12.0 SOILS & GEOLOGY

12.1 Receiving Environment

Bedrock Geology

12.1.1 The bedrock geology in the Dublin area is generally comprised of Calp Limestone, which was formed during the Carboniferous period.

12.1.2 During this period, the eastern part of Ireland underwent uplift and erosion.

12.1.3 Following this, there was a period of general subsidence in the area, permitting the sea to invade the lower ground and deposit sediment which eventually became the Calp limestone that dominates most of Dublin today.

12.1.4 The proposed site is located on the Calp limestone, (see Figure 12.1 which depicts the bedrock geology of the area).

12.1.5 There are a number of faults in the Calp limestone. However, the area of the proposed site itself is unfaulted.

12.1.6 Most of the rocks formed during the Carboniferous period form low ground, and are covered by a thick blanket of Quaternary sediments and peat deposits [1].

12.1.7 The Calp Limestone itself is comprised of dark grey, fine-grained, graded limestone with interbedded black, poorly fossilised shale, however there are no outcrops of bedrock on the proposed site.

12.1.8 A preliminary site investigation was carried out at the site, the trial pit logs are presented as Appendix 12.1, however bedrock was not encountered in any of the 6 (no.) trial pits excavated across the site, which ranged in depth from 1.8 m to 2.1 m.

12.1.9 The locations of the trial pits are shown in Figure 12.2, and the co-ordinates are presented as Table 12.1.

Table 12.1: Location and Depth of Trial Pits

Trial Pit No.	Co-ordinates		Depth cm
	Easting	Northing	
1	309889	232583	180
2	309922	232587	190
3	309958	232580	200
4	309995	232572	210
5	310027	232564	210
6	310029	232592	210

GEOLOGICAL KEY

- CD - Calp Limestone
- BZ -
- Nt - Granite

Location of Proposed Site

Project
CA Site at Labre park

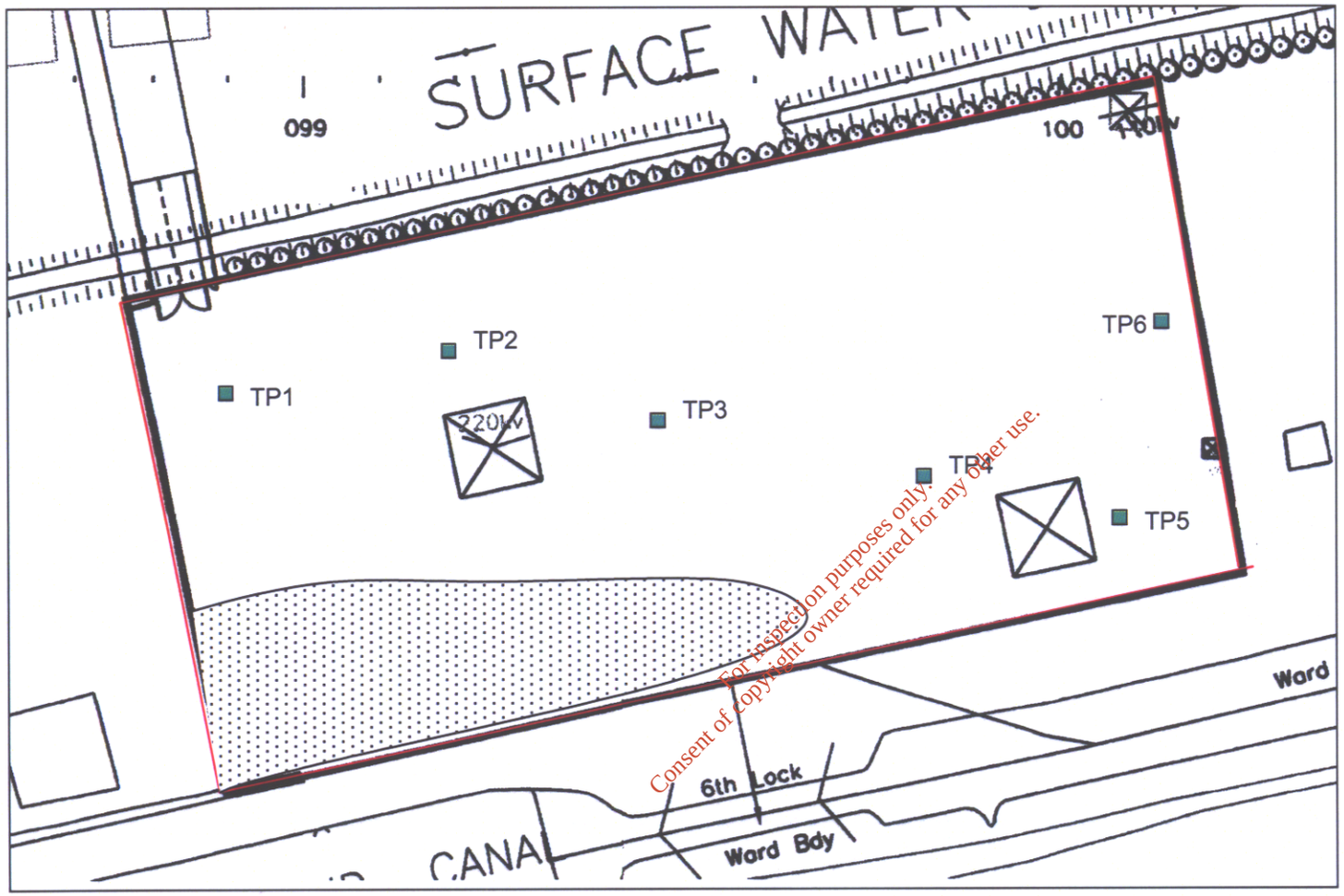
Reference
04_2348SR01

Figure 12.1

Geology of Area

awn consulting

The Tecpro Building, Clonshaugh Industrial Estate, Dublin 17. Tel: +353 (0)1 847 4220 Fax: +353 (0)1 847 4257



Trial Pit

Site Boundary

C&D Waste Deposits

Project
CA Site at Labre park

Reference
04_2348SR01

Figure 12.2

Location of Trial Pits

awn consulting

The Tecpro Building, Clonshaugh Industrial Estate, Dublin 17. Tel: +353 (0)1 847 4220 Fax: +353 (0)1 847 4257

12.1.10 The GSI Well Card Index is a record of wells drilled in Ireland. This Index shows a number of wells in the vicinity of the site.

12.1.11 While much useful information can be obtained from this Index, it is by no means exhaustive, as it requires individual drillers to submit details of wells in each area.

12.1.12 The well card data presented in Table 12.2 indicates where 8 of these wells encountered bedrock, with the depth to bedrock (DTB) ranging from 1.2 m to 16.7m below ground level in the area.

Table 12.2: GSI Well Card Data for the Ballyfermot Area

Well Ref.	Easting	Northing	Townland	DTB	Geology
W01	31120	23190	Drimnagh	1.2	Limestone
W04	31085	23092	Wilkinstown	8.5	Limestone
W05	30855	23095	Wilkinstown	6.3	Limestone
W06	30923	23161	Fox and Geese	3	Limestone
W07	30939	23161	Fox and Geese	3	N/A
W08	30930	23160	Fox and Geese	7	Limestone
W09	30970	23275	Ballyfermot Lwr.	16.7	N/A
W10	31200	23160	Crumlin	1.2	N/A
W11	31170	23180	Drimnagh	N/A	N/A
W12	31088	23101	Wilkinstown	N/A	N/A

12.1.13 It can be concluded that the depth to bedrock at the site is at least 2.1m below ground level and may be up to 16.7m below ground level.

Quaternary Deposits

12.1.14 The Quaternary geological period covers the last 1.6 million years, and can be sub-divided into the Pleistocene Epoch, which covers the Ice Age period and which extended up to 10,000 years ago and the Holocene Epoch, which extends from that time to the present day.

12.1.15 The Pleistocene Epoch in Ireland began when there was a significant cooling of the Earth's climate, and was characterised by alternating extended periods of very cold conditions, during which time much of the country was covered by an ice sheet.

12.1.16 The ice sheet in Ireland was formed by a number of coalescing ice domes, from which the ice flowed outwards in a radial pattern which, as it travelled over the ground, it eroded underlying bedrock and formed within, and beneath, the ice sheet, a sediment which consisted of particles with a massive size distribution, from clay particles to boulders.

12.1.17 This material has been labelled glacial till or boulder clay and is the most widespread sediment type in Ireland and can range in thickness from less than 1m thick to tens of metres thick.

12.1.18 Much of the Ballyfermot area is covered by Quaternary deposits of variable thickness [1]. The Quaternary deposits in the Dublin area are quite uniform in composition, consisting of tills that have also been affected by the limestone bedrock and contain limestone clasts.

12.1.19 The preliminary site investigation showed that the quaternary deposits were comprised of boulder clay, which was found to be a very compacted, medium brown clay material with large sub-rounded to angular limestone clasts (Appendix 12.1 shows the logs for these trial pits).

12.1.20 The boulder clay, also known as glacial till, was encountered at depths of 1.7 m (in Trial Pit 2, which was located to the west of the site) or deeper.

12.1.21 The thickness of the boulder clay was not determined during the site investigation as the trial pits were terminated before the deposits underlying the quaternary deposits were encountered.

12.1.22 The GSI well card data shows that quaternary deposits in the area can be very thick with one well record for Ballyfermot Lwr. showing quaternary deposits to 16.7 m below ground level.

12.1.23 Fill material was encountered during the trial pit investigations, which had been deposited on the underlying quaternary deposits.

Soils

12.1.24 The type of soil on the site has been derived from the quaternary geology and can be classed as Grey Brown Podzolic soil, which is usually formed from a calcareous parent material.

12.1.25 The lighter-textured Grey-Brown Podzolics are good all-purpose soils, while the heavier-textured members are highly suited to pasture production, responding well to manurial and management practices.

12.1.26 The site investigation showed that topsoil of 30 – 40 cm was recorded at Trial Pit Nos. 1, 3, 5, and 6, Nos. 2 and 4 had soil thicknesses of 70 and 80 cm respectively overlying the fill material.

Deposited Fill Material

12.1.27 There was evidence that a range of materials has been deposited on the site and there were also a number of abandoned vehicles noted on site during the site visit.

12.1.28 The trial pit logs show that a mixture of waste materials was encountered beneath the top layer of soil, i.e. a minimum of 30 cm below ground level.

12.1.29 Trial Pit No. 1 showed the fill material to be clean C&D (Construction and Demolition) waste, predominantly clay material, with a few stones, plastic fragments, and tarmacadam.

12.1.30 Trial Pit Nos. 2, 3 and 5 showed what appeared to be commercial waste, again primarily C&D waste, but which also contained bags of un-identified granular material (TP 2 and 5 only) and partially decomposed organic material.

12.1.31 Trial Pit Nos. 4 and 6 contained what appeared to be municipal solid waste, including plastic bottles, textiles, cardboard and paper and decomposed organic material.

12.1.32 Due to the proximity of the site to a number of industrial facilities and the finding of waste material during the site investigation, it is probable that there is historical contamination of the soil environment at the site.

12.2 Characteristics of the Proposal

During Construction

12.2.1 The proposed development will involve minimum excavation at the site for the purpose of levelling the site.

12.2.2 The development may entail removal of topsoil from the site, but it is the intention of the developer that most of the topsoil will, if suitable, be reused on site for levelling the site.

12.2.3 Construction may involve excavation to a depth at which bedrock may be encountered if the construction of underground attenuation tanks is required.

During Operation

12.2.4 The operation of the Civic Amenity site will entail continuous movement of waste materials during the hours of operation. There will be no emissions to the soil and geology environment.

12.3 Possible Effects of a Proposal of this Kind

During Construction

12.3.1 There may be surplus soil generated during excavations. As the site investigation trial pit logs showed, there is a layer of soil covering any deposits on the site, which appears to be clean topsoil. However, contaminant testing of this soil would be required to determine the quality of this material.

12.3.2 Any material excavated at the site may be contaminated and will require analysis and assessment prior to reuse on or off site, or disposal.

12.3.3 It is not expected that the waste deposits will be excavated across the majority of the site as part of the site development works (unless it is found necessary to remove contaminated material to protect visitors to the site and employees), as the excavations will be minimal and should not extend below 0.3 m below ground level. However if underground attenuation tanks are required for stormwater runoff, this will involve deeper excavation.

12.3.4 Measures outlined in the following section will be employed to ensure that procedures for correct storage, transportation and disposal of all materials excavated at the site are followed.

12.3.5 This work may require the importation of landscaping materials, such as topsoil due to the possibility that the topsoil at the site may not be suitable for reuse.

12.3.6 Details of the correct procedures for the importation of topsoil are shown in the following section to ensure that any impacts on the soil environment are minimal.

12.3.7 During the initial site preparation stage and the construction of the buildings and roads, there will be a large volume of machinery on site.

12.3.8 The potential impacts to the underlying soil environment from the construction of the proposed development could derive from accidental spillage of fuels, oils, paints and solvents.

12.3.9 This could impact soil and bedrock quality, if allowed to infiltrate to ground during storage and dispensing operations.

12.3.10 Mitigation measures outlined in the following section will ensure that this potential impact is addressed.

12.3.11 It can therefore be concluded that the construction stage of the project will not have a significant impact on the soil environment provided the mitigation measures outlined in the following section are followed.

During Operation

12.3.12 Due to the nature of the development, there will vehicles accessing the site during the hours of operation, including DCC street cleansing vehicles, service vehicles, staff vehicles and also private vehicles using the facility.

12.3.13 This may lead to emissions from vehicles such as hydrocarbons, from leaks or spills, which could cause contamination if released into the soil environment via the surface water runoff.

12.3.14 There will also be storage of waste electrical and electronic equipment , and priority wastes, including paints, bleach, oils etc, which can have a significant impact on the soils environment should correct bunding and containment not be put in place and maintained correctly at the facility.

12.3.15 Foul water drainage (excluding bunded drainage from certain sections of the site) from the proposed site offices will be discharged to an existing public foul sewer in the area. This will not impact upon the soil environment.

12.3.16 Provided the mitigation measures described in the following section are implemented, it can be concluded that the impact of the operation of the proposed development on the soil environment will be negligible.

12.4 Avoidance, Remedial or Reductive Measures

During Construction

12.4.1 It is recommended, in light of the initial site investigation which recorded the presence of municipal solid waste and commercial waste, that a programme of soil sampling and analysis be undertaken at the site prior to development commencing, to determine the quality of the soil environment and the nature and concentration of any contaminants present.

12.4.2 Should contaminant materials be found in significant concentrations, it is recommended that a site specific risk assessment, using the Dutch RISC HUMAN 3.1 Model or the UK CLEA Model, be conducted to determine whether the material poses a risk to users of the site and employees at the site. This assessment is known as a "fit for purpose" risk assessment.

12.4.3 It is recommended that 5 no. boreholes be installed at the site for the purpose of monitoring for the presence of landfill gases and for investigating groundwater quality and groundwater levels.

12.4.4 A programme of soil sampling should be carried out at the site, as part of this investigation work, to determine if there are potentially contaminating compounds present.

12.4.5 Depending on the results from the monitoring and risk assessment, the design of any buildings or enclosed spaces on the site may have to incorporate landfill gas venting measures and any surface water collecting in excavations or groundwater pumped from excavations may require treatment prior to disposal.

12.4.6 Any excavated soil destined for on site reuse or off site reuse or disposal will be assessed by visual, olfactory and if necessary chemical analysis, prior to reuse or disposal, to determine whether it is contaminated material.

12.4.7 Should any unusual staining or odour be noticed, samples of this soil will be analysed for the presence of possible contaminants.

12.4.8 Should it be determined that any of the spoil excavated is contaminated, this will be dealt with appropriately as per the Waste Management Act of 1996 and associated Regulations.

12.4.9 Construction works are planned to be carried out with the least feasible disturbance of soils.

12.4.10 Where soil stripping occurs the resulting excavated soil will be stockpiled; these stockpiles will be carefully managed in such a way as to prevent any potential negative impact on the receiving environment.

12.4.11 If excavated material which is unsuitable for use as fill material, or for landscaping, is generated at the site, it will be disposed of at suitably licensed off site disposal or remediation sites, in compliance with the Waste Management Acts of 1996 – 2003 and Section 5 of the Waste Management (Collection Permit) Regulations of 2001.

12.4.12 If any imported fill material is required, soil will be brought from as near a site as possible, in order to reduce transport distances, and the vehicles will be covered to prevent uncontrolled release of material.

12.4.13 To minimise any impact on the underlying subsurface strata, and the groundwater environment, from potential material spillages all oils, solvents and paints used during construction will be stored within specially constructed dedicated temporary bunded areas.

12.4.14 Oil and fuel storage tanks shall be stored in designated areas, when not in use and these areas shall be bunded to a volume of 110% of the capacity of the largest tank/container within the bunded area(s) (plus an allowance of 30 mm for rainwater ingress) and fuel for vehicles will be stored in a mobile double-skinned tank.

12.4.15 Filling and draw-off points will be located entirely within the bunded area(s) and drainage from the bunded area(s) shall be diverted for collection and safe disposal.

12.4.16 Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in a designated area of the site.

12.4.17 Spill kits and hydrocarbon adsorbent packs will be stored in this area and operators will be fully trained in the use of this equipment.

12.4.18 Waste residuals generated during construction activities, such as hydrocarbon, paint and solvent containers will also be stored within temporary bunded storage areas prior to removal by an appropriate Local Authority or EPA approved waste management contractor for off-site treatment/recycling/disposal.

12.4.19 Any other building waste will be disposed of to on-site skips for removal by an appropriately licensed waste management contractor.

12.4.20 If bedrock is encountered during excavation, it will either be crushed onsite and used for infill during construction, or be removed from the site by licensed contractors under the Waste Management Act of 1996 and Section 5 of the Waste Management (Permit) Regulations, and disposed of off site.

12.4.21 The combined application of these measures will ensure that inputs to, and subsequent contamination of, the soil and groundwater environment do not occur at the site during the construction phase.

During Operation

12.4.22 In order to minimise emissions of fuel and contaminated runoff to the soil (and potentially the bedrock), suitable 3-chamber, Class I hydrocarbon interceptors and silt traps will be installed at appropriate distances along the access roads and at suitable points in car stopping areas.

12.4.23 The installation of hydrocarbon interceptors will ensure that the surface water runoff from the roads and parking areas will not pollute the soil and bedrock environment, and the silt traps will reduce the level of suspended solids in the runoff from the hard standing areas.

12.4.24 Hydrocarbon interceptors will be designed in accordance with European Standard prEN858 (Installations for the separation of light liquids) and the design of all bunds will conform to standard bunding specifications - BS8007-1987.

12.4.25 The storage areas for priority wastes will be bunded, and all drainage from these areas will be collected in the bunded area, and either treated on-site or removed off-site for treatment at an appropriate, licensed facility.

12.4.26 A regular inspection and maintenance/desludging programme will be implemented whereby any oil/solids/debris trapped within the interceptors and silt traps will be removed and disposed of off-site by an appropriately licensed Local Authority or EPA approved waste disposal contractor.

12.5 Likely Effects of this Proposal

During Construction

12.5.1 Any predicted impacts during the construction phase will be short term and temporary in nature.

12.5.2 The mitigation measures with regard to the importation of materials, if required, will also ensure the impact on the soil environment is negligible.

12.5.3 The storage of fuel and refuelling using fuels and oils according to best practice, together with the on site spill kit, will ensure that any predicted impact on the soil environment is removed.

12.5.4 By implementing the mitigation measures described in the previous section, the construction state of the project will have a negligible impact on the soils and geology environment.

12.5.5 However, by leaving the waste deposits buried on site, there is a risk that components or emissions from the waste deposits may be contributing to soil contamination at the site.

12.5.6 Until a full risk assessment has been carried out at the site and monitoring of potential landfill gases is conducted, the likely effects of the waste deposits on the existing environment and on the proposed development cannot be fully determined.

During Operation

12.5.7 There will be a long term impact on the site as a result of the proposed development, due to the excavation of soil and by covering the majority if the site with hard-standing material.

12.5.8 There has been historic fly-tipping on the site, and some vehicles have been recently abandoned. By developing the site and having organized waste collections and storage, with the correct procedures in place, the risk of potential contaminants entering the soils and geology environment is minimized and the long-term impact on the environment is positive.

12.5.9 Provided the mitigation measures outlined in the previous section are implemented, there will be a negligible impact on the soil environment as a result of the operational phase of the development.

12.6 Monitoring

12.6.1 Monitoring of any excavations at the site will be carried out to determine whether the soil or material excavated shows signs of potential contamination.

12.7 Reinstatement

12.7.1 N/A

12.8 Forecasting Methods

12.8.1 The assessment of the potential impact of the proposed development on the soil and geology environment was carried out according to the methodology specified by the Environmental Protection Agency (EPA).

12.8.2 The Geological Survey of Ireland (GSI) geological maps and records for the area were inspected, with reference to geology.

12.8.3 A site visit was carried out in November 2004, to establish and assess the soil environment in the vicinity of the site.

12.8.4 A preliminary site investigation was also conducted under the supervision of personnel from AWN Consulting Ltd and Patel Tonra Ltd during December 2004.

12.8.5 The findings of the site investigation have been referred to in this section of the EIS and site logs are provided in Appendix 12.1.

12.9 Difficulties in Compiling Specified Information

12.9.1 N/A

12.10 References

1. Geology of Kildare – Wicklow, Sheet 16. McConnell, B. and Philcox, P., Geological Survey of Ireland, 1994.
2. EPA Advice Notes on Current Practice (in the preparation of Environmental Impact Statements), Environmental Publications, 17 Duke Street, Dublin 2, 2003
3. Soil Map of Ireland, 1980, An Foras Taluntais
4. EPA Guidelines on the Information to be Contained in Environmental Impact Statements, Environmental Publications, 17 Duke Street, Dublin 2, 2002

Appendix 12.1:

Trial Pit Logs

date	project	client
Jan 2005	Labre Park EIS	Dublin City Council

Appendix 12.1: Trial Pit Logs

TRIAL PIT RECORD

Contract: 04_2348 Patel

Trial Pit No.: 1

Client: Tonra

Date: 03/12/2004

Depth (cm)	Log	Description
0		Topsoil dry crumbly loose medium brown
50	/	Mixed fill material. Predominantly boulder clay with plastic fragments, metal pieces, cardboard, styrofoam, blocks of tarmacadam
100	/	
150	/	
		Pit terminated at 180 cm

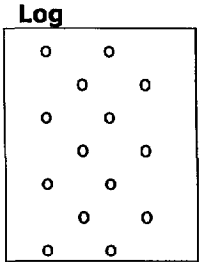
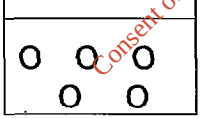
Groundwater conditions: No water ingress

Appendix 12.1: Trial Pit Logs

TRIAL PIT RECORD

Contract: 04_2348 | Trial Pit No.: 2

Client: Patel Tonra | Date: 03/12/2004

Depth (cm)	Log	Description
0		Dark brown crumbly soil, with clasts pebble - cobble size
		A few fragments of plastic, in matrix
50		
		Thin lense of light orange/brown soil
		Dark brown soil, with cobble sized clasts
100		Very dark brown, soil, high moisture content
		Sacks of white granules in layer from 130 - 160 cm
		Faint smell of decomposing material from layer
150		
		Boulder clay, large cobbles and boulders
		Pit terminated at 190 cm

Groundwater conditions: No water ingress

Appendix 12.1: Trial Pit Logs

TRIAL PIT RECORD

Contract: 04_2348 Patel — Trial Pit No.: 3

Client: Tonra — Date: 03/12/2004

Depth (cm)	Log	Description
0		Topsoil, medium brown, dry, crumbly, loose material
50		Dark grey/brown layer. High moisture content
		Dark grey/brown layer with blocks of concrete
100		Dark black/brown layer, glistening appearance Strong odour of decomposing material, possible hydrocarbons Mixed waste found in layer - plastic, netting, sack cloth
150		
200		

Groundwater conditions: No water ingress

Appendix 12.1: Trial Pit Logs

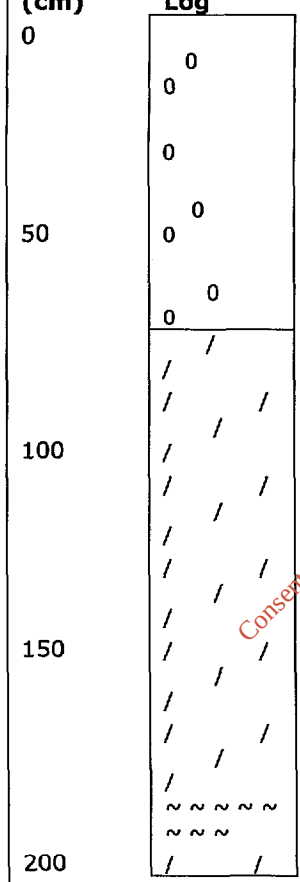
TRIAL PIT RECORD

Contract: 04_2348 Patel

Client: Tonra

Trial Pit No.: 4

Date: 03/12/2004



Depth (cm)	Description
0	Medium brown soil, high clay content
	Some cobble to boulder size clasts
	Thick deposit of mixed domestic waste
100	Decomposed very dark organic material, glass, plastic, shredded paper
	Water ingress at 190 cm
200	Pit terminated at 210 cm

Groundwater conditions: Water seeping in at 190 cm

Appendix 12.1: Trial Pit Logs

TRIAL PIT RECORD

Contract: 04_2348 Patel — Trial Pit No.: 5

Client: Tonra — Date: 03/12/2004

Depth (cm)	Log	Description
0		Medium brown soil, uncompacted, dry, no clasts
50		Mixed fill material Plastic sacks with orange white granules Faint odour of decomposing material, hydrocarbons
100		
150		
		Water trickling into trial pit at 180 cm
200		Boulder clay, very compacted and high proportion of clasts
		Pit terminated at 210

Groundwater conditions: Water ingress at 180 cm

Appendix 12.1: Trial Pit Logs

TRIAL PIT RECORD

Contract: 04_2348 Patel — Trial Pit No.: 2

Client: Tonra — Date: 03/12/2004

Depth (cm)	Log	Description
0		Medium brown soil, high clay content
		Some cobble to boulder size clasts
50		Thick deposit of mixed domestic waste Dark decomposed organic material, plastic, textiles, cardboard, rubber fragments
		Faint odour of hydrocarbons
100		
150		
200		Boulder clay

Groundwater conditions: No groundwater encountered