).

7.4.6 Other Analytes

- Many of the anions and cations were elevated above respective IGVs, in particular in the wells located in the western cell of the former waste disposal area (Cell 2).
- Ammonia concentrations were elevated in the groundwater samples collected from monitoring wells located in the former waste disposal area, in particular those on the western side (Cell No. 2) where concentrations ranged from 0.77 to 76 mg/L (against an IGV of 0.15 mg/L). Ammonia concentrations in the Station Grounds wells were markedly lower.
- Nitrite and phosphate concentrations marginally exceeded respective IGVs across the site in both Station Grounds and former waste disposal area wells.
- Phenols were detected in two wells (MW101 and BH2) where concentrations exceeded the IGV. As detailed above for soil data, it was concluded by the laboratory the low level concentrations were related to a batch of filters used in sampling handling. The data were removed from the summary tables presented herein. The low level occurrences are not related to the site.

7.5 Surface Waters

- PAHs were detected in each of the five surface water samples collected, with the exception of SW10. Guidelines are not available for the individual PAHs. The sum of 6 PAHs exceeded the respective EQS at sample location SW6, located on the southern site boundary.
- Metals were detected in all surface water samples, generally at concentrations that were less than respective EQSs. One exceedance of the EQS for selenium was recorded for surface water sample SW8, collected from an outfall located on the south-western corner of the site.
- Anions and cations were generally below respective EQSs, with the exception of SW8, where elevated concentrations were recorded. It is likely that seawater formed a large portion of the sample collected here.
- Nitrite and phosphate also exceeded EQSs in several of the samples.
- Coliforms were detected in all samples. The concentration recorded in SW6 was greater than the respective EQS.

7.6 Data Validation

A limited number of duplicate samples were collected during the course of the site works. The results are presented in Table 6.

Upon request by URS, the laboratory (Alcontrol, Dublin) undertook ionic balance calculations for two of the data batches relating to the Great Island site. These included B05857 and B05930, which related to surface and groundwaters respectively.

In batch B05857, the laboratory identified anomalies in the surface water results for cations calcium and magnesium, which were considered abnormally low and indicated this could be due to a number of reasons including matrix interferences. The low cations results resulted in a percentage difference result, which was considerably outside of acceptable ranges. The laboratory has in indicated the other ionic data is within acceptable ranges and suitable for interpretative use.

In batch B05930 the anion sulphate was identified as being abnormally high in the context of the other anions and cations. An investigation showed that errors were made during analyses and the sulphate results were subsequently withdrawn from the groundwater data set. The laboratory has in indicated the other ionic data is within acceptable ranges and suitable for interpretative use.

8. DISCUSSION

There were no exceedances of the GACs protective of human health in any of the targeted media; consequently the concentrations of analysed parameters are not considered to pose a risk to current or future users of the site in a continued industrial land use scenario.

There were some exceedances of the GACs protective of controlled waters, the DSVs and DIVs for soils and the GACs for sediments. There were also some exceedances of the IGVs protective of groundwater and the EQSs protective of surface water. These exceedances are discussed below.

8.1 Soil Quality

8.1.1 TPH and PAH in Soil

Upper Tier – Trial Pit Samples

Samples in which TPH aromatic fractions (C_{12} to C_{35}) were detected in shallow soils from trial pits located on the upper tier of the station grounds also contained slightly elevated concentrations of PAHs. These investigation locations included TP106, TP108, TP113 and TP117.

No field evidence of fuel related contamination such as staining or odours were noted at these locations. BTEX compounds or aliphatic TPH fractions, which would generally indicate a fuel based contaminant source, were not detected in these samples either. It is considered the TPH detections generally reflect the PAHs in the sampled materials.

Possible sources of PAH contamination would include boiler ash or other remnants of partially combusted materials. It is considered likely there could be minor isolated occurrences of such materials at these locations.

While some of the individual PAH concentrations exceeded GACs for controlled waters, the sum of 10 PAHs were less than the DIV in all cases.

BH207 (located immediately south of the 220 kV switching yard) was excavated to a depth of 19 m and no groundwater was encountered. The monitoring well, installed to a depth of 12 m, remained dry after installation. Given the relatively deep groundwater table beneath the upper tier, there is no pathway between the observed impact in shallow soil and the receptor (i.e. groundwater and surface water). It is unlikely, therefore, that there is a risk to the underlying aquifer beneath the subject area and these exceedances are not considered significant.

Switching Yards

Based on the results of the bracketing sampling (HA12 to HA15) undertaken near the south-eastern boundary of the 220 kV switching yard, it is considered the contamination encountered in sample HA04 is localised. Given the distance from the two oil tanks located in the switching compound, it is considered unlikely to be related to a spill or leak

from those potential sources. It appears the area concerned is used for storage of replacement (or spent) parts for the switching yard and it is considered likely the isolated contamination relates to these practices.

Lower Tier – Borehole Samples

PAHs were detected in soil samples collected from boreholes (BH203 and BH204) located along the foreshore area.

The likely closest source of PAH in this instance is considered to be the boiler wash effluent tank, located approximately 50 m to the north east, however, it is unclear whether spillage from this process has occurred historically.

The PAH concentrations detected in these soil samples exceeded the GACs for controlled waters and given the proximity to the estuary the concentrations are considered to warrant further assessment. It is noted the DSV for total PAHs was exceeded in only one of the soil samples (BH203) in this area. It is also noted PAHs were detected in surface water sample SW6, located downgradient.

In contrast to the TPH concentrations detected in samples collected from the trial pits on the Upper Tier, those detected in soil sample BH204 had both aliphatic and aromatic fractions present.

While the aromatic TPH compounds are likely to be related to the PAHs, the heavy end aliphatic fractions are more likely related to a heavy fuel oil source. However, these TPH concentrations did not exceed the individual GACs or DIV. They may be remnants of the spill that occurred at the stripping tank in the 1970s. The recorded concentrations are not considered to be a significant risk to the environment.

8.1.2 Metals in Soil

Almost all of the metal concentrations in soil exceeded the respective controlled waters GACs and a small number of metal concentrations were above the published EPA background values. The DIV for arsenic of 55mg/kg was exceeded in samples collected from locations HA01, TP08 and TP116, all at depths of less than 0.5m bgl. The DIV for copper was exceeded in sample HA02_2.5m and the DIV for zinc was exceeded in sample HA05_0.2m.

The EPA report identifies arsenic, lead and vanadium as occurring at naturally elevated concentrations in the southeastern region of the country. In addition, vanadium and nickel are known to be present in the HFO stored on-site and detections of these metals at low levels are not uncommon on fuel-fired power stations.

Based on the comparison with the published background concentrations, the recorded concentrations in soils are not considered to be a risk to the environment.

8.1.3 Other Compounds in Soil

Fluoride concentrations that exceeded the screening level GACs for controlled waters in soils are not considered to be a significant issue. They are widely distributed across the

site through developed and undeveloped areas, which is not consistent with potential point source (or sources) on site. Furthermore, the GACs are conservative screening criteria and the exceedances recorded for fluoride were marginal.

8.2 Sediment Quality

PAHs in Sediment

PAH concentrations detected in sediment are likely related to site activities, most likely being derivatives of combustion in the site boilers and/or the boiler clean out activities.

The concentrations did not exceed GACs for soils designed to be protective of controlled waters. PAHs were not detected in groundwater samples collected from monitoring wells located in the former waste disposal area, indicating there are unlikely to derive from materials contained therein. Equally, with the exception of BH2, PAHs were not detected in monitoring wells located in the Station Grounds.

PAHs were detected in at low concentrations in surface water samples collected from several of the process drain outlets across the foreshore and it is likely the PAH detected in the sediment are a result of low PAH concentrations in the surface water discharges and/or runoff.

TPH in Sediment

Aromatic TPH fractions detected in sediments may be due to the presence of PAHs (as outlined in the preceding section). The aliphatic fractions are more likely fuel related. The aliphatic fractions did not exceed the respective controlled waters GACs.

It is noted surface waters from the Tank Farm discharge (via an interceptor) to the estuary near these sediment-sampling locations. While TPH was not detected in the surface waters at this outfall on this occasion, it is possible that historical discharges have contained low levels of hydrocarbons and this is considered to be the most likely source in the sediments.

Heavy Metals in Sediment

The occurrence and concentrations of heavy metals in the sediment samples were similar to those for soils and were generally lower than respective EPA background values.

Other Parameters in Sediment

Elevated concentrations of anions and cations, in particular chloride, are likely related to presence of brackish water in the samples.

8.3 Groundwater

The following sections discuss groundwater quality at the monitoring wells installed across the lower tier and in the former landfill cells. Groundwater was not encountered beneath the upper tier.

Heavy Metals

Arsenic was detected at concentrations marginally above the IGV of 0.01mg/l in groundwater samples collected from monitoring wells MW101, MW102, MW104 and MW202 located within the former landfill areas. The concentrations detected in these samples ranged from 0.022mg/l to 0.037mg/l. Groundwater in the area is not suitable for potable abstraction given its brackish nature. It is therefore considered that there is no risk to human health from the observed arsenic concentrations. In addition, the concentrations observed were below the EQS for surface waters of 0.05mg/l, inferring that the observed concentrations in groundwater do not pose a risk to the adjacent estuary.

Anions and Cations

The detection of elevated concentrations of anions and cations in groundwater in several of the wells is likely related to brackish nature of the groundwater, caused by proximity to the estuary.

The concentrations of some are higher in the wells located in the reclaimed area along the southern boundary of the site, than in those located further upgradient on site (BH205 and BH206). This distribution is consistent with the influence of the estuarine waters.

However, as discussed above (see Section 7.6), discrepancies were reported in the laboratory data, in particular for sulphate results, which make further detailed assessment of these results difficult.

It is noted, however, that the distribution of conductivity field measurements is consistent with that for the anions and cations, with elevated readings near the estuary and lower reading further in land.

Ammonia

Ammonia was detected in several wells across the site, in particular those in the former waste disposal area. The highest concentrations were detected in the western cell. It is understood that the station dump received wastes that included canteen wastes and other putrescible wastes (TMS, 2006); it is likely the elevated ammonia concentrations indicate the natural biodegradation of these wastes.

There are no suitable wells present to assess whether ground waters discharging from the former dumps to the estuary contain elevated levels of ammonia. Access would not be possible to install a down gradient well.

Ammonia is also stored on-site as part of the boiler water conditioning process. Ammonia was detected at concentrations that exceeded IGVs at BH3 and BH202, both located on the lower tier. The actual volume of ammonia stored on-site is quite small (2 x 1 m^3) and it is stored in bunded IBCs. The concentrations detected in these wells may relate to minor historical losses to ground, however, it is considered there is no significant ongoing source on the site.

Phosphate and Nitrate

Phosphate and nitrite concentrations detected in several of the monitoring locations may be associated with local agricultural practices and the application of fertilizer to surrounding lands.

Coliforms

Coliforms were detected in several wells across the site. While the distribution would suggest the primary source is generally more likely to be agricultural practices in areas upgradient of the site, rather than historic or current site practices, it is noted BH3 (where one of the more elevated concentrations was recorded) is located reasonably close to, but upgradient of, the septic tank on the lower tier, which is connected to the sewage treatment plant. Groundwater in the area is not suitable for potable abstraction given its brackish nature. In addition, groundwater is not abstracted on site for any use. It is therefore considered that there is no risk to human health from the observed coliform concentrations in groundwater.

8.4 Surface Waters

PAHs were detected in each of five surface water samples. As discussed above, these concentrations likely relate to site 'runoff', containing PAHs derived from a variety of site sources, potentially including boiler washings, occasional deposits from chimneystacks or from the steam 'blow-down' process.

With the exception of a marginal exceedance of the EQS for Sum of 6 PAHs, the recorded concentrations did not exceed the respective EQS and as such are not considered to pose a risk to the surrounding environment.

8.5 Inaccessible Areas

Access to the area known as the Wetlands was not possible during the course of the investigation. The area is separated from the southern boundary of the former waste disposal area by a stream, which was not passable at the time of the site inspection. There is no other known access point to the area and it appeared the density of vegetation would preclude inspection if access had been possible.

The vegetation, which is well established, comprised bushes and thick gorse and is considered likely to have spread naturally, rather than having been planted. Based on the difficulty of access and the availability of a site dump (during the 70s and 80s) it is considered unlikely that wastes generated on-site would have been placed there. It is also likely that large portions of the land would be seasonally water logged or marshy, making access more difficult during these periods. It is therefore considered unlikely the area contains any site-derived contamination.

9. CONCLUSIONS

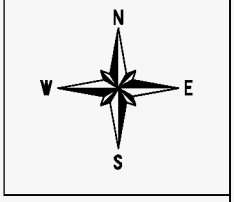
Based on the results and observations of the Phase 1 and 2 ESA, URS has drawn the following conclusions:

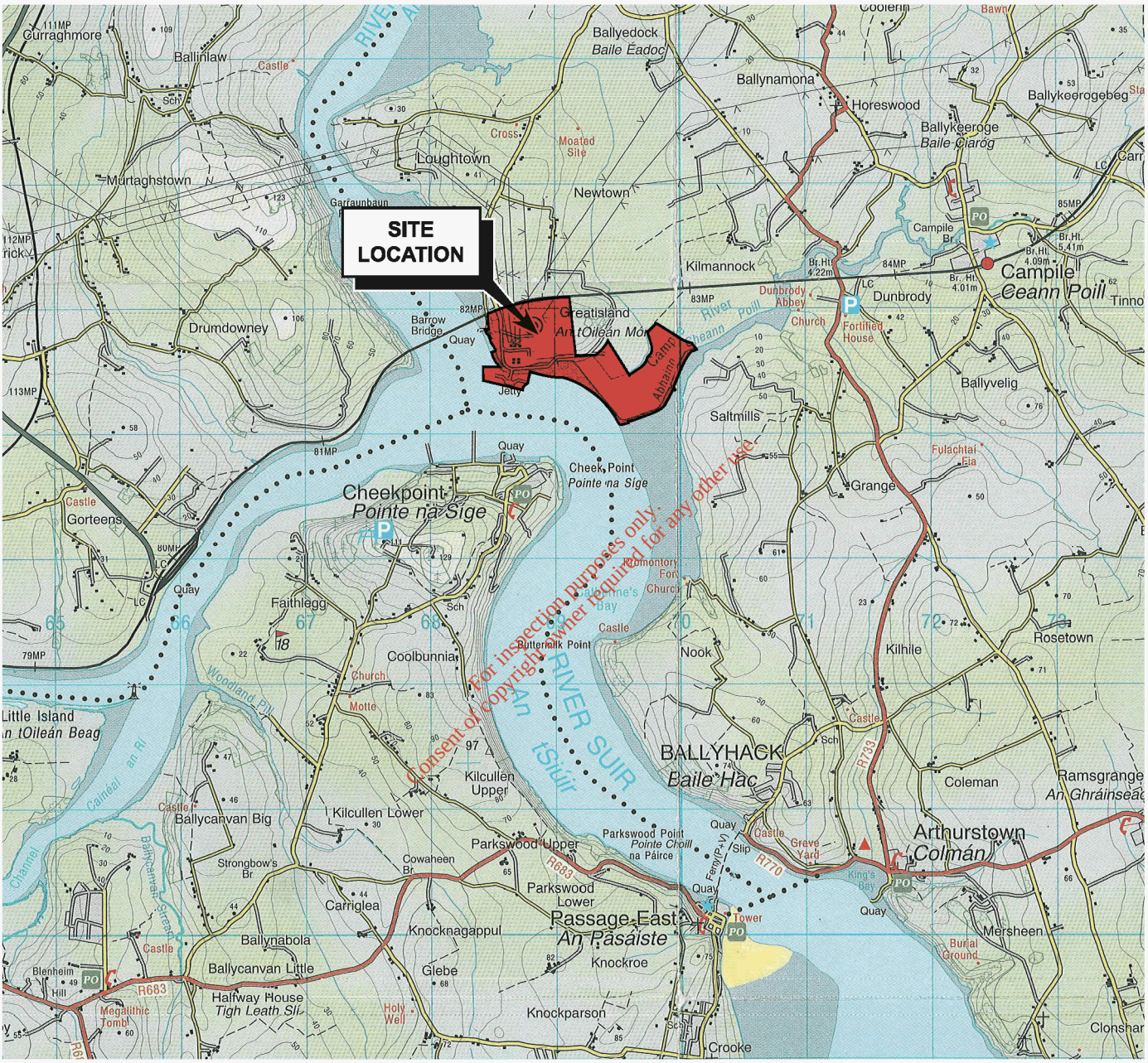
- From the perspective of human health and potential risks posed by environmental soil and groundwater quality to commercial site users, the site is considered suitable for the continued industrial use.
- A conservative assessment of the soil analytical data collected during the ESA identified potential risks to controlled waters (i.e. groundwater and surface water) from a number of metals as well as polycyclic aromatic hydrocarbons (PAH) and hydrocarbon indicator compounds. However, URS has concluded that across the majority of the site these potential risks are not significant.
- In general, the analytical results for most analytes were comparable to Dutch screening values (DSVs). Isolated (4 instances) of Dutch intervention value exceedances were not considered to warrant further assessment.
- It is considered that concentrations of PAH in the shallow soil near the southern site boundary and (to a lesser extent) in sediment and surface water samples, warrant some further assessment focussing on identification of likely source(s) and depending on the outcome a (probably limited) Quantitative Risk Assessment (QRA) to assess in more detail potential risks to the local ecosystems (estuary).
- Elevated concentrations of coliforms were detected in groundwater and surface waters in both the former landfill area and the station grounds. The primary source is considered likely to be agricultural practices in areas upgradient of the site, rather than historic or current site practices, however, there are likely to be some site-derived contributions in particular from the septic tank located on the lower tier.
- Elevated concentrations of ammonia in the former disposal area wells, in particular on the western cell, have not been delineated – however, access to drill in downgradient locations would be difficult to achieve. Some further assessment of estuarine waters and sediment quality downgradient of the waste disposal areas would be warranted.
- The presence of asbestos containing materials (ACM) in the subsurface is considered unlikely, except in the capped landfill, where ACM is known to exist.

In summary, no remedial action is currently considered necessary at the site under a continued industrial land use scenario, from the perspective of environmental soil and groundwater quality; however, some requirement for further assessment has been identified.

Figures

North





0 km 1 km 2 km 3 km

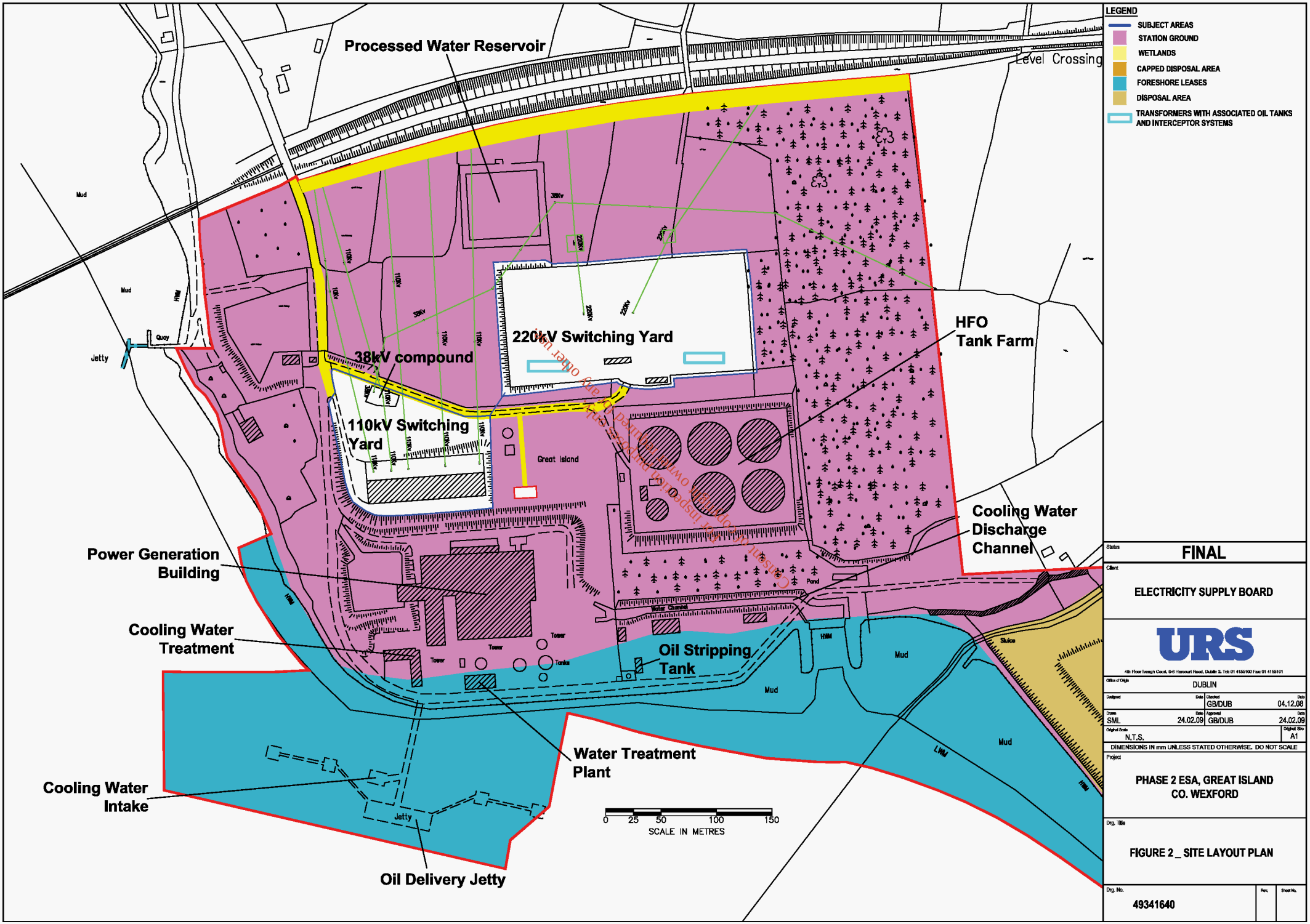
CLIENT
ELECTRICITY SUPPLY BOARD

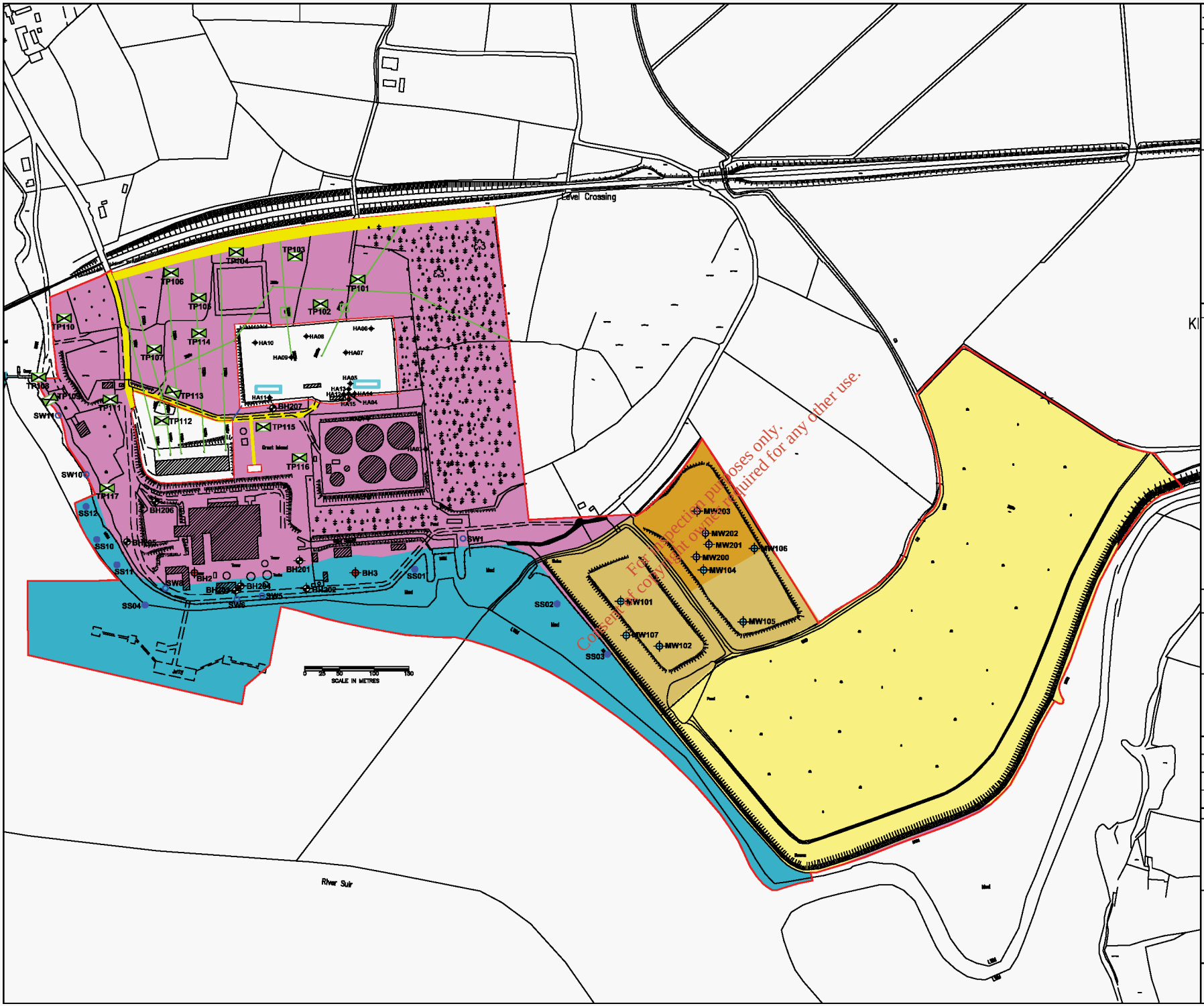
PROJECT LOCATION
PHASE 2 ESA, GREAT ISLAND
CO. WEXFORD

DRAWING TITLE
FIGURE 1 - SITE LOCATION PLAN

ENVIRONMENTAL CONSULTANTS
URS
Iveagh Court, 6–8 Harcourt Road, Dublin2
TEL +353 1 4155100 FAX +353 1 4155101

DRAWN	TRACED	CHECKED	APPROVED	DATE
SML		GB	GB/DUB	FEB '09
SCALE 1:50,000	Job No. 49341640			REV. A





LEGEND

URS INVESTIGATION OCTOBER 2008

- BOREHOLE / MONITORING WELL LOCATION
- HAND EXCAVATION / SAMPLE
- SEDIMENT SAMPLE LOCATION
- TRIAL PIT LOCATION
- SURFACE WATER SAMPLE LOCATION

- STATION GROUND
- WETLANDS
- SWITCHING YARDS
- CAPPED DISPOSAL AREA
- FORESHORE LEASES
- DISPOSAL AREA
- TRANSFORMERS WITH ASSOCIATED OIL TANKS AND INTERCEPTOR SYSTEMS

PREVIOUS INVESTIGATION LOCATIONS

- EXISTING MONITORING WELL ESBI 1996
- EXISTING MONITORING WELL ESBI 2003
- EXISTING MONITORING WELL ESB

Status: **FINAL**

Client: **ELECTRICITY SUPPLY BOARD**

URS

4th Floor Iveagh Court, 6-8 Harcourt Road, Dublin 2. Tel: 01 4155100 Fax: 01 4155101

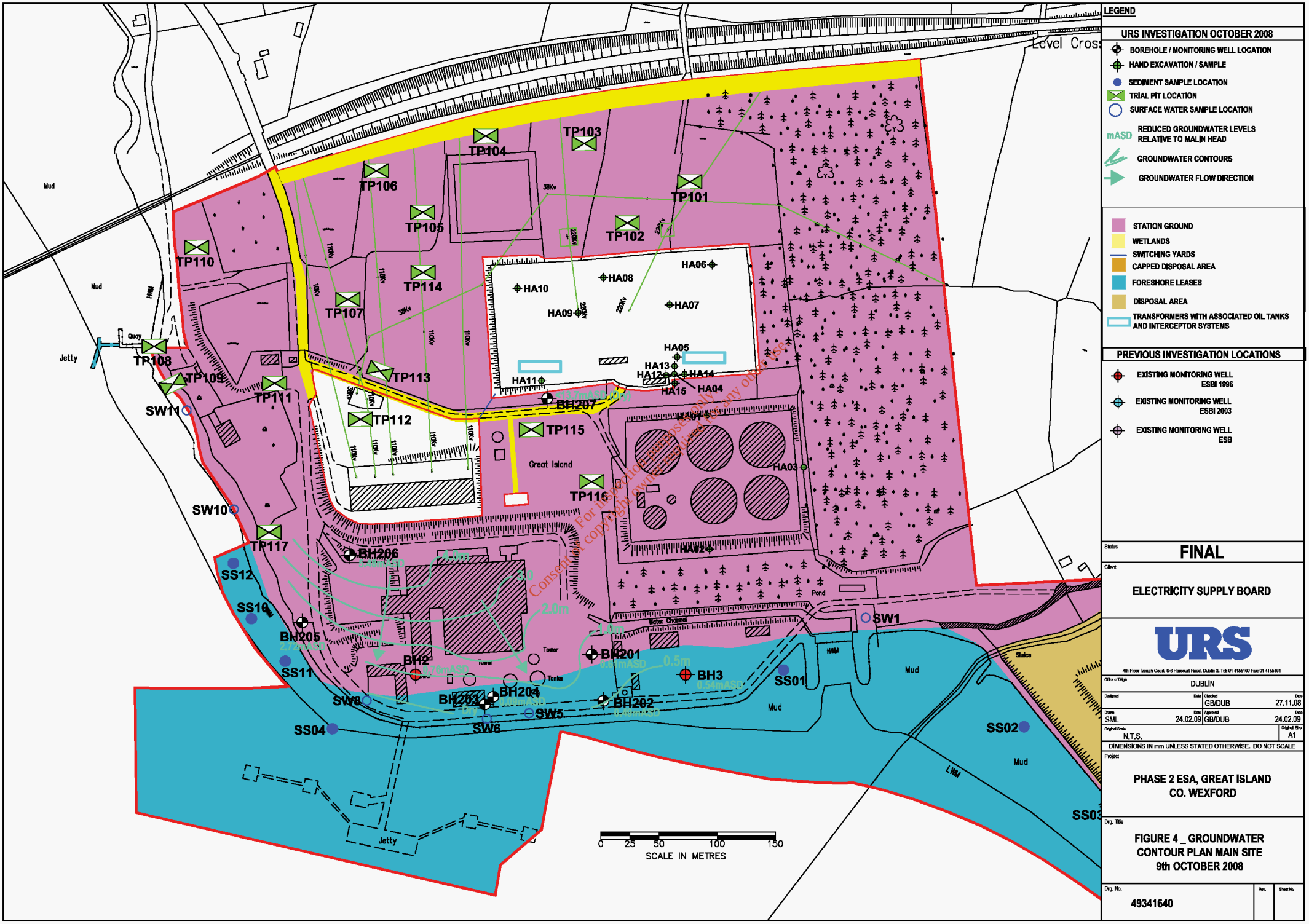
Office of Origin	DUBLIN		
Designed	Date	Checked GB/DUB	Date 27.11.08
Drawn SML	Date 24.02.09	Approved GB/DUB	Date 24.02.09
Original Scale N.T.S.		Original Size A1	

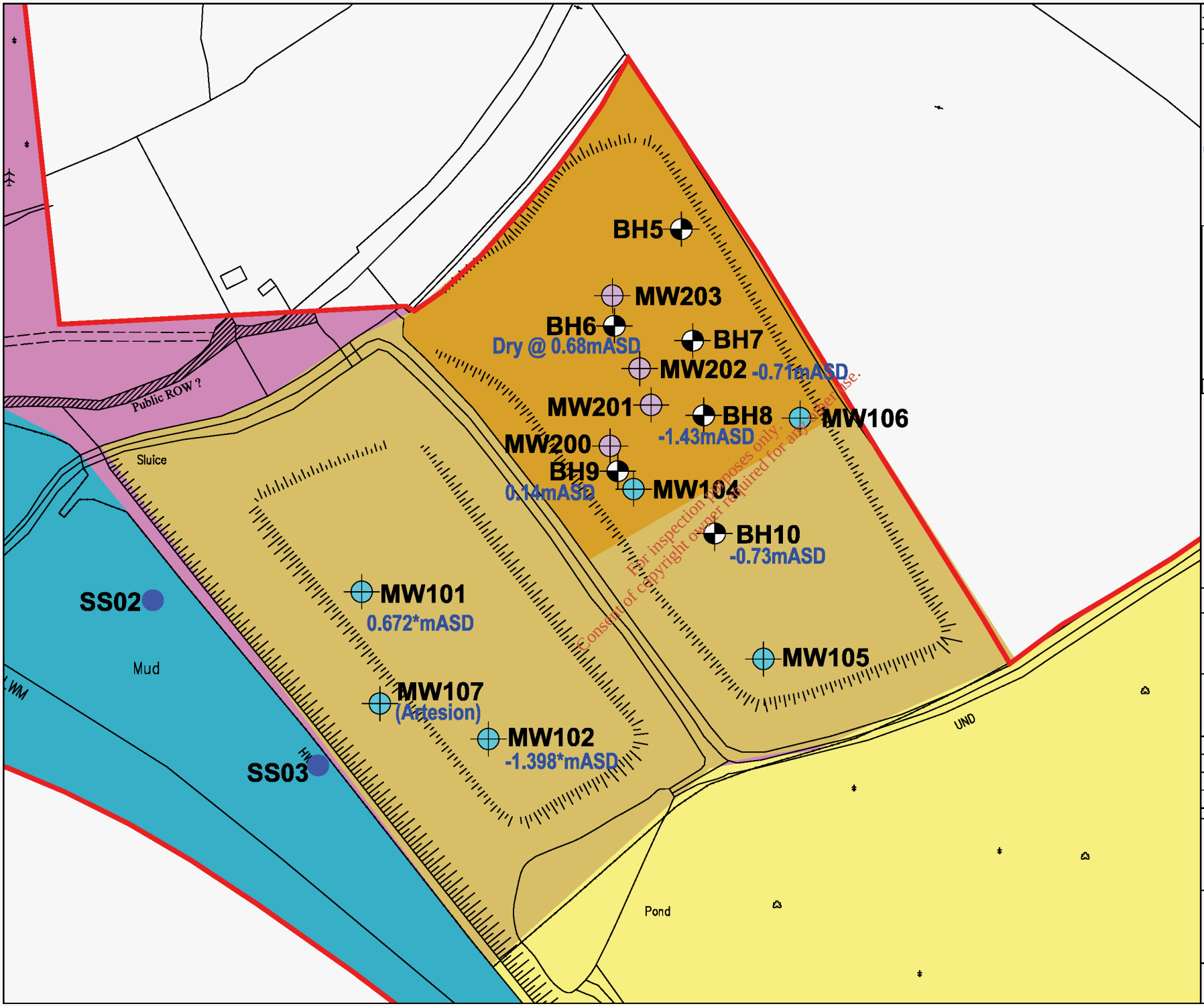
DIMENSIONS IN mm UNLESS STATED OTHERWISE. DO NOT SCALE

Project: **PHASE 2 ESA, GREAT ISLAND CO. WEXFORD**

Drg. Title: **FIGURE 3 _ INVESTIGATION LOCATIONS**

Drg. No.	Rev.	Sheet No.
49341640		





LEGEND

URS INVESTIGATION OCTOBER 2008

- BOREHOLE / MONITORING WELL LOCATION
- HAND EXCAVATION / SAMPLE
- SEDIMENT SAMPLE LOCATION
- TRIAL PIT LOCATION
- SURFACE WATER SAMPLE LOCATION
- mASD REDUCED GROUNDWATER LEVELS RELATIVE TO MALIN HEAD
- * ESTIMATE FROM ASSUMED PIEZO STICK UP (0.6m)

- STATION GROUND
- WETLANDS
- SWITCHING YARDS
- CAPPED DISPOSAL AREA
- FORESHORE LEASES
- DISPOSAL AREA
- OIL TANKS

PREVIOUS INVESTIGATION LOCATIONS

- EXISTING MONITORING WELL ESBI 1996
- EXISTING MONITORING WELL ESBI 2003
- EXISTING MONITORING WELL ESB

Status: FINAL

Client: ELECTRICITY SUPPLY BOARD

URS

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Office of Origin	DUBLIN		
Designed	Date	Checked GB/DUB	Date 04.12.08
Drawn SML	Date 24.02.09	Approved GB/DUB	Date 24.02.09
Original Scale N.T.S.			Original Size A1

DIMENSIONS IN mm UNLESS STATED OTHERWISE. DO NOT SCALE

Project: PHASE 2 ESA, GREAT ISLAND CO. WEXFORD

Drg. Title: FIGURE 5 _ REDUCED GROUNDWATER LEVELS - ASH DISPOSAL AREA - 9th OCTOBER 2008

Drg. No.	Rev.	Sheet No.
49341640		

CLIENT
ELECTRICITY SUPPLY BOARD

PROJECT
PHASE 2 ESA GREAT ISLAND

DRAWING TITLE
FIGURE 6 - PANORAMIC AND GROUND LEVEL PHOTOGRAPHIC SURVEY LOCATIONS

DRAWN	TRACED	CHECKED	APPROVED	DATE
SML		GB	GB/DUB	NOV '09
SCALE: AS SHOWN	Job No: 49341640			REV: A

Notes:
- SITE BOUNDARY LINE
- URS GROUND LEVEL PHOTOGRAPH LOCATION (88)
- MURPHY'S SURVEY LTD PANORAMIC PHOTOGRAPHIC SURVEY LOCATION

STATUS
FINAL

ENVIRONMENTAL CONSULTANTS
URS
Iveagh Court, 6–8 Harcourt Road, Dublin2
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Tables

Client	ESB
Project	ESB Great Island
Location	ESB Great Island
Job Number	49341640
Table 1:	Hydrocarbon Laboratory Results - Soil

							220 kV Compound								
Sample Type							Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample ID							HA01	HA02	HA02	HA02	HA03	HA03	HA04	HA05	HA06
Depth							0.5m	0.5m	1.5m	2.5m	0.5m	2.0m	0.2m	0.2m	0.2m
Collection Date							02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08
Parameters	**Units**	**MDL**	**Human Health GAC Soil**	**Controlled Water GAC - Soil**	***Dutch Screening (S) Value***	***Dutch Intervention (I) Value***									
Aromatics															
TPH (>EC6-7) aromatic	mg/kg	0.01	650	0.09	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC7-8) aromatic	mg/kg	0.01	670	0.11	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC8-10) aromatic	mg/kg	0.01	230	0.14	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC10-12) aromatic	mg/kg	0.01	45,000	0.22	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC12-16) aromatic	mg/kg	0.1	73,000	0.44	nv	nv	-	-	-	-	-	-	546.2	-	-
TPH (>EC16-21) aromatic	mg/kg	0.1	57,000	1.4	nv	nv	-	-	-	-	-	-	60.8	-	-
TPH (>EC21-35) aromatic	mg/kg	0.1	57,000	11.1	nv	nv	-	-	-	-	-	-	45.8	-	-
Total Aromatic TPH	mg/kg	0.1	nv	nv	nv	nv	-	-	-	-	-	-	652.7	-	-
Aliphatics															
TPH (>EC5-6) aliphatic	mg/kg	0.01	370	0.09	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC6-8) aliphatic	mg/kg	0.01	740	0.39	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC8-10) aliphatic	mg/kg	0.01	230,000	2.84	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC10-12) aliphatic	mg/kg	0.01	150,000	22.2	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC12-16) aliphatic	mg/kg	0.1	180,000	441	nv	nv	-	-	-	-	-	-	270.3	-	-
TPH (>EC16-21) aliphatic	mg/kg	0.1	IR	55,500	nv	nv	-	-	-	-	-	-	4,810.4	-	-
TPH (EC21-35) aliphatic	mg/kg	0.1	nv	668,000	nv	nv	-	-	-	-	-	-	2,127.5	-	-
Total Aliphatics (MO)	mg/kg	0.1	nv	nv	50	***5,000***	-	-	-	-	-	-	***7,208.3***	-	-
Total TPH	mg/kg	0.1	nv	nv	nv	nv	-	-	-	-	-	-	7,861.0	-	-
BTEX															
Benzene	mg/kg	0.01	1.5	0.001	0.01	***1***	-	-	-	-	-	-	-	-	-
Toluene	mg/kg	0.01	150	0.01	0.01	***130***	-	-	-	-	-	-	-	-	-
Ethylbenzene	mg/kg	0.01	48,000	0.04	0.03	***50***	-	-	-	-	-	-	-	-	-
Total Xylene	mg/kg	0.01	320	0.04	0.1	***25***	-	-	-	-	-	-	-	-	-
BTEX	mg/kg	-	nv	nv	nv	nv	-	-	-	-	-	-	-	-	-
MTBE	mg/kg	0.01	1,780	0.01	nv	***100***	-	-	-	-	-	-	-	-	-

xx	Exceeds Human Health Soil Generic Assessment Criteria
xx	Exceeds Controlled Water Generic Assessment Criteria
xx	Exceeds Dutch Intervention Value
GAC	Generic Assessment Criteria
MDL	Method Detection Limit
-	Less than MDL
na	Not Analysed
nv	No Value
IR	Insignificant risk to identified potential receptors
MO	Mineral Oil

Client	ESB
Project	ESB Great Island
Location	ESB Great Island
Job Number	49341640
Table 1:	Hydrocarbon Laboratory Results - Soil

							220 kV Compound								
Sample Type							Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample ID							HA07	HA08	HA09	HA10	HA11	HA12	HA13	HA14	HA15
Depth							0.2m	0.2m	0.2m	0.2m	0.2m	0.2m	0.2m	0.2m	0.2m
Collection Date							01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	03-Nov-08	03-Nov-08	03-Nov-08	03-Nov-08
Parameters	**Units**	**MDL**	**Human Health GAC Soil**	**Controlled Water GAC - Soil**	***Dutch Screening (S) Value***	***Dutch Intervention (I) Value***									
Aromatics															
TPH (>EC6-7) aromatic	mg/kg	0.01	650	0.09	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC7-8) aromatic	mg/kg	0.01	670	0.11	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC8-10) aromatic	mg/kg	0.01	230	0.14	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC10-12) aromatic	mg/kg	0.01	45,000	0.22	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC12-16) aromatic	mg/kg	0.1	73,000	0.44	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC16-21) aromatic	mg/kg	0.1	57,000	1.4	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC21-35) aromatic	mg/kg	0.1	57,000	11.1	nv	nv	-	-	-	-	-	-	-	-	-
Total Aromatic TPH	mg/kg	0.1	nv	nv	nv	nv	-	-	-	-	-	-	-	-	-
Aliphatics															
TPH (>EC5-6) aliphatic	mg/kg	0.01	370	0.09	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC6-8) aliphatic	mg/kg	0.01	740	0.39	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC8-10) aliphatic	mg/kg	0.01	230,000	2.84	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC10-12) aliphatic	mg/kg	0.01	150,000	22.2	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC12-16) aliphatic	mg/kg	0.1	180,000	441	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC16-21) aliphatic	mg/kg	0.1	IR	55,500	nv	nv	-	-	-	-	-	-	-	-	-
TPH (EC21-35) aliphatic	mg/kg	0.1	nv	668,000	nv	nv	-	-	-	-	-	-	-	-	-
Total Aliphatics (MO)	mg/kg	0.1	nv	nv	50	***5,000***	-	-	-	-	-	-	-	-	-
Total TPH	mg/kg	0.1	nv	nv	nv	nv	-	-	-	-	-	-	-	-	-
BTEX															
Benzene	mg/kg	0.01	1.5	0.001	0.01	***1***	-	-	-	-	-	-	-	-	-
Toluene	mg/kg	0.01	150	0.01	0.01	***130***	-	-	-	-	-	-	-	-	-
Ethylbenzene	mg/kg	0.01	48,000	0.04	0.03	***50***	-	-	-	-	-	-	-	-	-
Total Xylene	mg/kg	0.01	320	0.04	0.1	***25***	-	-	-	-	-	-	-	-	-
BTEX	mg/kg	-	nv	nv	nv	nv	-	-	-	-	-	-	-	-	-
MTBE	mg/kg	0.01	1,780	0.01	nv	***100***	-	-	-	-	-	-	-	-	-

xx	Exceeds Human Health Soil Generic Assessment Criteria
xx	Exceeds Controlled Water Generic Assessment Criteria
xx	Exceeds Dutch Intervention Value
GAC	Generic Assessment Criteria
MDL	Method Detection Limit
-	Less than MDL
na	Not Analysed
nv	No Value
IR	Insignificant risk to identified potential receptors
MO	Mineral Oil

Client	ESB
Project	ESB Great Island
Location	ESB Great Island
Job Number	49341640
Table 1:	Hydrocarbon Laboratory Results - Soil

							Upper Tier - Station Ground - Trial Pits								
Sample Type							Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample ID							TP101	TP102	TP103	TP104	TP104	TP104	TP105	TP105	TP105
Depth							0.5m	0.5m	0.5m	0.5m	1.0m	1.5m	0.5m	1.0m	1.5m
Collection Date							01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08
Parameters	**Units**	**MDL**	**Human Health GAC Soil**	**Controlled Water GAC - Soil**	***Dutch Screening (S) Value***	***Dutch Intervention (I) Value***									
Aromatics															
TPH (>EC6-7) aromatic	mg/kg	0.01	650	0.09	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC7-8) aromatic	mg/kg	0.01	670	0.11	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC8-10) aromatic	mg/kg	0.01	230	0.14	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC10-12) aromatic	mg/kg	0.01	45,000	0.22	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC12-16) aromatic	mg/kg	0.1	73,000	0.44	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC16-21) aromatic	mg/kg	0.1	57,000	1.4	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC21-35) aromatic	mg/kg	0.1	57,000	11.1	nv	nv	-	-	-	-	-	-	-	-	-
Total Aromatic TPH	mg/kg	0.1	nv	nv	nv	nv	-	-	-	-	-	-	-	-	-
Aliphatics															
TPH (>EC5-6) aliphatic	mg/kg	0.01	370	0.09	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC6-8) aliphatic	mg/kg	0.01	740	0.39	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC8-10) aliphatic	mg/kg	0.01	230,000	2.84	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC10-12) aliphatic	mg/kg	0.01	150,000	22.2	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC12-16) aliphatic	mg/kg	0.1	180,000	441	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC16-21) aliphatic	mg/kg	0.1	IR	55,500	nv	nv	-	-	-	-	-	-	-	-	-
TPH (EC21-35) aliphatic	mg/kg	0.1	nv	668,000	nv	nv	-	-	-	-	-	-	-	-	-
Total Aliphatics (MO)	mg/kg	0.1	nv	nv	50	***5,000***	-	-	-	-	-	-	-	-	-
Total TPH	mg/kg	0.1	nv	nv	nv	nv	-	-	-	-	-	-	-	-	-
BTEX															
Benzene	mg/kg	0.01	1.5	0.001	0.01	***1***	-	-	-	-	-	-	-	-	-
Toluene	mg/kg	0.01	150	0.01	0.01	***130***	-	-	-	-	-	-	-	-	-
Ethylbenzene	mg/kg	0.01	48,000	0.04	0.03	***50***	-	-	-	-	-	-	-	-	-
Total Xylene	mg/kg	0.01	320	0.04	0.1	***25***	-	-	-	-	-	-	-	-	-
BTEX	mg/kg	-	nv	nv	nv	nv	-	-	-	-	-	-	-	-	-
MTBE	mg/kg	0.01	1,780	0.01	nv	***100***	-	-	-	-	-	-	-	-	-

xx	Exceeds Human Health Soil Generic Assessment Criteria
xx	Exceeds Controlled Water Generic Assessment Criteria
xx	Exceeds Dutch Intervention Value
GAC	Generic Assessment Criteria
MDL	Method Detection Limit
-	Less than MDL
na	Not Analysed
nv	No Value
IR	Insignificant risk to identified potential receptors
MO	Mineral Oil

Client	ESB
Project	ESB Great Island
Location	ESB Great Island
Job Number	49341640
Table 1:	Hydrocarbon Laboratory Results - Soil

							Upper Tier - Station Ground - Trial Pits								
Sample Type							Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample ID							TP105	TP106	TP106	TP108	TP109	Dup for TP109	TP110	TP110	TP111
Depth							2.0m	0.5m	1.5m	0.3m	0.4m	0.4m	0.5m	1.5m	0.2m
Collection Date							01-Oct-08	01-Oct-08	01-Oct-08	03-Oct-08	03-Oct-08	03-Oct-08	03-Oct-08	03-Oct-08	03-Oct-08
Parameters	**Units**	**MDL**	**Human Health GAC Soil**	**Controlled Water GAC - Soil**	***Dutch Screening (S) Value***	***Dutch Intervention (I) Value***									
Aromatics															
TPH (>EC6-7) aromatic	mg/kg	0.01	650	0.09	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC7-8) aromatic	mg/kg	0.01	670	0.11	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC8-10) aromatic	mg/kg	0.01	230	0.14	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC10-12) aromatic	mg/kg	0.01	45,000	0.22	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC12-16) aromatic	mg/kg	0.1	73,000	0.44	nv	nv	-	-	3,037	0.67	-	-	-	-	-
TPH (>EC16-21) aromatic	mg/kg	0.1	57,000	1.4	nv	nv	-	-	178.02	0.47	-	-	-	-	-
TPH (>EC21-35) aromatic	mg/kg	0.1	57,000	11.1	nv	nv	-	-	69.44	-	-	-	-	-	-
Total Aromatic TPH	mg/kg	0.1	nv	nv	nv	nv	-	-	3,284.47	1.14	-	-	-	-	-
Aliphatics															
TPH (>EC5-6) aliphatic	mg/kg	0.01	370	0.09	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC6-8) aliphatic	mg/kg	0.01	740	0.39	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC8-10) aliphatic	mg/kg	0.01	230,000	2.84	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC10-12) aliphatic	mg/kg	0.01	150,000	22.2	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC12-16) aliphatic	mg/kg	0.1	180,000	441	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC16-21) aliphatic	mg/kg	0.1	IR	55,500	nv	nv	-	-	-	-	-	-	-	-	-
TPH (EC21-35) aliphatic	mg/kg	0.1	nv	668,000	nv	nv	-	-	-	-	-	-	-	-	-
Total Aliphatics (MO)	mg/kg	0.1	nv	nv	50	***5,000***	-	-	-	-	-	-	-	-	-
Total TPH	mg/kg	0.1	nv	nv	nv	nv	-	-	3,284	1.14	-	-	-	-	-
BTEX															
Benzene	mg/kg	0.01	1.5	0.001	0.01	***1***	-	-	-	-	-	-	-	-	-
Toluene	mg/kg	0.01	150	0.01	0.01	***130***	-	-	-	-	-	-	-	-	-
Ethylbenzene	mg/kg	0.01	48,000	0.04	0.03	***50***	-	-	-	-	-	-	-	-	-
Total Xylene	mg/kg	0.01	320	0.04	0.1	***25***	-	-	-	-	-	-	-	-	-
BTEX	mg/kg	-	nv	nv	nv	nv	-	-	-	-	-	-	-	-	-
MTBE	mg/kg	0.01	1,780	0.01	nv	***100***	-	-	-	-	-	-	-	-	-

xx	Exceeds Human Health Soil Generic Assessment Criteria
xx	Exceeds Controlled Water Generic Assessment Criteria
xx	Exceeds Dutch Intervention Value
GAC	Generic Assessment Criteria
MDL	Method Detection Limit
-	Less than MDL
na	Not Analysed
nv	No Value
IR	Insignificant risk to identified potential receptors
MO	Mineral Oil

Client	ESB
Project	ESB Great Island
Location	ESB Great Island
Job Number	49341640
Table 1:	Hydrocarbon Laboratory Results - Soil

							Upper Tier - Station Ground - Trial Pits								
Sample Type							Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample ID							TP112	TP112	TP113	TP114	TP115	TP116	Dup for TP116	TP117	TP117
Depth							0.5m	1.5m	0.5m	0.5m	0.5m	0.5m	0.5m	0.5m	1.5m
Collection Date							02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08
Parameters	**Units**	**MDL**	**Human Health GAC Soil**	**Controlled Water GAC - Soil**	***Dutch Screening (S) Value***	***Dutch Intervention (I) Value***									
Aromatics															
TPH (>EC6-7) aromatic	mg/kg	0.01	650	0.09	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC7-8) aromatic	mg/kg	0.01	670	0.11	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC8-10) aromatic	mg/kg	0.01	230	0.14	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC10-12) aromatic	mg/kg	0.01	45,000	0.22	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC12-16) aromatic	mg/kg	0.1	73,000	0.44	nv	nv	-	-	0.133	-	-	-	-	0.613	-
TPH (>EC16-21) aromatic	mg/kg	0.1	57,000	1.4	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC21-35) aromatic	mg/kg	0.1	57,000	11.1	nv	nv	-	-	-	-	-	-	-	-	-
Total Aromatic TPH	mg/kg	0.1	nv	nv	nv	nv	-	-	0.133	-	-	-	-	0.613	-
Aliphatics															
TPH (>EC5-6) aliphatic	mg/kg	0.01	370	0.09	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC6-8) aliphatic	mg/kg	0.01	740	0.39	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC8-10) aliphatic	mg/kg	0.01	230,000	2.84	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC10-12) aliphatic	mg/kg	0.01	150,000	22.2	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC12-16) aliphatic	mg/kg	0.1	180,000	441	nv	nv	-	-	-	-	-	-	-	-	-
TPH (>EC16-21) aliphatic	mg/kg	0.1	IR	55,500	nv	nv	-	-	-	-	-	-	-	-	-
TPH (EC21-35) aliphatic	mg/kg	0.1	nv	668,000	nv	nv	-	-	-	-	-	-	-	-	-
Total Aliphatics (MO)	mg/kg	0.1	nv	nv	50	***5,000***	-	-	-	-	-	-	-	-	-
Total TPH	mg/kg	0.1	nv	nv	nv	nv	-	-	0.133	-	-	-	-	0.613	-
BTEX															
Benzene	mg/kg	0.01	1.5	0.001	0.01	***1***	-	-	-	-	-	-	-	-	-
Toluene	mg/kg	0.01	150	0.01	0.01	***130***	-	-	-	-	-	-	-	-	-
Ethylbenzene	mg/kg	0.01	48,000	0.04	0.03	***50***	-	-	-	-	-	-	-	-	-
Total Xylene	mg/kg	0.01	320	0.04	0.1	***25***	-	-	-	-	-	-	-	-	-
BTEX	mg/kg	-	nv	nv	nv	nv	-	-	-	-	-	-	-	-	-
MTBE	mg/kg	0.01	1,780	0.01	nv	***100***	-	-	-	-	-	-	-	-	-

xx	Exceeds Human Health Soil Generic Assessment Criteria
xx	Exceeds Controlled Water Generic Assessment Criteria
xx	Exceeds Dutch Intervention Value
GAC	Generic Assessment Criteria
MDL	Method Detection Limit
-	Less than MDL
na	Not Analysed
nv	No Value
IR	Insignificant risk to identified potential receptors
MO	Mineral Oil

Client	ESB
Project	ESB Great Island
Location	ESB Great Island
Job Number	49341640
Table 1:	Hydrocarbon Laboratory Results - Soil

							Borehole Samples							
Sample Type							Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample ID							BH201	BH201	BH203	BH204	BH204	BH205	BH205	BH207
Depth							1-2.0m	4.0m	3.0m	1.0m	2.0m	1.0m	2.0m	1.0m
Collection Date							01-Oct-08	01-Oct-08	03-Oct-08	03-Oct-08	03-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08
Parameters	**Units**	**MDL**	**Human Health GAC Soil**	**Controlled Water GAC - Soil**	***Dutch Screening (S) Value***	***Dutch Intervention (I) Value***								
Aromatics														
TPH (>EC6-7) aromatic	mg/kg	0.01	650	0.09	nv	nv	-	-	-	-	-	-	-	-
TPH (>EC7-8) aromatic	mg/kg	0.01	670	0.11	nv	nv	-	-	-	-	-	-	-	-
TPH (>EC8-10) aromatic	mg/kg	0.01	230	0.14	nv	nv	-	-	-	-	-	-	-	-
TPH (>EC10-12) aromatic	mg/kg	0.01	45,000	0.22	nv	nv	-	-	-	-	-	-	-	-
TPH (>EC12-16) aromatic	mg/kg	0.1	73,000	0.44	nv	nv	-	-	13.09	0.17	-	-	-	-
TPH (>EC16-21) aromatic	mg/kg	0.1	57,000	1.4	nv	nv	-	-	2.08	0.12	-	-	-	-
TPH (>EC21-35) aromatic	mg/kg	0.1	57,000	11.1	nv	nv	-	-	-	-	-	-	-	-
Total Aromatic TPH	mg/kg	0.1	nv	nv	nv	nv	-	-	15.17	0.29	-	-	-	-
Aliphatics														
TPH (>EC5-6) aliphatic	mg/kg	0.01	370	0.09	nv	nv	-	-	-	-	-	-	-	-
TPH (>EC6-8) aliphatic	mg/kg	0.01	740	0.39	nv	nv	-	-	-	-	-	-	-	-
TPH (>EC8-10) aliphatic	mg/kg	0.01	230,000	2.84	nv	nv	-	-	-	-	-	-	-	-
TPH (>EC10-12) aliphatic	mg/kg	0.01	150,000	22.2	nv	nv	-	-	-	-	-	-	-	-
TPH (>EC12-16) aliphatic	mg/kg	0.1	180,000	441	nv	nv	-	-	-	64.81	36.80	38.55	-	-
TPH (>EC16-21) aliphatic	mg/kg	0.1	IR	55,500	nv	nv	-	-	-	91.43	-	64.36	-	-
TPH (EC21-35) aliphatic	mg/kg	0.1	nv	668,000	nv	nv	-	-	-	831.05	255.67	604.24	-	-
Total Aliphatics (MO)	mg/kg	0.1	nv	nv	50	***5,000***	-	-	-	987.29	292.47	707.15	-	-
Total TPH	mg/kg	0.1	nv	nv	nv	nv	-	-	15.17	987.58	292.50	707.10	-	-
BTEX														
Benzene	mg/kg	0.01	1.5	0.001	0.01	***1***	-	-	-	-	-	-	-	-
Toluene	mg/kg	0.01	150	0.01	0.01	***130***	-	-	-	-	-	-	-	-
Ethylbenzene	mg/kg	0.01	48,000	0.04	0.03	***50***	-	-	-	-	-	-	-	-
Total Xylene	mg/kg	0.01	320	0.04	0.1	***25***	-	-	-	-	-	-	-	-
BTEX	mg/kg	-	nv	nv	nv	nv	-	-	-	-	-	-	-	-
MTBE	mg/kg	0.01	1,780	0.01	nv	***100***	-	-	-	-	-	-	-	-

xx	Exceeds Human Health Soil Generic Assessment Criteria
xx	Exceeds Controlled Water Generic Assessment Criteria
xx	Exceeds Dutch Intervention Value
GAC	Generic Assessment Criteria
MDL	Method Detection Limit
-	Less than MDL
na	Not Analysed
nv	No Value
IR	Insignificant risk to identified potential receptors
MO	Mineral Oil

Client	ESB
Project	ESB Great Island
Location	ESB Great Island
Job Number	49341640
Table 2:	PAH Laboratory Results - Soil

							220 kV Compound							
Sample Type							Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample ID							HA01	HA02	HA03	HA04	HA05	HA06	HA08	HA11
Depth							0.5m	2.5m	2.0m	0.2m	0.2m	0.2m	0.2m	0.2m
Date							02-Oct-08	02-Oct-08	02-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08
Parameters	**Units**	**MDL**	**Human Health GAC - Soil**	**Controlled Water GAC - Soil**	***Dutch Screening (S) Value***	***Dutch Intervention (I) Value***								
Naphthalene *	mg/kg	1	270	0.011	nv	nv	-	-	-	0.042	-	-	-	-
Acenaphthylene	mg/kg	1	2,100	0.497	nv	nv	-	-	-	0.111	-	-	-	-
Acenaphthene	mg/kg	1	3,400	23	nv	nv	-	-	-	0.297	-	-	-	-
Fluorene	mg/kg	1	69,000	30	nv	nv	-	-	-	0.227	-	-	-	-
Phenanthrene *	mg/kg	1	34,000	2.02	nv	nv	-	-	-	0.152	-	-	-	-
Anthracene*	mg/kg	1	520,000	0.026	nv	nv	-	-	-	0.376	-	-	-	-
Fluoranthene *	mg/kg	1	3,400	0.094	nv	nv	-	-	-	0.776	-	-	-	-
Pyrene	mg/kg	1	35,000	168	nv	nv	-	-	-	0.544	-	-	-	-
Benzo(a)anthracene *	mg/kg	1	340	0.030	nv	nv	-	-	-	0.105	-	-	-	-
Chrysene *	mg/kg	1	3,500	0.372	nv	nv	-	-	-	0.07	-	-	-	-
Benzo(b)+Benzo(k) fluoranthene *	mg/kg	1	350	nv	nv	nv	-	-	-	0.035	-	-	-	-
Benzo(a)pyrene *	mg/kg	1	35	0.090	nv	nv	-	-	-	0.008	-	-	-	-
Indeno(123cd)pyrene *	mg/kg	1	350	nv	nv	nv	-	-	-	0.007	-	-	-	-
Dibenzo(ah)anthracene	mg/kg	1	35	0.308	nv	nv	-	-	-	0.005	-	-	-	-
Benzo(ghi)perylene *	mg/kg	1	52,000	nv	nv	nv	-	-	-	0.011	-	-	-	-
Sum of 10 PAH	mg/kg	-	nv	nv	1	***40***	-	-	-	1.21	-	-	-	-
Total 16 EPA PAHs (16)	mg/kg	-	nv	nv	nv	nv	-	-	-	2.765	-	-	-	-

xx	Exceeds Human Health Soil Generic Assessment Criteria
xx	Exceeds Controlled Water Generic Assessment Criteria
xx	Exceeds Dutch Intervention Value
GAC	Generic Assessment Criteria
MDL	Method Detection Limit
-	Less than MDL
na	Not Analysed
nv	No Value

* Included in sum of ten PAHs

Client	ESB
Project	ESB Great Island
Location	ESB Great Island
Job Number	49341640
Table 2:	PAH Laboratory Results - Soil

							Upper Tier - Station Grounds - Trial Pits									
Sample Type							Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample ID							TP101	TP103	TP106	TP106	TP108	TP110	TP111	TP113	TP115	TP117
Depth							0.5m	0.5m	0.5m	1.5m	0.3m	0.5m	0.2m	0.5m	0.5m	0.5m
Date							01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	03-Oct-08	03-Oct-08	03-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08
Parameters	**Units**	**MDL**	**Human Health GAC - Soil**	**Controlled Water GAC - Soil**	***Dutch Screening (S) Value***	***Dutch Intervention (I) Value***										
Naphthalene *	mg/kg	1	270	0.011	nv	nv	-	-	-	0.002	0.017	-	-	0.002	0.006	0.002
Acenaphthylene	mg/kg	1	2,100	0.497	nv	nv	-	-	-	0.002	0.004	-	-	0.005	0.006	0.037
Acenaphthene	mg/kg	1	3,400	23	nv	nv	-	-	-	0.018	0.028	-	-	0.021	0.018	0.021
Fluorene	mg/kg	1	69,000	30	nv	nv	-	-	-	0.001	0.015	-	-	0.002	0.008	0.008
Phenanthrene *	mg/kg	1	34,000	2.02	nv	nv	-	-	-	0.003	0.164	-	-	0.022	0.011	0.05
Anthracene*	mg/kg	1	520,000	0.026	nv	nv	-	-	-	0.001	0.037	-	-	0.004	0.004	0.067
Fluoranthene *	mg/kg	1	3,400	0.094	nv	nv	-	-	-	0.001	0.242	-	-	0.042	0.021	0.244
Pyrene	mg/kg	1	35,000	168	nv	nv	-	-	-	0.001	0.183	-	-	0.037	0.018	0.186
Benzo(a)anthracene *	mg/kg	1	340	0.030	nv	nv	-	-	-	0.007	0.061	-	-	0.023	0.035	0.006
Chrysene *	mg/kg	1	3,500	0.372	nv	nv	-	-	-	0.004	0.113	-	-	0.028	0.016	0.023
Benzo(b)+Benzo(k) fluoranthene *	mg/kg	1	350	nv	nv	nv	-	-	-	0.002	0.226	-	-	0.035	0.026	0.02
Benzo(a)pyrene *	mg/kg	1	35	0.090	nv	nv	-	-	-	0.001	0.115	-	-	0.023	0.011	0.004
Indeno(123cd)pyrene *	mg/kg	1	350	nv	nv	nv	-	-	-	0.001	0.066	-	-	0.008	0.008	0.004
Dibenzo(ah)anthracene	mg/kg	1	35	0.308	nv	nv	-	-	-	0.001	0.016	-	-	0.003	0.003	0.001
Benzo(ghi)perylene *	mg/kg	1	52,000	nv	nv	nv	-	-	-	0.001	0.073	-	-	0.01	0.007	0.008
Sum of 10 PAH	mg/kg	-	nv	nv	1	***40***	-	-	-	0.023	1.114	-	-	0.197	0.145	0.428
Total 16 EPA PAHs (16)	mg/kg	-	nv	nv	nv	nv	-	-	-	0.046	1.360	-	-	0.263	0.198	0.68

xx	Exceeds Human Health Soil Generic Assessment Criteria
xx	Exceeds Controlled Water Generic Assessment Criteria
xx	Exceeds Dutch Intervention Value
GAC	Generic Assessment Criteria
MDL	Method Detection Limit
-	Less than MDL
na	Not Analysed
nv	No Value

* Included in sum of ten PAHs

Client	ESB
Project	ESB Great Island
Location	ESB Great Island
Job Number	49341640
Table 2:	PAH Laboratory Results - Soil

							Borehole Samples						
Sample Type							Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample ID							BH201	BH201	BH203	BH204	BH204	BH205	BH207
Depth							1-2.0m	4.0m	3.0m	1.0m	2.0m	2.0m	1.0m
Date							01-Oct-08	01-Oct-08	03-Oct-08	03-Oct-08	03-Oct-08	02-Oct-08	02-Oct-08
Parameters	**Units**	**MDL**	**Human Health GAC - Soil**	**Controlled Water GAC - Soil**	***Dutch Screening (S) Value***	***Dutch Intervention (I) Value***							
Naphthalene *	mg/kg	1	270	0.011	nv	nv	0.002	-	0.003	0.017	0.001	-	-
Acenaphthylene	mg/kg	1	2,100	0.497	nv	nv	0.003	-	0.13	0.009	0.002	-	-
Acenaphthene	mg/kg	1	3,400	23	nv	nv	0.022	-	0.291	0.02	0.009	-	-
Fluorene	mg/kg	1	69,000	30	nv	nv	0.003	-	0.636	0.02	0.005	-	-
Phenanthrene *	mg/kg	1	34,000	2.02	nv	nv	0.009	-	3.727	0.008	0.01	-	-
Anthracene*	mg/kg	1	520,000	0.026	nv	nv	0.003	-	1.342	0.045	0.004	-	-
Fluoranthene *	mg/kg	1	3,400	0.094	nv	nv	0.003	-	3.826	0.027	0.009	-	-
Pyrene	mg/kg	1	35,000	168	nv	nv	0.003	-	3.137	0.045	0.013	-	-
Benzo(a)anthracene *	mg/kg	1	340	0.030	nv	nv	0.021	-	0.949	0.045	0.008	-	-
Chrysene *	mg/kg	1	3,500	0.372	nv	nv	0.014	-	0.605	0.035	0.013	-	-
Benzo(b)+Benzo(k) fluoranthene *	mg/kg	1	350	nv	nv	nv	0.003	-	0.471	0.015	0.007	-	-
Benzo(a)pyrene *	mg/kg	1	35	0.090	nv	nv	0.001	-	0.255	0.05	0.014	-	-
Indeno(123cd)pyrene *	mg/kg	1	350	nv	nv	nv	0.001	-	0.051	0.021	0.003	-	-
Dibenzo(ah)anthracene	mg/kg	1	35	0.308	nv	nv	0.001	-	0.01	0.009	0.005	-	-
Benzo(ghi)perylene *	mg/kg	1	52,000	nv	nv	nv	0.001	-	0.018	0.036	0.012	-	-
Sum of 10 PAH	mg/kg	-	nv	nv	1	***40***	0.058	-	11.247	0.299	0.081	-	-
Total 16 EPA PAHs (16)	mg/kg	-	nv	nv	nv	nv	0.090	-	15.451	0.402	0.115	-	-

xx	Exceeds Human Health Soil Generic Assessment Criteria
xx	Exceeds Controlled Water Generic Assessment Criteria
xx	Exceeds Dutch Intervention Value
GAC	Generic Assessment Criteria
MDL	Method Detection Limit
-	Less than MDL
na	Not Analysed
nv	No Value

* Included in sum of ten PAHs

Client	ESB
Project	ESB Great Island
Location	ESB Great Island
Job Number	49341640
Table 3 : PCBs	PCB Laboratory Results - Soil

Sample Type							Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample ID							HA01	HA02	HA03	HA04	HA05	HA06	HA07	HA08
Depth							0.5m	2.5m	2.0m	0.2m	0.2m	0.2m	0.2m	0.2m
Date							02-Oct-08	02-Oct-08	02-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08
Parameters	**Units**	**MDL**	**Human Health GAC - Soil**	**Controlled Water GAC - Soil**	***Dutch MAC - Screening (S) Value***	***Dutch MAC - Intervention (I) Value***								
PCB Total of 7 Congeners	mg/kg	0.001	16.8	0.004	0.02	***1***	-	-	-	-	-	-	-	-

xx	Exceeds Human Health Soil Generic Assessment Criteria
xx	Exceeds Controlled Water Generic Assessment Criteria
xx	Exceeds Dutch Intervention Value
GAC	Generic Assessment Criteria
MDL	Method Detection Limit
-	Less than MDL
na	Not Analysed
nv	No Value

Client	ESB
Project	ESB Great Island
Location	ESB Great Island
Job Number	49341640
Table 3 : PCBs	PCB Laboratory Results - Soil

Sample Type							Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample ID							HA09	HA10	HA11	TP103	TP113	BH201	BH201
Depth							0.2m	0.2m	0.2m	0.5m	0.5m	1.0-2.0m	4.0m
Date							01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	02-Oct-08	01-Oct-08	01-Oct-08
Parameters	**Units**	**MDL**	**Human Health GAC - Soil**	**Controlled Water GAC - Soil**	***Dutch MAC - Screening (S) Value***	***Dutch MAC - Intervention (I) Value***							
PCB Total of 7 Congeners	mg/kg	0.001	16.8	0.004	0.02	***1***	-	-	-	-	-	-	-

xx	Exceeds Human Health Soil Generic Assessment Criteria
xx	Exceeds Controlled Water Generic Assessment Criteria
xx	Exceeds Dutch Intervention Value
GAC	Generic Assessment Criteria
MDL	Method Detection Limit
-	Less than MDL
na	Not Analysed
nv	No Value

Client ESB
Project ESB Great Island
Location ESB Great Island
Job Number 49341640
Table 4: Heavy Metal Laboratory Results - Soil

Sample Type								Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample ID								HA01	HA02	HA02	HA02	HA03	HA03	HA04	HA05	HA06	HA07
Depth								0.5m	0.5m	1.5m	2.5m	0.5m	2.0m	0.2m	0.2m	0.2m	0.2m
Date								02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08
Parameter	**Units**	**MDL**	**Human Health GAC - Soil**	**Controlled Water GAC - Soil**	**EPA Background**	***Dutch MAC - Screening (S) Value***	***Dutch MAC - Intervention (I) Value***										
Antimony	mg/kg	1.5	15	0.23	1.54	3	***15***	-	-	-	-	-	-	-	-	-	-
Arsenic	mg/kg	3	500	0.29	21.9	29	***55***	***173***	17	8	15	16	13	31	9	12	7
Barium	mg/kg	6	28,000	4.11	454.5	160	***625***	72	76	74	74	90	85	70	78	68	63
Cadmium	mg/kg	0.2	1,400	0.55	1.652	0.8	***12***	-	-	-	-	-	-	-	-	-	-
Chromium	mg/kg	4.5	5,000	6.50	86.8	100	***380***	30	24	26	27	27	20	1	24	3	11
Copper	mg/kg	6	IR	0.04	45.9	36	***190***	20	41	21	231	25	30	16	68	17	15
Lead	mg/kg	2	750	0.40	61.9	85	***530***	32	77	52	52	92	105	69	107	27	67
Mercury	mg/kg	0.4	480	0.002	0.237	0.3	***10***	-	-	-	-	-	-	-	-	-	-
Molybdenum	mg/kg	0.6	1,310	1.41	3.29	3	***200***	2	5	2	2	3	4	-	2	-	-
Nickel	mg/kg	0.9	5,000	0.76	50	35	***210***	24	21	22	22	24	20	18	36	33	42
Selenium	mg/kg	3	8,000	0.05	2.67	0.7	***100***	-	-	-	-	-	-	-	-	-	-
Vanadium	mg/kg	1.5	23,400	20	104.8	42	***250***	54	56	56	61	58	50	50	78	72	113
Zinc	mg/kg	2.5	IR	0.29	144.7	140	***720***	82	257	147	127	221	299	115	***890***	84	100

xx	Exceeds Human Health Soil Generic Assessment Criteria
xx	Exceeds Controlled Water Generic Assessment Criteria
xx	Exceeding EPA Background 95 Percentile
xx	Exceeds Dutch Intervention Value
GAC	Generic Assessment Criteria
MDL	Method Detection Limit
-	Less than MDL
na	Not Analysed
nv	No Value
IR	Insignificant risk to identified potential receptors

Note: There may be some minor variations in MDL between the tables and the lab certificates, as some samples were analysed by Alcontrols facility at Chester.

Client ESB
Project ESB Great Island
Location ESB Great Island
Job Number 49341640
Table 4: Heavy Metal Laboratory Results - Soil

Sample Type								Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample ID								HA08	HA09	HA10	HA11	TP101	TP102	TP103	TP104	TP104	TP104
Depth								0.2m	0.2m	0.2m	0.2m	0.5m	0.5m	0.5m	0.5m	1.0m	1.5m
Date								01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08
Parameter	**Units**	**MDL**	**Human Health GAC - Soil**	**Controlled Water GAC - Soil**	**EPA Background**	***Dutch MAC - Screening (S) Value***	***Dutch MAC - Intervention (I) Value***										
Antimony	mg/kg	1.5	15	0.23	1.54	3	***15***	-	-	-	-	-	1.2	-	2.6	3.7	3.8
Arsenic	mg/kg	3	500	0.29	21.9	29	***55***	9	19	11	9	16	2.1	13	19	25	29
Barium	mg/kg	6	28,000	4.11	454.5	160	***625***	126	80	84	46	76	60	88	79	63	67
Cadmium	mg/kg	0.2	1,400	0.55	1.652	0.8	***12***	-	-	-	-	-	-	-	0.2	-	0.2
Chromium	mg/kg	4.5	5,000	6.50	86.8	100	***380***	2	12	7	-	29	21	24	26	34	34
Copper	mg/kg	6	IR	0.04	45.9	36	***190***	12	23	14	8	14	16	11	27	36	38
Lead	mg/kg	2	750	0.40	61.9	85	***530***	23	23	23	29	30	23	20	34	21	24
Mercury	mg/kg	0.4	480	0.002	0.237	0.3	***10***	-	-	-	-	-	-	-	-	-	-
Molybdenum	mg/kg	0.6	1,310	1.41	3.29	3	***200***	-	-	-	-	1	0.9	1	1.2	0.8	1
Nickel	mg/kg	0.9	5,000	0.76	50	35	***210***	35	28	39	8	18	17	10	24	36	38
Selenium	mg/kg	3	8,000	0.05	2.67	0.7	***100***	-	-	-	-	-	-	1	-	-	-
Vanadium	mg/kg	1.5	23,400	20	104.8	42	***250***	89	61	71	45	52	27	46	30	37	37
Zinc	mg/kg	2.5	IR	0.29	144.7	140	***720***	102	102	85	101	60	57	49	78	92	92

xx	Exceeds Human Health Soil Generic Assessment Criteria
xx	Exceeds Controlled Water Generic Assessment Criteria
xx	Exceeding EPA Background 95 Percentile
xx	Exceeds Dutch Intervention Value
GAC	Generic Assessment Criteria
MDL	Method Detection Limit
-	Less than MDL
na	Not Analysed
nv	No Value
IR	Insignificant risk to identified potential receptors

Note: There may be some minor variations in MDL between the tables and the lab certificates, as some samples were analysed by Alcontrols facility at Chester.

Client ESB
Project ESB Great Island
Location ESB Great Island
Job Number 49341640
Table 4: Heavy Metal Laboratory Results - Soil

Sample Type								Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample ID								TP105	TP105	TP105	TP105	TP106	TP106	TP108	TP109	Dup for TP109	TP110
Depth								0.5m	1.0m	1.5m	2.0m	0.5m	1.5m	0.3m	0.4m	0.4m	0.5m
Date								01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	03-Oct-08	03-Oct-08	03-Oct-08	03-Oct-08
Parameter	**Units**	**MDL**	**Human Health GAC - Soil**	**Controlled Water GAC - Soil**	**EPA Background**	***Dutch MAC - Screening (S) Value***	***Dutch MAC - Intervention (I) Value***										
Antimony	mg/kg	1.5	15	0.23	1.54	3	***15***	3	2.2	3.7	4.3	-	-	na	na	na	na
Arsenic	mg/kg	3	500	0.29	21.9	29	***55***	20	19	25	28	17	33	***82***	31	24	15
Barium	mg/kg	6	28,000	4.11	454.5	160	***625***	73	56	71	72	64	81	215	126	114	76
Cadmium	mg/kg	0.2	1,400	0.55	1.652	0.8	***12***	-	-	-	-	-	-	-	-	-	-
Chromium	mg/kg	4.5	5,000	6.50	86.8	100	***380***	27	21	31	31	24	34	35	38	36	13
Copper	mg/kg	6	IR	0.04	45.9	36	***190***	25	16	36	36	14	34	40	26	23	24
Lead	mg/kg	2	750	0.40	61.9	85	***530***	25	19	35	25	23	32	251	59	49	33
Mercury	mg/kg	0.4	480	0.002	0.237	0.3	***10***	-	-	-	-	-	-	-	-	-	-
Molybdenum	mg/kg	0.6	1,310	1.41	3.29	3	***200***	1.2	0.9	1	1	2	2	2	2	2	2
Nickel	mg/kg	0.9	5,000	0.76	50	35	***210***	28	21	38	40	16	35	31	22	21	9
Selenium	mg/kg	3	8,000	0.05	2.67	0.7	***100***	-	-	-	-	1	-	-	-	-	-
Vanadium	mg/kg	1.5	23,400	20	104.8	42	***250***	30	25	35	31	44	63	54	57	53	30
Zinc	mg/kg	2.5	IR	0.29	144.7	140	***720***	76	64	94	95	57	82	137	88	76	57

xx	Exceeds Human Health Soil Generic Assessment Criteria
xx	Exceeds Controlled Water Generic Assessment Criteria
xx	Exceeding EPA Background 95 Percentile
xx	Exceeds Dutch Intervention Value
GAC	Generic Assessment Criteria
MDL	Method Detection Limit
-	Less than MDL
na	Not Analysed
nv	No Value
IR	Insignificant risk to identified potential receptors

Note: There may be some minor variations in MDL between the tables and the lab certificates, as some samples were analysed by Alcontrols facility at Chester.

Client ESB
Project ESB Great Island
Location ESB Great Island
Job Number 49341640
Table 4: Heavy Metal Laboratory Results - Soil

Sample Type								Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample ID								TP110	TP111	TP112	TP112	TP113	TP114	TP115	TP116	Dup for TP116	TP117
Depth								1.5m	0.2m	0.5m	1.5m	0.5m	0.5m	0.5m	0.5m	0.5m	0.5m
Date								03-Oct-08	03-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08
Parameter	**Units**	**MDL**	**Human Health GAC - Soil**	**Controlled Water GAC - Soil**	**EPA Background**	***Dutch MAC - Screening (S) Value***	***Dutch MAC - Intervention (I) Value***										
Antimony	mg/kg	1.5	15	0.23	1.54	3	***15***	na	na	-	-	-	-	-	-	-	-
Arsenic	mg/kg	3	500	0.29	21.9	29	***55***	17	31	12	12	15	14	13	***156***	13	13
Barium	mg/kg	6	28,000	4.11	454.5	160	***625***	63	88	60	98	70	130	73	79	76	82
Cadmium	mg/kg	0.2	1,400	0.55	1.652	0.8	***12***	-	-	-	-	-	-	-	-	-	-
Chromium	mg/kg	4.5	5,000	6.50	86.8	100	***380***	12	19	19	44	25	23	28	28	28	30
Copper	mg/kg	6	IR	0.04	45.9	36	***190***	15	17	12	13	15	12	14	17	20	32
Lead	mg/kg	2	750	0.40	61.9	85	***530***	26	16	15	13	28	25	29	27	27	36
Mercury	mg/kg	0.4	480	0.002	0.237	0.3	***10***	-	-	-	-	-	-	-	-	-	-
Molybdenum	mg/kg	0.6	1,310	1.41	3.29	3	***200***	1	2	-	-	2	2	2	2	2	1
Nickel	mg/kg	0.9	5,000	0.76	50	35	***210***	7	19	12	29	17	11	17	18	20	34
Selenium	mg/kg	3	8,000	0.05	2.67	0.7	***100***	-	-	-	-	-	-	-	-	-	-
Vanadium	mg/kg	1.5	23,400	20	104.8	42	***250***	25	32	69	135	42	43	46	48	46	49
Zinc	mg/kg	2.5	IR	0.29	144.7	140	***720***	56	65	54	72	73	49	60	62	61	89

xx	Exceeds Human Health Soil Generic Assessment Criteria
xx	Exceeds Controlled Water Generic Assessment Criteria
xx	Exceeding EPA Background 95 Percentile
xx	Exceeds Dutch Intervention Value
GAC	Generic Assessment Criteria
MDL	Method Detection Limit
-	Less than MDL
na	Not Analysed
nv	No Value
IR	Insignificant risk to identified potential receptors

Note: There may be some minor variations in MDL between the tables and the lab certificates, as some samples were analysed by Alcontrols facility at Chester.

Client ESB
Project ESB Great Island
Location ESB Great Island
Job Number 49341640
Table 4: Heavy Metal Laboratory Results - Soil

Sample Type								Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample ID								TP117	BH201	BH201	BH203	BH204	BH204	BH205	BH205	BH207
Depth								1.5m	1-2.0m	4.0m	3.0m	1.0m	2.0m	1.0m	2.0m	1.0m
Date								02-Oct-08	01-Oct-08	01-Oct-08	03-Oct-08	03-Oct-08	03-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08
Parameter	**Units**	**MDL**	**Human Health GAC - Soil**	**Controlled Water GAC - Soil**	**EPA Background**	***Dutch MAC - Screening (S) Value***	***Dutch MAC - Intervention (I) Value***									
Antimony	mg/kg	1.5	15	0.23	1.54	3	***15***	-	-	-	na	na	na	-	-	-
Arsenic	mg/kg	3	500	0.29	21.9	29	***55***	13	25	-	8	11	13	12	16	15
Barium	mg/kg	6	28,000	4.11	454.5	160	***625***	82	42	21	30	50	64	54	66	40
Cadmium	mg/kg	0.2	1,400	0.55	1.652	0.8	***12***	-	-	-	-	-	-	-	-	-
Chromium	mg/kg	4.5	5,000	6.50	86.8	100	***380***	30	33	20	18	25	26	25	40	31
Copper	mg/kg	6	IR	0.04	45.9	36	***190***	32	5	3	7	17	37	23	16	21
Lead	mg/kg	2	750	0.40	61.9	85	***530***	36	9	9	7	17	26	24	27	15
Mercury	mg/kg	0.4	480	0.002	0.237	0.3	***10***	-	-	-	-	-	-	-	-	-
Molybdenum	mg/kg	0.6	1,310	1.41	3.29	3	***200***	1	1	1	2	3	3	3	2	2
Nickel	mg/kg	0.9	5,000	0.76	50	35	***210***	22	11	11	5	19	23	20	25	29
Selenium	mg/kg	3	8,000	0.05	2.67	0.7	***100***	-	-	-	-	-	-	-	-	-
Vanadium	mg/kg	1.5	23,400	20	104.8	42	***250***	38	42	45	29	40	54	43	59	45
Zinc	mg/kg	2.5	IR	0.29	144.7	140	***720***	70	39	49	31	67	95	132	61	61

xx	Exceeds Human Health Soil Generic Assessment Criteria
xx	Exceeds Controlled Water Generic Assessment Criteria
xx	Exceeding EPA Background 95 Percentile
xx	Exceeds Dutch Intervention Value
GAC	Generic Assessment Criteria
MDL	Method Detection Limit
-	Less than MDL
na	Not Analysed
nv	No Value
IR	Insignificant risk to identified potential receptors

Note: There may be some minor variations in MDL between the tables and the lab certificates, as some samples were analysed by Alcontrols facility at Chester.

Client ESB
Project ESB Great Island
Location ESB Great Island
Job Number 49341640
Table 5: Various Laboratory Results - Soil

Sample Type							Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample ID							HA01	HA02	HA02	HA02	HA03	HA03	HA04	HA05	HA06	HA07
Depth							0.5m	0.5m	1.5m	2.5m	0.5m	2.0m	0.2m	0.2m	0.2m	0.2m
Date							02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08
Parameters	**Units**	**MDL**	**Human Health GAC - Soil**	**Controlled Water GAC - Soil**	***Dutch MAC - Screening (S) Value***	***Dutch MAC - Intervention (I) Value***										
TOC																
Total Organic Carbon	%	0.2	nv	nv	nv	nv	1.2	2.3	2.2	2.2	2.1	4.1	1.1	0.2	0.9	0.8
Miscellaneous																
Total Phenols	mg/kg	0.01	nc	nc	0.05	***40***	-	na	na	0.10	na	-	0.07	0.04	0.05	na
Total Cyanide	mg/kg	2.50	50	nv	1	***20***	-	na	na	-	na	-	-	-	-	na
Chloride	mg/kg	5.00	nv	nv	nv	nv	na	na	na	na	na	na	8	-	na	na
Fluoride	mg/kg	0.50	36,900	0.08	nv	nv	na	na	na	na	na	na	-	0.7	na	na
Sulphate	g/l	0.003	nv	32.9	nv	nv	na	na	na	na	na	na	0.003	-	na	na
VOCs	ug/kg	1	nv	nv	nv	nv	na	na	na	na	na	na	na	na	na	na

xx	Exceeds Human Health Soil Generic Assessment Criteria
xx	Exceeds Controlled Water Generic Assessment Criteria
xx	Exceeds Dutch Intervention Value
GAC	Generic Assessment Criteria
MDL	Method Detection Limit
-	Less than MDL
na	Not Analysed
nv	No Value

Client ESB
Project ESB Great Island
Location ESB Great Island
Job Number 49341640
Table 5: Various Laboratory Results - Soil

Sample Type							Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample ID							HA08	HA09	HA10	HA11	TP101	TP102	TP103	TP104	TP104	TP104
Depth							0.2m	0.2m	0.2m	0.2m	0.5m	0.5m	0.5m	0.5m	1.0m	1.5m
Date							01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08
Parameters	**Units**	**MDL**	**Human Health GAC - Soil**	**Controlled Water GAC - Soil**	***Dutch MAC - Screening (S) Value***	***Dutch MAC - Intervention (I) Value***										
TOC																
Total Organic Carbon	%	0.2	nv	nv	nv	nv	0.9	0.5	0.8	1.1	1.1	1.3	0.7	0.8	0.3	-
Miscellaneous																
Total Phenols	mg/kg	0.01	nc	nc	0.05	***40***	0.04	na	na	0.06	0.03	na	0.03	na	na	na
Total Cyanide	mg/kg	2.50	50	nv	1	***20***	-	na	na	-	-	na	-	na	na	na
Chloride	mg/kg	5.00	nv	nv	nv	nv	na	na	na	6	-	na	72	na	na	na
Fluoride	mg/kg	0.50	36,900	0.08	nv	nv	na	na	na	0.5	0.6	na	4.2	na	na	na
Sulphate	g/l	0.003	nv	32.9	nv	nv	na	na	na	-	-	na	-	na	na	na
VOCs	ug/kg	1	nv	nv	nv	nv	na	na	na	na	na	na	-	na	na	na

xx	Exceeds Human Health Soil Generic Assessment Criteria
xx	Exceeds Controlled Water Generic Assessment Criteria
xx	Exceeds Dutch Intervention Value
GAC	Generic Assessment Criteria
MDL	Method Detection Limit
-	Less than MDL
na	Not Analysed
nv	No Value

Client ESB
Project ESB Great Island
Location ESB Great Island
Job Number 49341640
Table 5: Various Laboratory Results - Soil

Sample Type							Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample ID							TP105	TP105	TP105	TP105	TP106	TP106	TP108	TP109	Dup for TP109	TP110
Depth							0.5m	1.0m	1.5m	2.0m	0.5m	1.5m	0.3m	0.4m	0.4m	0.5m
Date							01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	01-Oct-08	03-Oct-08	03-Oct-08	03-Oct-08	03-Oct-08
Parameters	**Units**	**MDL**	**Human Health GAC - Soil**	**Controlled Water GAC - Soil**	***Dutch MAC - Screening (S) Value***	***Dutch MAC - Intervention (I) Value***										
TOC																
Total Organic Carbon	%	0.2	nv	nv	nv	nv	0.9	0.2	-	-	0.9	-	2.3	1.1	0.8	1.1
Miscellaneous																
Total Phenols	mg/kg	0.01	nc	nc	0.05	***40***	na	na	na	na	0.02	0.12	0.09	na	0.04	0.03
Total Cyanide	mg/kg	2.50	50	nv	1	***20***	na	na	na	na	-	-	-	na	-	-
Chloride	mg/kg	5.00	nv	nv	nv	nv	na	na	na	na	-	na	10	na	15	8
Fluoride	mg/kg	0.50	36,900	0.08	nv	nv	na	na	na	na	-	na	-	na	-	-
Sulphate	g/l	0.003	nv	32.9	nv	nv	na	na	na	na	-	na	-	na	-	-
VOCs	ug/kg	1	nv	nv	nv	nv	na	na	na	na	na	na	na	na	na	na

xx	Exceeds Human Health Soil Generic Assessment Criteria
xx	Exceeds Controlled Water Generic Assessment Criteria
xx	Exceeds Dutch Intervention Value
GAC	Generic Assessment Criteria
MDL	Method Detection Limit
-	Less than MDL
na	Not Analysed
nv	No Value

Client ESB
Project ESB Great Island
Location ESB Great Island
Job Number 49341640
Table 5: Various Laboratory Results - Soil

Sample Type							Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample ID							TP110	TP111	TP112	TP112	TP113	TP114	TP115	TP116	Dup for TP116	TP117	TP117
Depth							1.5m	0.2m	0.5m	1.5m	0.5m	0.5m	0.5m	0.5m	0.5m	0.5m	1.5m
Date							03-Oct-08	03-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08
Parameters	**Units**	**MDL**	**Human Health GAC - Soil**	**Controlled Water GAC - Soil**	***Dutch MAC - Screening (S) Value***	***Dutch MAC - Intervention (I) Value***											
TOC																	
Total Organic Carbon	%	0.2	nv	nv	nv	nv	0.8	0.8	0.7	0.3	1	1.1	1.3	1.2	1.3	0.9	0.5
Miscellaneous																	
Total Phenols	mg/kg	0.01	nc	nc	0.05	***40***	na	0.07	na	na	-	na	0.03	na	na	0.07	na
Total Cyanide	mg/kg	2.50	50	nv	1	***20***	na	-	na	na	-	na	-	na	na	-	na
Chloride	mg/kg	5.00	nv	nv	nv	nv	na	-	na	na	6	na	na	na	na	45	na
Fluoride	mg/kg	0.50	36,900	0.08	nv	nv	na	-	na	na	-	na	na	na	na	0.8	na
Sulphate	g/l	0.003	nv	32.9	nv	nv	na	-	na	na	-	na	na	na	na	0.005	na
VOCs	ug/kg	1	nv	nv	nv	nv	na	na	na	na	na	na	na	na	na	na	na

xx	Exceeds Human Health Soil Generic Assessment Criteria
xx	Exceeds Controlled Water Generic Assessment Criteria
xx	Exceeds Dutch Intervention Value
GAC	Generic Assessment Criteria
MDL	Method Detection Limit
-	Less than MDL
na	Not Analysed
nv	No Value

Client ESB
Project ESB Great Island
Location ESB Great Island
Job Number 49341640
Table 5: Various Laboratory Results - Soil

Sample Type							Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample ID							BH201	BH201	BH203	BH204	BH204	BH205	BH205	BH207
Depth							1-2.0m	4.0m	3.0m	1.0m	2.0m	1.0m	2.0m	1.0m
Date							01-Oct-08	01-Oct-08	03-Oct-08	03-Oct-08	03-Oct-08	02-Oct-08	02-Oct-08	02-Oct-08
Parameters	**Units**	**MDL**	**Human Health GAC - Soil**	**Controlled Water GAC - Soil**	***Dutch MAC - Screening (S) Value***	***Dutch MAC - Intervention (I) Value***								
TOC														
Total Organic Carbon	%	0.2	nv	nv	nv	nv	0.3	-	-	1	0.8	1.3	0.8	0.2
Miscellaneous														
Total Phenols	mg/kg	0.01	nc	nc	0.05	***40***	0.11	0.03	na	0.06	0.02	na	na	0.08
Total Cyanide	mg/kg	2.50	50	nv	1	***20***	-	-	na	-	-	na	-	-
Chloride	mg/kg	5.00	nv	nv	nv	nv	85	5	na	118	62	na	na	17
Fluoride	mg/kg	0.50	36,900	0.08	nv	nv	3.7	-	na	1.3	1.5	na	na	-
Sulphate	g/l	0.003	nv	32.9	nv	nv	0.058	0.040	na	0.046	0.017	na	na	0.007
VOCs	ug/kg	1	nv	nv	nv	nv	na	-	na	na	na	na	na	na

xx	Exceeds Human Health Soil Generic Assessment Criteria
xx	Exceeds Controlled Water Generic Assessment Criteria
xx	Exceeds Dutch Intervention Value
GAC	Generic Assessment Criteria
MDL	Method Detection Limit
-	Less than MDL
na	Not Analysed
nv	No Value

Client ESB
Project ESB Great Island
Location Great Island
Job Number 49341640
Table 6: Relative Percentage Difference

Sample Type			Soil	Soil		Soil	Soil	
Sample ID			TP109	Dup for TP109	%RPDs	TP116	Dup for TP116	%RPDs
Depth (m)			0.4m	0.4m		0.5m	0.5m	
Date			03-Oct-08	03-Oct-08		02-Oct-08	02-Oct-08	
Parameters	**Units**	**MDL**						
Hydrocarbons								
Aromatics								
C6-C7	mg/kg	0.01	-	-	NC	-	-	NC
C7-C8	mg/kg	0.01	-	-	NC	-	-	NC
C8-C10	mg/kg	0.01	-	-	NC	-	-	NC
C10-C12	mg/kg	0.01	-	-	NC	-	-	NC
C12-C16	mg/kg	0.1	-	-	NC	-	-	NC
C16-C21	mg/kg	0.1	-	-	NC	-	-	NC
C21-C35	mg/kg	0.1	-	-	NC	-	-	NC
Total Aromatics	mg/kg	0.1	-	-	NC	-	-	NC
Aliphatics								
C5-C6	mg/kg	0.01	-	-	NC	-	-	NC
C6-C8	mg/kg	0.01	-	-	NC	-	-	NC
C8-C10	mg/kg	0.01	-	-	NC	-	-	NC
C10-C12	mg/kg	0.01	-	-	NC	-	-	NC
C12-C16	mg/kg	0.1	-	-	NC	-	-	NC
C16-C21	mg/kg	0.1	-	-	NC	-	-	NC
C21-C35	mg/kg	0.1	-	-	NC	-	-	NC
Total Aliphatics (MO)	mg/kg	0.1	-	-	NC	-	-	NC
Total TPH	mg/kg	0.1	-	-	NC	-	-	NC
BTEX								
Benzene	mg/kg	0.01	-	-	NC	-	-	NC
Toluene	mg/kg	0.01	-	-	NC	-	-	NC
Ethylbenzene	mg/kg	0.01	-	-	NC	-	-	NC
Total Xylene	mg/kg	0.01	-	-	NC	-	-	NC
BTEX	mg/kg	0.01	-	-	NC	-	-	NC
MTBE	mg/kg	0.01	-	-	NC	-	-	NC
TOC								
Total Organic Carbon	%	0.2	1	1	32	1	1	8
Heavy Metals								
Antimony	mg/kg	1.5	na	na	NC	-	-	NC
Arsenic Low Level	mg/kg	3	31	24	25	156	13	**169**
Barium	mg/kg	6	126	114	10.0	79	76	3.9
Cadmium Low Level	mg/kg	0.2	-	-	NC	-	-	NC
Chromium	mg/kg	4.5	38	36	5.4	28	28	0.0
Copper	mg/kg	6	26	23	12	17	20	16
Lead	mg/kg	2	59	49	18.5	27	27	0.0
Mercury Low Level	mg/kg	0.4	-	-	NC	-	-	NC
Molybdenum	mg/kg	0.6	2	2	0.0	2	2	0.0
Nickel	mg/kg	0.9	22	21	4.7	18	20	10.5
Selenium Low Level	mg/kg	3	-	-	NC	-	-	NC
Vanadium	mg/kg	1.5	57	53	7.3	48	46	4.3
Zinc	mg/kg	2.5	88	76	14.6	62	61	1.6

"-" - Less than MDL
na - Not Analysed
NC - Not Calculable
Bold - % RPD greater than 40% and results reported greater than ten times the MDL.

Compiled by:JJ
Checked by: