

**Streetscene
Y-Strydynun**

Civic Centre/Canolfan Ddinesig
Newport/Casnewydd
South Wales/De Cymru
NP20 4UR



Environmental Services

**Work Package 5
Docksway Waste Disposal Site**

Phase 2 Cell 3 Stabilisation

**Project Ref: 2505
Date: 30/07/2014**

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Document Control Sheet

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Environmental Services				

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1.0 Introduction

This works information constitutes the elements relating to work package 5 issued under the existing term relationship that exists between Newport City Council and Jim Davies Civil Engineering.

It is prepared with due regard to the Contract Data provided in the initial contract and relates to contracts awarded under the main option B: Priced Contract with Bill of Quantities of the NEC New Engineering Contract 3.

Due to the size of the site and the variety of possible work elements possible the contract data defers to each work package the following information:

Works information

Site information

Site boundaries

Programme

Start date

Access date

It endeavours to promote good management, flexibility and clarity in the development of the work package in line with the core objectives of the NEC.

2.0 Works Information

2.1 Description of works

2.1.1 General Design Concept

Phase 2 is designed on a full containment principle, to minimise the creation of leachate by rainfall infiltration or groundwater seepage. The containment system will include an engineered barrier system to mitigate leakage from the site and the associated transport of contaminants.

The engineered barrier system will comprise imported clay with a minimum thickness of 1.2m engineered to achieve a permeability not exceeding 1×10^{-9} m/s. In order to achieve the required cell/sub-cell basal profiles, the thickness of the engineered clay will vary up to 3m thick.

The existing alluvial soils beneath the site must remain insitu and they will form the low permeability natural geological barrier between the underside of the engineered barrier system and the river gravels. The stabilisation works must increase the shear strength of the very soft and soft alluvial soils whilst retaining the low permeability of these soils. In addition any stabilisation works must be such that at least 2m of untreated alluvial soils are left above the top of the river gravels.

2.1.2 Scope of the works

The base stabilisation works are to comprise soil mixing within the basal area of the proposed landfill Cell 3 at Docksway Disposal Site to improve the existing soft/very soft subgrade soils, in order that the engineered barrier system can be subsequently constructed by others. The area of the base stabilisation works is defined on the site layout drawing No JNA 2505 - 02, presented as Figure 3 and comprises two discrete areas as indicated. This drawing also includes typical cross sections.

The total area to be stabilised comprises approximately 15,000m² of land within a former river meander and associated flood plain on either side of the former river channel.

2.1.3 Previous Stabilisation Works

Cells 1 and 2 at the Docksway Disposal site were formed after stabilisation of the very soft and soft alluvial soils was undertaken. The stabilisation works for these cells comprised the formation of 800mm diameter, 2m long soil/cement mix columns by a dry mixing process on a square grid pattern.

The stabilized columns were designed to form an upper stabilized soil zone with an effective combined shear strength of about 65KPa and a bearing capacity of about 20 MPa, and were anticipated to be able to achieve a permeability of less than 1×10^{-9} m/s. In order for the stabilized ground to support construction plant, a basal reinforced platform (load transfer blanket) was incorporated over the dry soil mix columns.

The engineered basal liner and drainage layers for the cells were then constructed on top of the load transfer blanket. It was later discovered that the soil/cement columns tended to be very strong and brittle and that the permeability of the columns themselves was higher than the natural soils in which they were formed. In respect of maintaining the natural geological barrier this was considered undesirable and it has been decided to seek alternative solutions for the construction of future cells.

In consideration of the difficulty in controlling permeability of the stabilized soil zone using the previous dry soil/cement mixing process to form columns, the stabilisation works now being considered will need to be able to demonstrate and guarantee achievability of strength and permeability criteria as determined in the following sections of this specification.

2.2 General Constraints

2.2.1 Use of the Site

Local Authority planning conditions require that working hours are as follows: -

Monday to Friday	07.00 to 18.00
Saturday	07.00 to 18.00
Sundays and Bank Holidays	NO WORKING

Unless otherwise agreed by the Project Manager and Employer, these shall be the working hours. At least 3 days' notice is required if the Contractor wishes to apply to work outside of these hours and any intention to do so shall be indicated at the time of tender. No guarantee can be given to accept working outside of these hours.

The Contractor must give the Project Manager reasonable notice in the event that the Works are temporarily stopped for a period of more than one day due to plant breakdown, failure of Sub-Contractors to commence on the date or reasons other than weather. Where the Project Manager or CQA Engineer is delayed or remains on site without work progressing as a result of the Contractor failing to give notice to the CQA Engineer, the Contractor will be expected to compensate the Employer for that period of inactivity. The Contractor will give the Project Manager reasonable notice of the recommencement of the Works.

2.2.2 Access to the site

The principle access to the site for contractors plant and deliveries is a shared route with other site traffic and members of the public across the site weighbridge. As such the access is restricted to the times set out above without special contractor led contingencies in place.

Docksway Disposal Site is an operational landfill. At all times the needs of the Employer's plant and equipment will be given priority to any and all Contractor's activities, and the Contractor's rates are deemed to include for such.

The Contractor shall take all due care to avoid damage to surfaces or any area of the current landfill cells adjacent to the Works. Any damage caused by the Contractor or Subcontractors to surfaces or any area of current landfill cells adjacent to the works shall be reinstated by the Contractor at his own cost.

The Contractor will be required to instigate a traffic management system in conjunction with the Employer, to enable the free and safe movement of all vehicles and personnel on site. Contractors vehicles will be required to "give way" to all other traffic movements on site. In the interest of Health and Safety, and in minimising disruption to the landfills existing operations, a transport management plan, will have to be agreed in advance with NCC prior to undertaking any works.

Temporary haul ramps will be required in order to facilitate access to parts of the works areas. The Contractor will, following completion of the works, remove any ramps that are formed as part of the Works. Rates for the construction, maintenance and removal of ramps are deemed to be included within the earthwork's items. The Contractor is also deemed to have included for the maintenance of all haul roads required to facilitate the works. All access and site haul roads are subject to a speed limit of 10 miles per hour. This speed restriction shall not be exceeded and must be observed at all times.

There is an alternative access through Associated British Ports land adjacent to the site. Preliminary discussions are underway regarding its use. Should access be granted and the contractor prefer to use the route he should adhere to all the methodology, Safety requirements and any other associated conditions set out by ABP.

2.2.3 Noise and Vibration

All work shall be carried out without unreasonable noise and disturbance. The Contractor shall indemnify the Employer against any liability for damages on account of noise or any other disturbance created while or in carrying out the work and from and against all claim demands proceeding damages costs, charges and expenses whatsoever in regard or in relation to such liability.

Between the hours of 07:00 hours and 18:00 hours, the level of noise emitted as a result of any activity or operation at the site shall not exceed 55dB LAeq (1 hour) (Freefield) when measured at any noise sensitive property. Outside these hours the level of noise emitted as a result of any activity or operation at the site shall not exceed 42dB LAeq (1 hour) (Freefield) when measured at any noise sensitive property.

All plant must use white noise beepers. Any plant not fitted with functioning white noise beepers will not be allowed to work on site.

2.2.4 Parking

Provision for parking is at the north western portion of the site some 700m from the contracted working area. Parking outside this area will only be permitted after prior consent from the Project manager and at the contractors risk.

2.2.5 Storage and use of chemicals

Mass storage of fuels will not be permitted. Storage of chemicals must be stored in accordance with the associated COSHH information and the provisions outlined in HSE guidance HSG71 – Chemical Warehousing.

2.2.6 Site Specific Environmental Conditions and Control

The Contractor is deemed to have included in his prices for all plant, labour, materials and scheduling required, as well as compliance with the site Environmental Permit, discharge consents and pertinent Health and Safety legislation. Any requisite liaison or cooperation with either the Employer or the Project Manager is also deemed to be included. The site Environmental Permit, operational working plan and planning and discharge consent documentation are available for inspection at the Employer's site offices.

The Contractor shall ensure that the method of working or other on site activities or associated off site operations comply with the requirements of the Statutory Authorities, provisions for these requirements are deemed included within the Contract Tender Sum.

When weather conditions are such that the quality of the Works may be impaired or the conditions of the materials impaired then the Works will be stopped with the agreement of the Project Manager. Inclement weather may comprise high winds, rain, snow, freezing or excessive temperatures or a combination of the above.

For all works above and below ground level, due regard shall be taken of weather conditions, which may affect ground conditions. Where in the opinion of the Project Manager or his CQA Engineer such works, carried out in those weather conditions, have been adversely affected those works shall be removed and made good at the Contractor's expense.

Following adverse weather conditions, any standing water on the surface of the works shall be removed at the Contractor's expense. Earthworks placement operations following inclement weather conditions shall not proceed without prior approval of the Project Manager.

Procedures for environmental protection are specified below and are generally encompassed within the rules for safe working. Additional monitoring may be required by the Engineer and Employer to ensure that control measures are in place and that additional protection measures can be brought in where necessary.

The key area for protection is for the Contractor's personnel from potential landfill gas, dusts, waste materials and leachate, which will require monitoring to ensure that statutory safety exposure limits or nuisance levels are not exceeded.

The Contractor shall make provision within his tender for measures to appropriately mitigate risk posed by the measured landfill gas concentrations and provide a detailed risk assessment and emergency response plan relating to such. The Contractor shall be responsible for making any further provision within the tender determined necessary regarding other gas hazards (e.g. VOCs, H₂S etc.)

Contractors shall be mindful of the need to assess the risk of hot works operations, and arrange the works such that the method of working does not expose hot welding equipment or sparks to flammable or explosive gas concentrations.

2.2.7 *Surface Water and Groundwater Control.*

There are no specified requirements for groundwater lowering. The Contractor shall take all necessary measures (both temporary and permanent) to ensure that the presence or ingress of groundwater, infiltration water and the effects of weather does not compromise the integrity of stabilisation works.

The Contractor is deemed to have reviewed and taken into consideration the current surface water management arrangements on site and all restrictions in regard to pumping, discharge points, quantity and quality restrictions and associated environmental monitoring and protection. Failure to control groundwater and/or surface water, and any costs for remedial works associated with that failure, will be borne totally by the Contractor.

Prior to commencement of any pumping the contractor shall take samples of the waters. Each sample will be clearly dated and marked with the sample location and time. Such samples shall be tested by the Contractor for suspended solids, ammoniacal nitrogen and pH.

The Contractor shall ensure that all waters are monitored for the presence of any visible oils/petroleum surface sheen. On no account shall any waters with a visible screen be pumped from the works area without provision of written instruction on discharge location from the Project Manager and/or NCC.

Non potable water extraction for the purposes of the works shall be restricted to the areas designated in the northern lagoon, refer to Drg No JNA 2505 01

2.2.8 *Occupied premises and users*

All areas outside that designated as 'the site' are occupied by site operatives and delivery vehicles. As such the contractor shall restrict his operations within this curtilage and his movements outside this area in accordance with his agreed traffic management plan.

The site speed limit is restricted to 10mph.

2.2.9 *Security*

The Contractor is to provide and maintain any lights, guards and watching when and where necessary, as required by himself, the Project Manager or by any other competent statutory or other Authority, for the protection of personnel, the Works and construction plant associated with the Works, and for the safety and convenience of other parties on site, both during and outside normal working hours.

The Contractor must monitor all entries and exits into the site. No unauthorised person shall be allowed on site. The Contractor shall maintain at all times a register of site staff which shall be available for inspection on request by the Project Manager or Employer's site manager.

2.2.10 *Protection of existing structures and services*

There are no known public services in the immediate vicinity of the working area. However, there are several private landfill services (gas, leachate, telemetry, power, groundwater and surface water monitoring and extraction wells, pipes, cables and ducts, chambers, ditches and drains) in the vicinity of the working area. The Contractor shall be responsible for ensuring that appropriate investigations are undertaken prior to any excavation works. In the event of any damage to any services the Contractor shall contact the Site Manager immediately.

The supply of any services information to the Contractor does not absolve the Contractor from his responsibilities to ascertain more accurately the location of any service apparatus within the site using all reasonable care and attention.

The Contractor shall be held liable for all damage and interference to roads, bridges, drains, culverts, pipes, ditches, cables, lines, telegraph or electrical apparatus, lining materials synthetic or otherwise, boreholes and similar services whether at, above or below ground level caused by him or his sub-contractors, in the execution of the works whether or not the location of the damage is within the site boundaries. Should any damage be done, whether or not the location of the item is shown on the drawings, the Contractor must make good the same without delay and do any further work considered necessary by the Project Manager or the Owner of the damaged item all at his own cost or, in default of such action, pay the cost incurred by the Employer in undertaking remedial measures. The Contractor will be deemed to have included for this in determining his tender rates.

2.2.11 Cleanliness of Roads

The Contractor shall take such measures, in consultation with the Project Manager as are necessary to control the liberation of dust at any time especially during dry and/or windy periods. Works will be stopped if acceptable measures are not in place or being utilised. A Method Statement detailing the Contractor's dust control system method shall be provided no less than one week before commencement of the works.

At no time shall any mud or debris be deposited on the public highways or Employer's permanent access roads. The Contractor shall make the necessary arrangement to ensure that such highways and footpaths are maintained in a suitable condition. If mud is deposited on public highways or shared access routes, appropriate mitigation measures shall be taken. A road-sweeping vehicle shall be employed as necessary.

The Contractor shall for the duration of the works use the Employers wheel cleaning facility, for the vehicles exiting this facility that have entered onto the operational landfill or works areas.

The Contractor will ensure that any load being transported to or from the site which is capable of generating dust, ash, rubbish or other wind-blown material is sheeted in an appropriate manner.

2.2.12 Site Cleanliness

All superfluous soil, subsoil, rubble, and waste or any other material accumulated on the surface or disturbed by contracting activities must be correctly and tidily disposed of by the Contractor as they accumulate and at completion of the works. All storage and working areas are to be kept clean and tidy at all times. Any cost incurred in this respect will be borne by the Contractor.

Material stockpiles formed by the Contractor are to be left at all times in a condition to the complete satisfaction of the Project Manager, which shall include for the provision of bunding and drainage control. Material stockpiled for reuse shall be formed in such a manner that detrimental damage due to ingress of water or excessive drying out is minimised. Any material that becomes unsuitable will be removed and processed until in a suitable condition at the Contractor's own cost.

2.3 Contractors Design

2.3.1 Design Responsibility

The Contractor is to carry out the full design of the soil stabilisation works.

The works are to be undertaken where the existing sub base soils are too soft to support earthworks plant and machinery that will be needed to place and compact the proposed clay liner. The stabilisation works are therefore required to improve the nature of the very soft to soft sub-grade soils sufficiently to allow placement and compaction of the clay liner.

The stabilisation works must result in sufficient improvement of the sub-grade soils to support earth moving plant and equipment (as detailed in Section 2.3.5.4 Performance Specification) for the purposes of clay liner

construction. This can either be directly on the surface of a mass stabilised soil 'blanket' (if suitable) or on the surface of a load transfer blanket over stabilised columns or soil 'blanket' if necessary.

The stabilisation works are to be designed by the Contractor. It is however envisaged that the stabilisation works will include for a process of soil mixing using cement/PFA binder to improve the stiffness/shear strength of the very soft/soft alluvial clay to satisfy the performance criteria detailed within this specification.

The method of soil stabilisation/improvement shall be determined by the Contractor. However the process is envisaged to comprise soil mixing either as a dry process or a wet process. The dry process would include mixing the insitu soil with an appropriate binder applied in a dry (powder form). The wet process would include for forming a grout of the binder mixed with water, with this grout then being mixed with the insitu soil. The binder is envisaged to be a cement/PFA premixed binder with a ratio of cement/PFA of 70%/30% subject to Contractors own design.

The process of mixing binders with the insitu soils could be either a mass mixing process to form an improved layer (or mattress) of soil or by forming a series of improved columns on an appropriate grid (stabilised columns). It is anticipated that if a soil column system is proposed, this may require a suitable strengthened load transfer platform above the level of the columns to support construction plant and equipment, to enable the proposed clay liner to be constructed.

If the Contractor proposes a soil column system with load transfer platform, the Contractor shall be responsible for the design and construction of the load transfer platform in combination with the stabilised column system.

The Contractor shall be required to technically validate his proposed designs based on the laboratory testing undertaken by the Employer and by conduction of his own laboratory testing on the materials already provided by the Employer. Furthermore the contractor will be required to conduct onsite trials and take validation samples in accordance with table 2.7.2B before the work begins wholesale. It is intended that the contractor includes in his unit rate the cost of this trial and the associated down time.

2.3.2 Design Submission Procedure

All working drawings or other drawings prepared by as part of the Contractor's design shall be produced and submitted along with the tender returns. They should be in digital form in such a way as to enable them to be opened, read and edited in AutoCAD (2013) .dwg format together with accompanying paper copies.

The contractors design will be considered separately to the scoring of the Financial and Quality aspect of the tender. The scoring process will only be undertaken once the submission is deemed technically valid.

The Contractor shall prepare and submit Contractor's Design Documents and Construction & Working drawings to the Project Manager in sufficient time to allow any comments of the Project Manager and where appropriate, the Employer's advisors, in accordance with the following submission procedure:

Within 14 days from the date of receipt of any Contractor's Submission Documents, or later where stated, the Project Manager will designate the submission 'A', 'B', 'C' or 'R' defined as follows

Designation 'A': The Project Manager accepts the proposals contained in the submission. As such the proposals may be regarded as technically valid and can be considered within the tender process. If awarded the contract the Contractor may proceed with the Works in accordance with that submission and as described in the works information. Acceptance of a submission by the Project Manager does not relieve the Contractor of his duties and obligations under the Contract

Designation 'B': The Project Manager accepts the proposals contained in the submission subject to any conditions or comments made at the time. As such the proposals may be regarded as technically valid and

can be considered within the tender process. If awarded the contract the Contractor may proceed with the Works in accordance with that submission, any conditions set and as described in the works information. Conditional acceptance of a submission by the Project Manager does not relieve the Contractor of his duties and obligations under the Contract

Designation 'C': The Project Manager does not accept the proposals contained in the submission document and provides his comments. The Contractor shall take due account of the Project Manager comments and shall either resubmit the proposals in an amended form for further comment and acceptance or notify the Project Manager of his intended course of action. Only after successful resubmission can the proposals be regarded as technically valid and be considered in the tender process.

Designation 'R': The Project Manager receives the information contained in the submission 'for record purposes only' and issues his comments to the contractor within 3 working days.

If the Contractor disagrees with a comment of the Project Manager and considers that the submission in question is in accordance with the contract and the works information, he shall within 3 working days of receipt of the comment notify the Project Manager.

If the Contractor considers that compliance with the comment would give rise to a change to the works information and a compensation event, he shall within 3 working days of receipt of the comment notify the Project Manager setting out his reasons. Upon receipt of such a notification the Project Manager shall within 3 working days either confirm or withdraw the comment and take further action according to the provisions of the Contract

2.3.3 Design approvals from others

The Project Manager will defer the analysis of the contractors design to his specialist consulting Engineers. The Consulting Engineers are Peter Bret Associates.

2.3.4 Survey

The levels shown on the various drawings relate to Ordnance Datum unless otherwise stated.

The Contractor will be given a suitable ordnance or temporary bench mark on or near the site to which all levels shall be referred. As soon as the Contractor takes possession of the site, bench marks must be established at a ratio of one per hectare area of the site. Levels will be agreed with the Project Manager and a list supplied to him.

The survey of original ground levels shown on the contract drawings should be regarded as indicative only. The site is an operational landfill, and variations to levels can occur at any time. The Contractor should verify for himself the accuracy of all survey data.

Prior to the commencement of any works on site the Contractor is required to undertake a coordinate level survey of the entire works area to an area extent such that all the works are covered. The Project Manager will verify and approve this survey (for measurement purposes only). Further coordinated level surveys are required at various stages throughout the Works to verify setting out, and to be utilized for measurement purposes.

All survey shall comply with the following specification:

A 10 m grid (to define the formation surface);

Strings on break in slope, toe and crest of slope at 10m intervals (to define the formation surface boundaries);

Vertical accuracy + / - 10mm; and

Horizontal accuracy + / - 100mm.

The Contractor shall provide an accurate method of checking and recording the final depth/thickness of the stabilized zone (columns/mattress). Such information shall be coordinated in order that an as-built survey drawing can be developed on completion of the works. Where possible, surveys should be undertaken on a consistent 10m grid basis such that overlying points can be cross referenced.

Draft surveys should be submitted to the Project Manager within 3 working days of undertaking each survey. Final surveys shall be provided within 7 working days of completion of the associated activity. Proceeding with installation of any overlying layer/load transfer blanket prior to confirmation that the depth/thickness of the stabilized zone has been attained as calculated by survey, is at the Contractor's own risk. Any delays occurring as a result of failure to provide information will be entirely at the Contractor's risk.

The Contractor shall present survey information to the Project Manager in a DWG format suitable for use in AutoCAD Civils 3D 2010. It shall be presented such that it will be acceptable as an As-Built Drawing.

2.3.5 Employers Requirements

2.3.5.1 Compliance with the Specification

All workmanship and materials shall be supplied and installed strictly in accordance with the Clauses of this Specification. Should the Contractor wish to deviate from this Specification in any way, he shall agree such variations with the Project Manager in writing in advance. The Contractor should raise any queries regarding this Specification during the tendering period. Any claims resulting from a failure to comply with this Specification or to seek clarification during the tender period will be deemed to be invalid. Should there be any conflict between this Specification and any other contractual document the Project Manager's decision will be final with respect to determining precedence.

All documents referred to or implied in this Specification shall be those current at the time of Tender, including all the latest amendments.

All work at, below, or above ground level shall be in accordance with all relevant British Standards and other relevant guidance documents, particularly with the following and any other documents noted therein, except the requirements of this Specification, which shall be applied wherever they are at variance with the British Standards. Should there be any discrepancy with this specification or any of the above documents the Project Manager's decision shall be sought in writing. Such a decision shall be final and absolute.

BS EN 14679:2005 Execution of Special Geotechnical Works, Deep Soil Mixing.

Euro Soil Stab: Development of Design and Construction Methods to Stabilise Soft Organic Soils: Design Guide, Soft Soil Stabilisation: CT 97 – 035.

BS6031: Code of Practice for Earthworks.

Manual of Contract Documents for Highway Works Volume 1: Specification for Highway Works Consolidated Edition 1994 and subsequent amendments, Highways Agency (Hereafter referred to as the 'SHW').

EPA 1990: Environmental Protection Act including the Section 34 Duty of Care requirements.

EA 1995: Environment Act.

Relevant Health and Safety Executive Guidance Notes in particular HS(G)66.

The works will be carried out generally in accordance with the above, and any supporting Notes for Guidance and subject to the additional clauses given below. In so far as any of the additional clauses conflict or be inconsistent with the above documents then the additional clauses below shall prevail. In any event of ambiguity the Project Manager's decision will be final.

2.3.5.2 Accuracy of Information.

The appendices accompanying this document should be read in conjunction with the Specification.

The Contractor shall be deemed to have examined all relevant available drawings, documents and schedules etc., prior to submitting the tender and commencing work and to have satisfied himself as to the accuracy of the information.

The Tender price submitted in respect of this contract shall be deemed to allow for any and all site conditions existing or arising during the course of the Works. The Contractor shall visit the site (by arrangement) before submitting his Tender and acquaint himself with all matters that may affect the Works. Any claims arising from a failure to visit the site and assess the site conditions will be disregarded.

All discrepancies will be reported to the Engineer who will issue the necessary instructions. Such discrepancies will be reported within seven days of receipt of drawings and documents and shall be clarified in writing.

2.3.5.3 Plant and Equipment

The Contractor shall use plant of suitable and appropriate capacity to carry out the work in accordance with the Specification. Each item of plant will be maintained and operated in a safe manner. No claim will be entertained for mechanical breakdown, theft, vandalism or punctures.

It is strongly recommended that the Contractor considers the potential safety hazards of his proposed works and adapts plant and vehicles accordingly.

Fuel tanks and drums used by the Contractor will be stored at a location approved by the Project Manager. All such tanks and drums will be bunded in a containment bund capable of containing 110% of the total quantity of fuel present at any one time. The containment bund will have an impermeable base and sides. All fuel spillage's within and outside the bund will be remediated in a safe and controlled manner by the Contractor. Empty oil and grease containers shall be stored in a bunded area or lockable container and shall be disposed of properly.

All plant utilised on site is to be fitted with white noise beepers and a reversing audible alarm. Plant not fitted with such safety devices will not be permitted to work on site until such equipment is fitted. Walk by checks and maintenance records of vehicles shall be made weekly in line with the Employers Requirements.

2.3.5.4 Performance Specification

The surface of the stabilised/improved soil shall be designed to support earth moving plant and clay liner loading without excessive deviation of the surface or excessive rutting. Deviation of the surface should not exceed 150mm in 3m and surface rutting should not exceed 75mm. If soil/cement columns are used the above limits will be for the top of any load transfer platform that is formed above the columns.

- **The stabilised/improved sub-grade soils should have an improved shear strength of at least 50kN/m² and shall demonstrate non-brittle characteristics with a maximum shear strength of 150kN/m².**
- **The stabilised/improved sub-grade soils should have a CBR value of at least 15% based on use of a minimum 450mm diameter plate bearing test after a period of 5 days (120 hours). If a**

soil/cement column system is adopted, the upper surface of any load transfer platform over the columns should have a CBR value of at least 15%.

- **The stabilized / improved soil shall have maximum permeability of 1×10^{-9} m/s**

2.3.5.5 Soil Mix Trials

Preliminary laboratory testing has been undertaken on a range of different soil/binder mixes. The results of this testing together with a summary report on these trials is presented in Appendix A of this Works Information.

The Contractor is to undertake field trials in order to confirm any design assumptions and that the requirements of the soil stabilisation can be achieved by the methods proposed by the Contractor. These field trials will be used to establish critical control values using the same equipment, materials, techniques and procedures as will be used in the execution of the main works.

The field trials shall include for determining:

- Penetration and retrieval speed of mixing tool.
- Rotation speed of mixing tool
- Air pressure (in case of dry mix)
- Feed rate of binder/slurry
- Minimum shear strength achieved in accordance with the Performance Specification.
- Maximum permeability achieved in accordance with the Performance Specification.

The Contractor may also wish to undertake further laboratory testing to enable him to determine the best method of achieving the design requirements.

The results of all field trials and any further laboratory testing shall be made available to the Engineer prior to commencement of the main works. The contractor is required to include the associated costs and standing down time in his unit rate for treatment.

2.3.5.6 Limiting Values for Pollution of Controlled Waters

All Granular fill materials incorporated in the works shall be tested to ensure the concentrations of potential contaminants are below the guideline values for inert waste given by:

- (a) DEFRA (2004). The Landfill (England and Wales) (Amendment) Regulations 2004. Statutory Instrument 2004 No 1375. Department of the Environment, Food and Rural Affairs, London.

Sampling and testing shall be carried out in accordance with the Landfill (England and Wales) (Amendment) Regulations 2004 and / or Clauses 15 and 16 of the Landfill (England and Wales) (Amendment) Regulations 2005, that later version taking precedence where appropriate.

The frequency of acceptability testing shall be in accordance to Section 2.7.3

No material exceeding these limits shall be incorporated into the works.

2.3.5.7 *Limiting Values for Harm To Human Health and the Environment.*

All earthworks materials imported into the site should be designated as chemically inert. The Contractor is responsible for all validation of such and should provide the Project manager with all test certification prior to importation

All imported fill materials shall be tested to ensure the concentrations of potential contaminants are below the limiting values relevant for a residential development (with plant uptake end use) given by:

- (a) EA (2009) Soil Guideline Value Reports. CLEA website. <http://www.environmentagency.gov.uk/research/planning/33714.aspx> Environment Agency, Bristol.
- (b) CEIH (2009) The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment (2nd Edition). The Chartered Institute of Environmental Health, Nottingham.

The frequency of acceptability testing shall be according to Section 2.7.3

No material exceeding these limits shall be incorporated into the works.

1. EA (2009c) Human health toxicological assessment of contaminants in soil. Science Report SC050021/SR2. Environment Agency, Bristol.
2. LQM & CIEH (2009) The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment (2nd Edition). Land Quality Press, Nottingham. ISBN 0-9547474-7-X.

2.3.5.8 *Records and As-Built Information*

The Contractor will be required to keep a detailed daily journal recording all plant and labour present, quantities of materials delivered and placed, dimensions and locations of materials placed, weather conditions, details of meetings and details of testing results, remedial works and any other relevant information in a form to be approved by the Project Manager. The Contractor will give the Project Manager reasonable access to the daily journal which will, if necessary, be made available to the Project Manager, Environment Agency or any other Authority during and after completion of the Works.

Records of geosynthetic materials, pipework and soils placement shall show the extent of works, panel layout, location and details of samples taken, and location and details of failures/corrective actions. In relation to the capping works, all temporary capping shall be recorded in full, in accordance with the requirements for the permanent capping works.

The Contractor is required to submit a written monthly statement. The statements shall be based upon the Bill of Quantities. Items not described in the Bill of Quantities but appropriate for inclusion as measured work, shall be shown at the end of the relevant section or under new section headings if appropriate indicating quantity, unit rate and value. In respect of all other matters referred to in the Contract, the Contractor shall separately show in the statement quantities, units and rates of goods and / or materials and also details of any other matters to which he considers himself entitled. New items raised in the statement during the course of the Contract shall be given a unique reference which shall be reserved for this item for the duration of the Contract.

2.4 Completion

The works will be deemed complete on total stabilisation of the defined area to the specified standard and removal of any temporary works onsite discounting that which the Project Manager has approved to remain. The employer is

There is no sectional completion associated with this contract.

2.5 Programme.

The contractor shall request a programme from his subcontractor with his tender return. Further to the requirements of ECC clause 31.2, the start date shall be within the month of August 2014. The time allocated to complete the work is subject to the individual sub-contractors methodology and consequently will be scored in the quality evaluation criteria in the tender assessment.

2.6 Quality Assurance

All works will be subject to the construction quality assurance regime set out in Appendix B. This will report the results of all tests carried out in accordance with section 2.7 below and detail the progress and any design changes that may arise.

2.7 Tests and Inspections

2.7.1 General

The Contractor is to provide daily records of all the stabilisation works including accurate information on the depth of soil mixing and weight of cement/m³ added and locations of any testing undertaken.

For all material tests a UKAS test report or certificate is required unless specifically agreed with the Project Manager.

Unless otherwise shown in this Specification tests and test certificates for work, goods or materials as scheduled under any one Clause are required for all such work, goods or materials in the Works

All samples/tests shall be given a site reference number (not the laboratory reference number) that enables ease of reference and location. Such reference should include location and depth/elevation as a minimum. Color photographs shall be taken of each sample/test location showing all necessary details of the location and material being sampled / tested. Artificial (flash) lighting shall be used for each photograph. Each photograph shall contain a graduated scale together with a reference board identifying the project and the sample/test number, a standard color chart and a monochrome step wedge.

Preliminary records of all test results shall be provided within 48 hours of completion of the test. On completion of the works, a Validation Report shall be prepared by the Contractor presenting a record of the works carried out, full records of all soil mixing including dose rates and areas of treatment. On completion of the works a Validation Report shall be presented in a single document together with a copy of the report in pdf format on CD, and digital data in AGS format.

A nuclear density gauge shall not be used for the any testing or checks although one may be used by the Contractor for an indication of density and moisture content during the works for his own purposes.

The unconfined shear strength of cores from the stabilised/improved soil shall be determined at 5 days, further tests at 7 days and 10 days at a frequency of at least 1 set of strength determinations per every 500m² of treated subgrade may be required. The uniaxial testing shall be undertaken at 5 days after treatment.

For the stabilized soils 100mm diameter cores shall be taken from the stabilized material for Triaxial Permeability Testing undertaken at a frequency of 1 test per 500m². The locations shall be directed by the

CQA Engineer and shall be taken from a variety of layers throughout the construction of the works. The stabilized material shall be deemed suitable if all cores tested exhibit a coefficient of permeability, k , of not greater than of 1×10^{-9} m/s. The testing laboratory shall have UKAS accreditation for the appropriate sampling and test method. The permeability testing shall be determined using the hydraulic triaxial cell method in accordance with BS 1377: Part 6: Clause 6. Saturation shall be achieved by increments of cell pressure and back pressure with cell pressures not exceeding a maximum of 100kN/m².

Two cores shall be taken from each test location. One core shall be tested for permeability, and the other retained until all test results are available. Should there be any untoward discrepancy in test results, then the retained sample shall be tested. Cores shall be stored by the laboratory for at least 10 days after issue of the associated test certificate.

The depth of soil mixing shall be such to ensure that at least 2m of natural alluvial soil remains beneath the base level of the stabilised/improved soil system. The Contractor shall undertake such investigations to demonstrate that such sufficient depth of material remains upon completion of the works and shall undertake any such investigations on a frequency of one test location every 625m² (i.e. a 25m grid). Any intrusive investigations shall be backfilled with a bentonite cement grout to ensure that the natural permeability of the underlying soils is not compromised.

2.7.2 Requirements for Acceptability and Testing of Stabilised / Treated Soils

The following requirements are to be read in conjunction with the specific testing detailed in Section 2.7.1 above.

Acceptable limits and criteria for the Stabilised/Treated Soils are detailed on Table 2.7.2(a) and 2.7.2(b) below. The Contractor is responsible for appropriate sampling and testing, and determine the acceptability of the works based on the specified limits and criteria.

Samples for classification and acceptability testing shall be at a frequency as detailed in Section 2.7.1 above and location of samples are to be agreed in advance with the Project Manager.

The Contractor is to submit a Quality Control Method Statement for approval by the Project Manager not less than 10 working days prior to the start of Stabilisation works.

The Contractor is responsible for ensuring all statutory and regulatory requirements for the receipt and use of all materials either excavated from the site or imported onto the site are observed. The Contractor is responsible for ensuring a record of each load delivered and accepted is kept giving: (i) date, (ii) nature and quality, (iii) place of origin, (iv) quantity by weight/volume, (v) carrier, (vi) supplier.

Table 2.7.2(a)

Frequency of testing

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
SHW SERIES 600 EARTHWORKS					
630, 633 & 640	Soil Mixing	Hand Shear Vane	1 per 200m ² within the upper 0.5m of the treated soil	Required	Tests to be undertaken at 2 days and 5 days after mixing
		Undrained Shear Strength on Core	1 per 500m ² with cores taken from various depths of the treated soil	Required	Quick undrained triaxial cores to be taken at 5 days after mixing
		Permeability	On cores recovered from treated soil at a frequency of 1 per 500m ² with cores taken from various depths of the treated soil	Required	By triaxial method cores to be taken 7 days after mixing
		CBR	1 per 500m ²	Required	Plate Bearing Test across the finished treated area at a minimum of 5 days after completion of soil mixing
Note: UKAS accredited tests and test certification should be assumed to be required in all cases unless such accreditation is unavailable for a particular test, or agreement is otherwise reached with the Engineer that accreditation is not required.					

Table 2.7.2(b) Material Properties Required for Acceptability

General Material Description	Material Properties Required for Acceptability				Comments
	Property (See exceptions in previous column)	Defined and Tested in Accordance with:	Acceptable Limits within		
			Lower	Upper	
Stabilised Clay	(i) Direct Shear Strength by Hand Shear Vane	BS 1377: Part 7	50kN/m ²	150kN/m ²	The Stabilised/Treated Clay will remain plastic after treatment and the testing shall demonstrate that failure during shear strength testing is a ductile plastic type failure (none brittle) . The plate size for the plate bearing tests shall be a min 450mm diameter.
	(ii) Quick Undrained Triaxial Shear Strength on Core Sample	BS 1377: Part 7	50kN/m ²	150kN/m ²	
	(iii) Permeability in Triaxial Cell on Core Sample	BS 1377: Part 6	-	1 x 10 ⁻⁹ m/s	
	(iv) CBR	Plate Bearing Test	15%	-	
	(v) Thickness of underlying natural soils	Contractor to determine and agree with Project Manager	2m	-	

2.7.3 Requirements for Acceptability and Testing of imported Granular materials

All imported materials for the purposes of constructing a load transfer blanket (if proposed) shall be tested to ensure the concentrations of potential contaminants are below the guideline values for INERT waste given by:

- DEFRA (2005) The Landfill (England and Wales) (Amendment) Regulations 2005. Statutory Instrument 2005 No 1640. Department of the Environment, Food and Rural Affairs, London.

No material exceeding these limits shall be incorporated into the works.

Test frequency shall be one test per 500m³ or each source whichever is the greater.

2.8 Management of the Works

2.8.1 Definitions and Duties

In the context of this document the following definitions shall apply:

Employer – means the person or persons, firm, company, subsidiaries, or other body who own and have responsibility for the facility. For the purpose of this document the Employer is Newport City Council Limited (NCC). The Employer has entered into a contract with the Contractor for the execution of the Works specified in the Specification and Contract Drawings.

Contractor – means the person or persons, firm, company or other body to whom the Contract has been awarded by the Employer, and includes the Contractor's personal representatives or other parties, e.g. Installation Sub-Contractors and Manufacturer. The Contractor will undertake the execution of the Works under the terms of the Contract. This includes duties as the Principal Contractor under the CDM regulations.

Project Manager – means the person, firm or company appointed by the Employer to act on his behalf for the proper execution of the Works. For the purpose of this document the Project Manager is Newport City Council (NCC)

CQA Engineer – means the person, firm or company appointed by the Employer to act on his behalf for the proper execution of the Works. For the purpose of this document the CQA Engineer is PBA.

CDM Coordinator – means the person, firm or company appointed by the Employer to act as CDM Coordinator for the Works. For the purpose of this document the CDM Coordinator is NCC.

2.8.2 Responsibilities

No approval, nor acceptance, shall relieve the Contractor of his responsibilities under the contract for the design of any of the works, excavations; support thereof; the quality of materials or standard of workmanship in the works.

The presence of the Project Manager or Supervisor, shall not absolve the Contractor of his responsibilities under the Contract.

2.8.3 Supervision

The Contractor is to provide a competent Agent, General Foreman and Gangers as necessary and to provide all necessary supervision to produce workmanship to the complete satisfaction of the Project Manager. The Contractor must also provide adequate engineering staff to ensure accurate setting out, construction and

quality control. Curriculum Vitae of all key personnel shall be required for inspection by the Project Manager prior to works commencement.

The Contractor shall give or provide all necessary superintendence during the execution of the Works and as long thereafter as the CQA Engineer may consider necessary. Such superintendence shall be given by an experienced person having adequate knowledge of the operations to be carried out (including the methods and techniques required, the hazards likely to be encountered and the methods of preventing accidents) as may be requisite for the satisfactory construction of the Works. The Contractor must also provide adequate engineering staff to ensure accurate setting out, construction and quality control.

2.8.4 *Communication*

All communications shall be directed through the Project Manager and the Contractors Representative. The form of communication shall be in writing in a format to be agreed during the pre-contract meeting.

2.9 Working with the Employer

2.9.1 *Sharing the working Area*

The contractor is not required to share the working area with the Employer. The designated access routes are shared however and the contractor is expected to submit a traffic management plan in accordance with the requirements outlined in section 2.2.2 and 2.11

2.9.2 *Cooperation and Coordination*

Prior to the construction of the works, the Project Manager will call a Pre-Construction Meeting, to be held on Site. The meeting will be attended by senior Contractor's staff, including the Site Agent and General Foreman. Also present will be representatives of any specialist Subcontractors, and the Employer.

The purpose of the meeting is to familiarise all parties with the requirements for Construction Quality Assurance, responsibilities, and lines of communication. Specific requirements from this meeting are to:

- Review the responsibilities of each party;
- Review the project specifications;
- Establish lines of communication;
- Confirm methods for documentation and reporting;
- Review the design
- Review the site safety plan;
- Review working methods with respect to materials handling;
- Review construction and materials installation methods; and
- Review testing methods.

Progress meetings shall be held between the Employer, the Project Manager, and the Contractor at intervals determined by the Project Manager. The Contractor shall be represented at a senior level, including the Site Agent and General Foreman.

2.10 Services to be provided

2.10.1 By the Contractor

2.10.1.1 Temporary Services and Welfare Facilities

The Employer will not provide facilities for the use of the Contractor. The Contractor shall make all arrangements for all necessary welfare requirements, including first aid, mess rooms and cleaning/changing facilities that he deems necessary for his or his Sub-Contractor's operatives.

All buildings, sheds and other temporary structures that the Contractor may erect for his own or the Project Manager's purpose shall in respect of location, design and sanitary arrangements meet with the approval of the Project Manager. Any welfare facilities are nevertheless to comply with the requirements of the Workplace (health safety and welfare Regulations 1992), where applicable.

Immediately on completion of the Works, or at such other times as the Project Manager may determine that they are no longer required, all temporary buildings, offices, sheds, huts, stores and other accommodations put up by the Contractor shall be removed by him.

The Contractor's rates should allow for all mobilisation, set up maintenance and demobilization, including for any reinstatement works necessary to return the areas to their original condition to the satisfaction of the Project Manager.

2.10.1.2 Facilities for the Project Manager and CQA Engineer

The Contractor shall provide and maintain within the Contractor's area separate temporary site office accommodation for the use of the Project Manager and his staff having not less than 15m² floor area and including controllable ventilation, adequate lighting and windows. The external door shall be fitted with a mortice lock and three keys shall be provided. The Contractor will maintain all facilities provided for the Project Manager for the duration of the Works. The Contractor shall be wholly responsible for on-site security and protection of all equipment supplied for the use of the Project Manager.

The following furniture and equipment shall be provided in new or approved condition for the Project Manager's office within one week of commencement of the Works:

2 no. desks with lockable drawers;

no. stacking chairs;

1 no. drawing rack/cabinet;

1 no. steel filing cabinet with four locking drawers;

2 no. 5.0m steel tape measures;

1 no. 50m fibre tape measure;

1 no. metric measuring wheel;

cans line marker spray paint - colour white;

cans line marker spray paint - colour red; and

1 no. First Aid Kit;

The Contractor shall make available on site at all times for use by the Project Manager and his staff such surveying equipment and resources which may be required for checking the accuracy of the Works. The Contractor shall maintain all the survey equipment in the condition required for accurate working and in the event of damage or loss of accuracy shall immediately provide a satisfactory replacement. The Contractor shall provide all necessary assistance to the Project Manager and his staff in carrying out their duties including the services of competent chainmen to be available as and when reasonably required.

2.10.1.3 Security

The Contractor is to provide and maintain any lights, guards and watching when and where necessary, as required by himself, the Project Manager or by any other competent statutory or other Authority, for the protection of personnel, the Works and construction plant associated with the Works, and for the safety and convenience of other parties on site, both during and outside normal working hours.

The Contractor must monitor all entries and exits into the site. No unauthorised person shall be allowed on site. The Contractor shall maintain at all times a register of site staff which shall be available for inspection on request by the Project Manager or Employer's site manager.

2.11 Health and Safety

The Contractor shall be responsible for ensuring that all his operations and activities whether on or off site, are carried out in full compliance with the appropriate health and safety legislation, at current amendments, and with the appropriate guidance documents and approved Codes of Practice published by the HSE. Relevant guidance includes, but is by no means limited to the following:

- The Health and Safety at Work Act 1974;
- Management of Health and Safety at Work Regulations 1992;
- The Manual Handling Operations 1992;
- The Provision and Use of Work Equipment Regulations 1998;
- The Personal Protective Equipment at Work Regulations 1992;
- The Workplace (Health, Safety and Welfare) Regulations 1992;
- The Construction (Design and Management) Regulations 2007;
- The Health and Safety (Consultation with Employees) Regulations 1996;
- RIDDOR 1995; and,
- COSHH Regulations.

Notwithstanding the requirements of the pre contract information the contractor shall ensure the following method statements are included in the tender return.

- Onsite vehicular movement
- Mixing operations on unstable ground
- Water sourcing

The Contractor shall ensure that any incomplete or temporary works are covered and secure at the end of every working day. The potential for vandalism and theft are present at the site.

The Contractor shall not undertake any operations that contravene or conflict with the Environmental Permit for the site, the planning permission conditions or the safety policies of the Employer. The above permit, permissions and documentation's can be made available on request for inspection at the offices of the Employer.

2.12 Subcontracting

2.12.1 Restrictions

The stabilisation sub contract shall be made from the providers listed in Appendix E. The list has been drafted following a speculative notice published on the 'Sell to Wales' website and subsequent interviews and bespoke testing regimes to determine their technical suitability as providers.

2.12.2 Acceptance Procedures

The sub contract award criteria shall be based on 70% Price 30% Quality. The scoring criteria shall be as outlined in Appendix F. The Award process will only be conducted after the validation of the Sub contract Design as set out in section 2.3.2.

2.12.3 Submission Procedures

The contractor shall appoint his subcontractors using the nec 3 short subcontract. The Tendering period should be 3 wks and should be returned by the date set out in the instructions for tendering to the following address:

Jim Davies Civil Engineering
Ty Gwyn
Banalog Tce
Hollybush
Blackwood
South Wales
NP12 OSG

2.13 Delay Damages

Delay Damages for completion of the work are £1500 per week. This is based on extra supervision, CQA, and specialist consulting Engineers costs.

2.14 Performance Bond

A performance bond is required. The amount of the performance bond shall be 10% of the tender sum. The form of this bond will be as set out in Appendix D

2.15 Employers requirements

2.15.1 Drawings

A list of contract Drawings are as identified in Appendix H

2.15.2 Specifications

The Specification is as set out previously in section 2.2 and 2.3

2.15.3 Bill of Quantities

The Bill of Quantities is as set out in Appendix G

3 Site Information

The site information provided in the Term Contract, Contract Data relates to the whole of Docksway waste disposal site. This section provides supplemental data that is required for the appointment of sub-contractors.

3.1 Background

- 3.1.1 The Docksway Disposal Site is located approximately 2km south of Newport Town Centre between the River Ebbw and Newport Docks. The site location is at approximate National Grid Reference ST 305 853 as shown on Figure 1. The total site area is approximately 60 hectares and is situated just to the south of the A48 Docks Way. The River Ebbw forms the boundary on the south and west side of the site with Newport Docks adjacent to the eastern boundary of the site. The River Ebbw flows from north to south and joins the River Usk approximately 1km to the south of the site.
- 3.1.2 The site comprises two main landfill development areas, Phase 1 to the north and Phase 2 to the south), as shown on Figure 2.
- 3.1.3 A Civic Amenity area, the site weighbridge, and other associated facilities are located to the west of the Phase 1 area. The Phase1 landfill area is a capped and partially restored “dilute and disperse” landfill that is in the process of being formally closed.
- 3.1.4 The southern Phase 2 area of the site comprises land reclaimed in 1990 following a diversion of the River Ebbw and is currently partly developed as engineered containment landfill cells (Cells 1 and 2), and partly undeveloped land proposed for development as engineered containment landfill (Cells 3 and 4). The cell layout in Area 2 is shown on Figure 2.
- 3.1.5 Cells 1 and 2 in Phase 2 of the landfill have previously been developed and engineered as containment cells. As part of the development and engineering of Cells 1 and 2, the natural very soft alluvial soils present beneath the site were stabilized to improve the strength sufficiently to facilitate the construction of the engineered barrier system. It is therefore proposed to stabilize the very soft alluvial soils beneath the next engineered containment cell (Cell 3), and this document present the performance specification required from the stabilized material.

3.2 Topography

- 3.2.1 Docksway Disposal site is located on the alluvial plain of the River Severn Estuary. Prior to all filling activities, the site would have had a low-lying relief cut into by various meanders of the River Ebbw. As a result of landfilling activities, current ground surface levels in Phase 1 now lie between approximately 15m AOD and 40m AOD.
- 3.2.2 The northwestern part of Phase 2 has also been raised using waste materials, following preparatory earthworks and engineering of the basal area. In other remaining locations within Phase 2, the alluvial clay has in part already been excavated for use in the engineering and restoration of Phase 1 (The materials being utilised as temporary daily cover material for example) and this has reduced the ground level across some parts of Phase 2. The edge of Phase 2 adjacent to the River Ebbw has also been raised for flood protection. Topographic lows are however typically present where the River

Ebbw formerly meandered through Phase 2 (see Figure 3 for the location of the former River Ebbw meander).

- 3.2.3 The ground level within the remaining undeveloped areas of Phase 2 now typically vary between approximately 3.5m AOD and 6.5m AOD with the floor of the former oxbow lake/river meander generally at approximately 2.5m AOD.

3.3 Published Geology

- 3.3.1 The geology of the site area as shown on the British Geological Survey (BGS, 1969/1986) map of the area (Newport, Sheet 249) indicates the site to be covered by Marine Beach or Tidal Flat Deposits overlying Alluvium and Mercia Mudstone.
- 3.3.3 Marine Beach Deposits predominately comprise sands and gravels and the Alluvium consists mainly of alluvial mud, silts and sands with a little gravel (BGS, 1948).
- 3.3.4 The Mercia Mudstone bedrock comprises red, brownish red or purplish red mudstone or silty mudstone. Locally the Mercia Mudstone contains thin bands of calcisiltite, fine calcarenite and siltstone.
- 3.3.5 Made Ground is present overlying the natural superficial deposits over some of the site. Due to the extent of various activities at the site such as bank raising, land reclamation, bund, roadway and dam construction and landfilling activity in the area and the natural local topography, the thicknesses of each of these strata vary significantly across different parts of the site.

3.4 Ground Conditions

- 3.4.1 The published geology indicates that the site is underlain by alluvial clays, which overlie gravels which in turn rest on the Mercia Mudstone. Various phases of ground investigation have been undertaken at the site these have been reviewed and are available in the Engineers offices for inspection. The alluvial clays generally comprise grey, grey-brown or grey-black organic-rich clays or clay-silts with traces of peat. They are generally firm to stiff with a desiccated 'crust' for the upper 1m to 2m of the strata. Below this depth they are soft and very soft. However in the former channel of the River Ebbw meander and some other areas there is no desiccated crust and very soft clays are present at the existing ground surface.
- 3.4.2 The thickness of the Alluvial Clay varies considerably beneath Phase 2. It ranges between approximately 5.5m in the west and 8.0 to 10.0m in the east with thinning to a minimum of 2.0m observed below the former river channel. The Gravel Deposits beneath Phase 2 vary in thickness between approximately 3.8m at the western end and 8.9m at the eastern boundary of the site.
- 3.4.3 The base of the Alluvial Clay/top of the Gravels generally lies between approximately -0.6m OD and -3.0m OD. The base of the gravel horizon/top of the Mercia Mudstone Group is present at between about -5.00m OD and -11.00m OD. The boundary undulates somewhat but in general it deepens towards the east as the Alluvial Clays and Gravel Deposits above thicken.
- 3.4.4 Sub-artesian groundwater is present in the gravels and generally has a piezometric surface at a level of between +0.5m AOD and +4.15m AOD. Water levels within the River Gravels generally remain at a level below 3m AOD. It has however been recorded in the boreholes around the perimeter of the site adjacent to the River Ebbw that during tide cycles water levels within the monitoring standpipes do vary and have reached about 4m AOD on a spring tide.

APPENDIX – A

Soil Mix Laboratory Results



2788

Laboratory Report



GEO Site & Testing Services Ltd

Contract Number: 20915

Client's Reference: **TBC**Report Date: **29-01-2014**

Client **Peter Brett Associates**
Lakeside House,
Blackbrook Business Park,
Blackbrook Park Avenue,
Taunton
TA1 2PX

Contract Title: **Docksway Landfill Site**
 For the attention of: **Laurence Tomlin**

Date Received: **27-09-2013**
 Date Commenced: **27-09-2013**
 Date Completed: **29-01-2014**

Test Description	Qty
Moisture Content 1377 : 1990 Part 2 : 3.2 - UKAS *	34.0
1 Point Liquid & Plastic Limit 1377 : 1990 Part 2 : 4.4 & 5.3 - UKAS *	34.0
Hand Vane Remould	90.0
Density by Linear Measurement 1377 : 1990 Part 2 : 7.2	4.0
Determination of Permeability in a triaxial cell BS1377 Part 6 :1990 Clause 6 - UKAS *	4.0
Additional days for 4.02 - UKAS *	16.0

Notes: Observations and Interpretations are outside the UKAS Accreditation

* - denotes test included in laboratory scope of accreditation

- denotes test carried out by approved contractor

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Approved Signatories:

Alex Wynn (Associate Director) - Benjamin Sharp (Contracts Manager) - Emma Williams (Office Manager)
 Paul Evans (Quality/Technical Manager) - Vaughan Edwards (Managing Director)



2788

Laboratory Report



GEO Site & Testing Services Ltd

Contract Number: 20915

Test Description	Qty
Quick Undrained Triaxial Compression Test - Multi-stage Loading of a single specimen (100mm diameter) 1377 : 1990 Part 7 : 9 - UKAS *	4.0

Notes: Observations and Interpretations are outside the UKAS Accreditation

* - denotes test included in laboratory scope of accreditation

- denotes test carried out by approved contractor

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Approved Signatories:

Alex Wynn (Associate Director) - Benjamin Sharp (Contracts Manager) - Emma Williams (Office Manager)

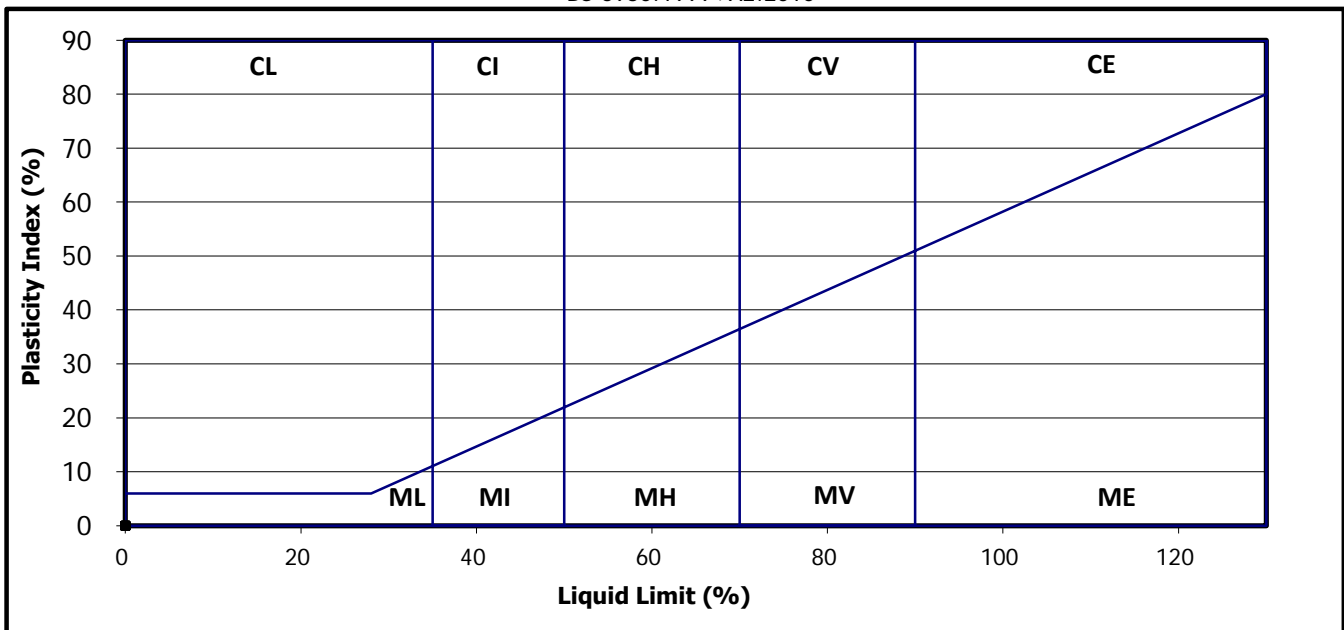
Paul Evans (Quality/Technical Manager) - Vaughan Edwards (Managing Director)

**Test Report: Method of the Determination of the plastic limit and plasticity index
BS 1377 : Part 2 : 1990 Method 5**

Client ref: TBC
Location: Docksway Landfill Site
Contract Number: 20915

Hole/ Sample Number	Sample Type	Depth m	Moisture Content % Cl. 3.2	Liquid Limit % Cl. 4.3/4.4	Plastic Limit % Cl. 5.	Plasticity Index % Cl. 6.	% Passing .425mm	Remarks
Natural 1	B	N/A	141	135	40	95	100	CE Extremely High Plasticity
Natural 2	B	N/A	134	138	37	101	100	CE Extremely High Plasticity
Natural 3	B	N/A	139	137	36	101	100	CE Extremely High Plasticity
Natural 4	B	N/A	140	139	39	100	100	CE Extremely High Plasticity

Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved
 PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.
 BS 5930:1999+A2:2010



[Signature]
 Checked By

Date Approved: 25.10.13

[Signature]
 Approved By:

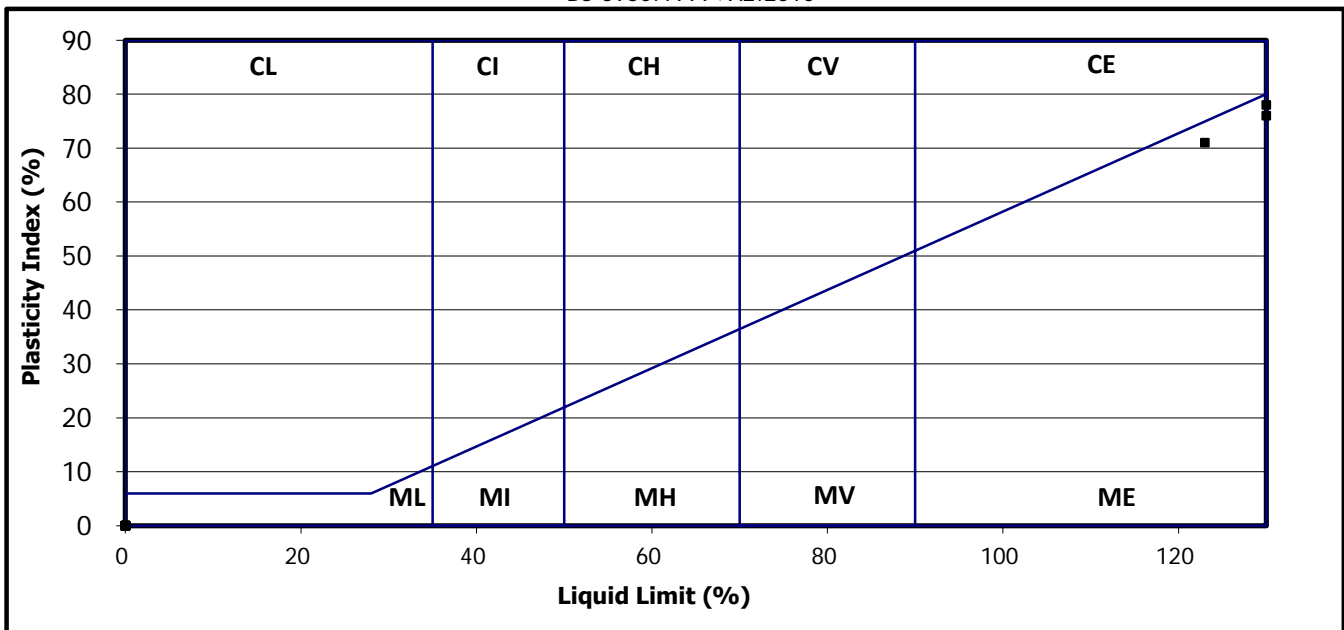


**Test Report: Method of the Determination of the plastic limit and plasticity index
BS 1377 : Part 2 : 1990 Method 5**

Client ref: TBC
Location: Docksway Landfill Site
Contract Number: 20915

Mix Ratio	Sample Type	Mix Type	Moisture Content % Cl. 3.2	Liquid Limit % Cl. 4.3/4.4	Plastic Limit % Cl. 5.	Plasticity Index % Cl. 6.	% Passing .425mm	Remarks
80kg/1	B	Dry - 24hr	111	130	52	78	100	ME Extremely High Plasticity
120kg/2	B	Dry - 24hr	104	130	54	76	100	ME Extremely High Plasticity
160kg/3	B	Dry - 24hr	104	137	59	78	100	ME Extremely High Plasticity
200kg/4	B	Dry - 24hr	109	141	65	76	100	ME Extremely High Plasticity
240kg/5	B	Dry - 24hr	94	123	52	71	100	ME Extremely High Plasticity

Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved
 PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.
 BS 5930:1999+A2:2010



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 Checked By

Date Approved: 25.10.13

[Signature]
 Approved By:



SUMMARY OF SHEAR STRENGTH TESTS (TOTAL STRESS)
(B.S. 1377 : PART 7 : 1990)

Client ref: TBC
 Location: Docksway Landfill Site
 Contract Number: 20915
 Mix Type: Dry
 Mix Time: 24Hrs

Mix Ratio	Sample Number	Mix Time m	Moisture Content %	Bulk Density Mg/m ³	Dry Density Mg/m ³	Undrained Triaxial Compression Tests (Total Stress)						Hand Vane kPa				
						Size mm	Lateral Pressure s ₃ kPa	Cohesion 1/2(s ₁ -s ₃) kPa	Average Cohesion kPa	Failure Strain %	Type of Failure	Peak	Residual			
80kg	1	24hr	111			33							16	4		
															15	4
															16	4
120kg	2	24hr	104			33							33	5		
															32	5
															32	5
160kg	3	24hr	104			33							33	5		
															35	7
															39	6
200kg	4	24hr	109			19							53	10		
															46	10
															50	8
240kg	5	24hr	94			19							56	13		
															56	13
															50	13
BOTTOM																
80kg	1	24hr	111			33							17	5		
															16	5
															17	4
120kg	2	24hr	104			33							34	6		
															33	5
															31	6
160kg	3	24hr	104			33							36	6		
															39	7
															40	8
200kg	4	24hr	109			19							56	11		
															55	11
															51	9
240kg	5	24hr	94			19							58	11		
															58	12
															59	12

SYMBOLS: RM: Remoulded MS: Multistage B: Brittle P: Plastic C: Compound Vane Size : 19mm/33mm



B. Shep

Checked by:

D.P. Grant

Approved by:

25/10/13

Date of approval:

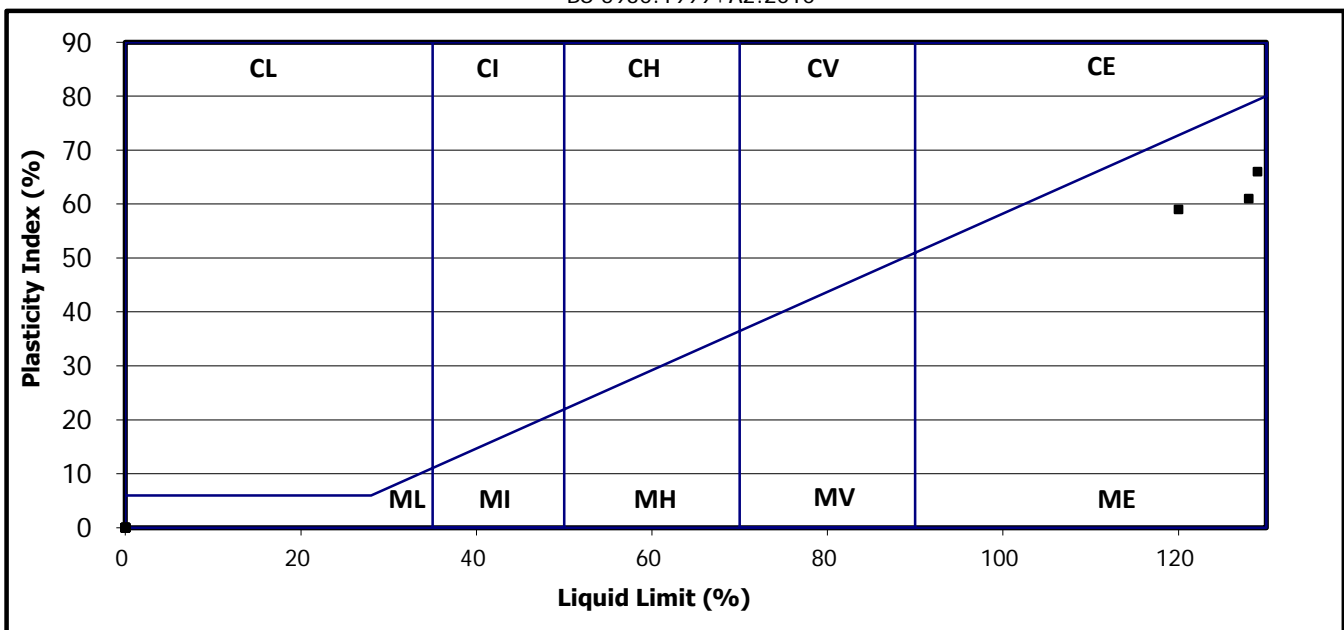
**Test Report: Method of the Determination of the plastic limit and plasticity index
BS 1377 : Part 2 : 1990 Method 5**

Client ref: TBC
Location: Docksway Landfill Site
Contract Number: 20915

Mix Ratio	Sample Type	Mix Type	Moisture Content % Cl. 3.2	Liquid Limit % Cl. 4.3/4.4	Plastic Limit % Cl. 5.	Plasticity Index % Cl. 6.	% Passing .425mm	Remarks
80kg/1	B	Dry - 48hr	110	136	69	67	100	ME Extremely High Plasticity
120kg/2	B	Dry - 48hr	103	128	67	61	100	ME Extremely High Plasticity
160kg/3	B	Dry - 48hr	101	129	63	66	100	ME Extremely High Plasticity
200kg/4	B	Dry - 48hr	102	133	65	68	100	ME Extremely High Plasticity
240kg/5	B	Dry - 48hr	93	120	61	59	100	ME Extremely High Plasticity

Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved
 PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

BS 5930:1999+A2:2010



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Date Approved: 25.10.13

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 Approved By:



SUMMARY OF SHEAR STRENGTH TESTS (TOTAL STRESS)
(B.S. 1377 : PART 7 : 1990)

Client ref: TBC
 Location: Docksway Landfill Site
 Contract Number: 20915
 Mix Type: Dry
 Mix Time: 48Hrs

Mix Ratio	Sample Number	Mix Time m	Moisture Content %	Bulk Density Mg/m ³	Dry Density Mg/m ³	Undrained Triaxial Compression Tests (Total Stress)						Hand Vane kPa	
						Size mm	Lateral Pressure s ₃ kPa	Cohesion 1/2(s ₁ -s ₃) kPa	Average Cohesion kPa	Failure Strain %	Type of Failure	Peak	Residual
80kg	1	48hr	110			33						17	5
												16	5
												16	6
120kg	2	48hr	103			19						48	10
												53	8
												51	10
160kg	3	48hr	101			19						38	8
												43	10
												40	10
200kg	4	48hr	102			19						61	17
												61	15
												58	13
240kg	5	48hr	93			19						71	8
												53	12
												65	10
BOTTOM													
80kg	1	48hr	110			33						18	5
												18	5
												17	4
120kg	2	48hr	103			19						47	6
												49	5
												51	6
160kg	3	48hr	101			19						38	6
												37	7
												38	8
200kg	4	48hr	102			19						60	11
												61	11
												61	9
240kg	5	48hr	93			19						74	11
												68	12
												60	12

SYMBOLS: RM: Remoulded MS: Multistage B: Brittle P: Plastic C: Compound Vane Size : 19mm/33mm



Checked by: *B. Sheep* Approved by: *D.P. Grant*

25/10/13

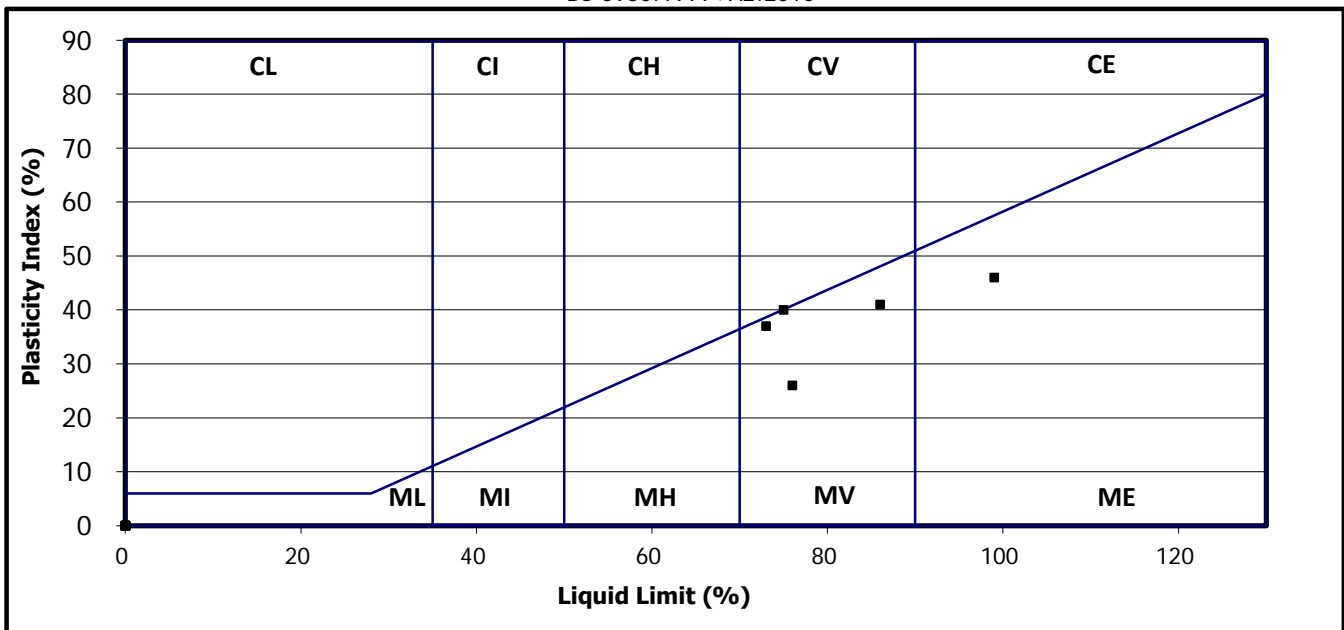
Date of approval:

**Test Report: Method of the Determination of the plastic limit and plasticity index
BS 1377 : Part 2 : 1990 Method 5**

Client ref: TBC
Location: Docksway Landfill Site
Contract Number: 20915

Mix Ratio	Sample Type	Mix Type	Moisture Content % Cl. 3.2	Liquid Limit % Cl. 4.3/4.4	Plastic Limit % Cl. 5.	Plasticity Index % Cl. 6.	% Passing .425mm	Remarks
80kg/1	B	Dry - 120hr	50	75	35	40	100	MV Very High Plasticity
120kg/2	B	Dry - 120hr	63	76	50	26	100	MV Very High Plasticity
160kg/3	B	Dry - 120hr	47	73	36	37	100	MV Very High Plasticity
200kg/4	B	Dry - 120hr	87	99	53	46	100	ME Extremely High Plasticity
240kg/5	B	Dry - 120hr	70	86	45	41	100	MV Very High Plasticity

Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved
 PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.
 BS 5930:1999+A2:2010



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 Approved By:

Date Approved: 29.10.13



**SUMMARY OF SHEAR STRENGTH TESTS (TOTAL STRESS)
(B.S. 1377 : PART 7 : 1990)**

Client ref: TBC
 Location: Docksway Landfill Site
 Contract Number: 20915
 Mix Type: Dry
 Mix Time: 120Hrs

Mix Ratio	Sample Number	Mix Time m	Moisture Content %	Bulk Density Mg/m ³	Dry Density Mg/m ³	Undrained Triaxial Compression Tests (Total Stress)						Hand Vane kPa	
						Size mm	Lateral Pressure s ₃ kPa	Cohesion 1/2(s ₁ -s ₃) kPa	Average Cohesion kPa	Failure Strain %	Type of Failure	Peak	Residual
80kg	1	120hr	50			33						21	5
												18	5
												18	5
120kg	2	120hr	63			33						37	9
												37	9
												37	6
160kg	3	120hr	47			33						40	9
												37	6
												42	7
200kg	4	120hr	87			19						73	13
												70	13
												73	13
240kg	5	120hr	70			19						70	13
												66	13
												66	13
BOTTOM													
80kg	1	120hr	53			33						18	6
												18	6
												17	5
120kg	2	120hr	63			33						47	10
												49	8
												51	9
160kg	3	120hr	47			33						42	6
												39	7
												39	8
200kg	4	120hr	87			19						71	11
												70	10
												69	12
240kg	5	120hr	70			19						74	13
												75	12
												72	12

SYMBOLS: RM: Remoulded MS: Multistage B: Brittle P: Plastic C: Compound Vane Size : 19mm/33mm



Checked by: *B. Sheep* Approved by: *D.P. Grant*

29/10/13

Date of approval:

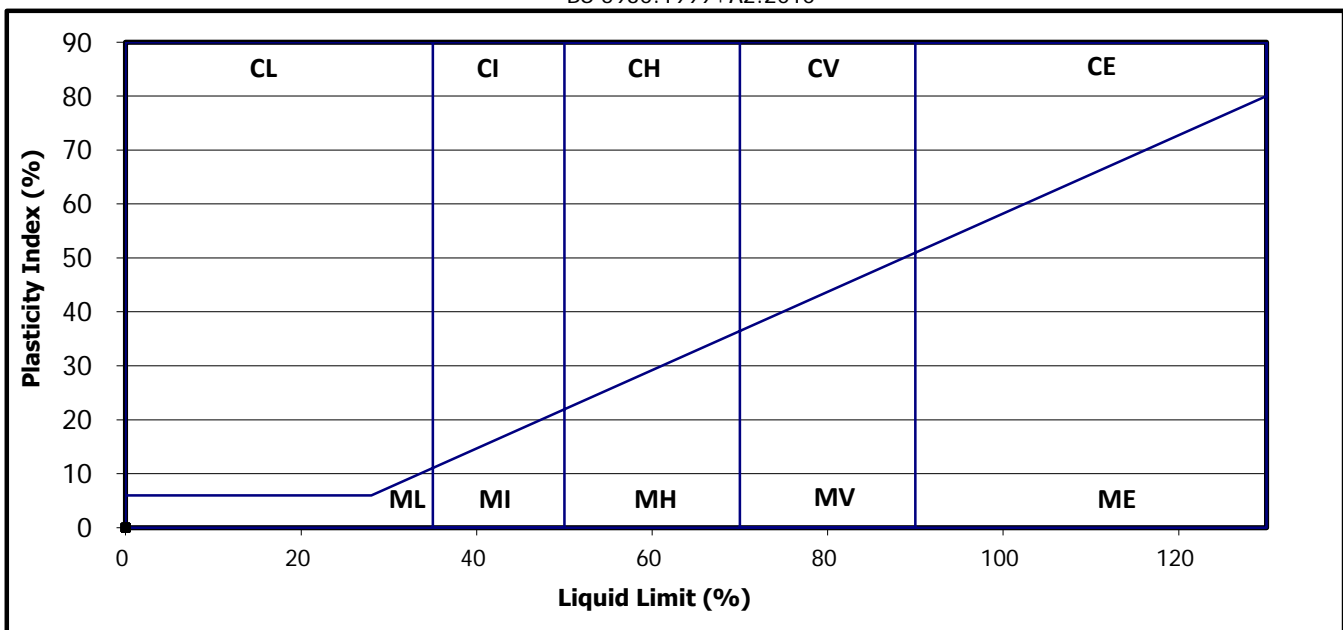
**Test Report: Method of the Determination of the plastic limit and plasticity index
BS 1377 : Part 2 : 1990 Method 5**

Client ref: TBC
Location: Docksway Landfill Site
Contract Number: 20915

Mix Ratio	Sample Type	Mix Type	Moisture Content % Cl. 3.2	Liquid Limit % Cl. 4.3/4.4	Plastic Limit % Cl. 5.	Plasticity Index % Cl. 6.	% Passing .425mm	Remarks
80kg/1	B	Wet - 24hr	151	160	84	76	100	ME Extremely High Plasticity
120kg/2	B	Wet - 24hr	141	153	77	76	100	ME Extremely High Plasticity
160kg/3	B	Wet - 24hr	124	139	59	80	100	ME Extremely High Plasticity
200kg/4	B	Wet - 24hr	114	138	60	78	100	ME Extremely High Plasticity
240kg/5	B	Wet - 24hr	108	131	55	76	100	ME Extremely High Plasticity

Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.
BS 5930:1999+A2:2010



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Approved By:

Date Approved: 7.11.13



**SUMMARY OF SHEAR STRENGTH TESTS (TOTAL STRESS)
(B.S. 1377 : PART 7 : 1990)**

Client ref: TBC
 Location: Docksway Landfill Site
 Contract Number: 20915
 Mix Type: Wet
 Mix Time: 24Hrs

Mix Ratio	Sample Number	Mix Time m	Moisture Content %	Bulk Density Mg/m ³	Dry Density Mg/m ³	Undrained Triaxial Compression Tests (Total Stress)						Hand Vane kPa	
						Size mm	Lateral Pressure s ₃ kPa	Cohesion 1/2(s ₁ -s ₃) kPa	Average Cohesion kPa	Failure Strain %	Type of Failure	Peak	Residual
80kg	1	24hr	151			33						21	6
												22	5
												23	5
120kg	2	24hr	141			33						29	4
												28	3
												27	3
160kg	3	24hr	124			33						30	5
												29	4
												30	5
200kg	4	24hr	114			33						41	4
												41	5
												41	5
240kg	5	24hr	108			33						42	5
												44	7
												44	5
BOTTOM													
80kg	1	24hr	151			33						21	6
												22	5
												21	6
120kg	2	24hr	141			33						27	3
												26	3
												26	3
160kg	3	24hr	124			33						33	4
												34	3
												32	3
200kg	4	24hr	114			33						38	5
												39	5
												39	5
240kg	5	24hr	108			33						42	5
												41	5
												41	5

SYMBOLS: RM: Remoulded MS: Multistage B: Brittle P: Plastic C: Compound Vane Size : 19mm/33mm



B. Sheep

Checked by:

D.P. Wang

Approved by:

07/11/13

Date of approval:

**Test Report: Method of the Determination of the plastic limit and plasticity index
BS 1377 : Part 2 : 1990 Method 5**

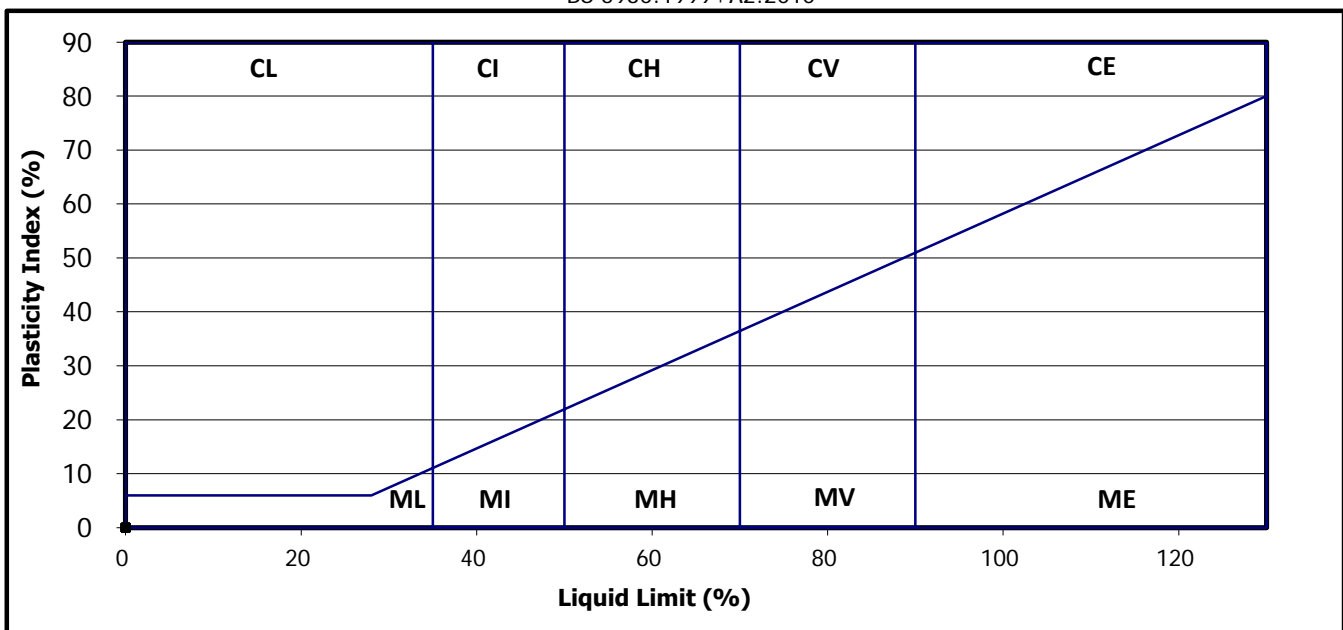
Client ref: TBC
Location: Docksway Landfill Site
Contract Number: 20915

Mix Ratio	Sample Type	Mix Type	Moisture Content % Cl. 3.2	Liquid Limit % Cl. 4.3/4.4	Plastic Limit % Cl. 5.	Plasticity Index % Cl. 6.	% Passing .425mm	Remarks
80kg/1	B	Wet - 48hr	112	154	61	93	100	ME Extremely High Plasticity
120kg/2	B	Wet - 48hr	106	142	48	94	100	CE Extremely High Plasticity
160kg/3	B	Wet - 48hr	173	205	55	150	100	CE Extremely High Plasticity
200kg/4	B	Wet - 48hr	121	160	70	90	100	ME Extremely High Plasticity
240kg/5	B	Wet - 48hr	106	141	79	62	100	ME Extremely High Plasticity

Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

BS 5930:1999+A2:2010



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Approved By:

Date Approved: 29.11.13



SUMMARY OF SHEAR STRENGTH TESTS (TOTAL STRESS)
(B.S. 1377 : PART 7 : 1990)

Client ref: TBC
 Location: Docksway Landfill Site
 Contract Number: 20915
 Mix Type: Dry
 Mix Time: 48Hrs

Mix Ratio	Sample Number	Mix Time m	Moisture Content %	Bulk Density Mg/m ³	Dry Density Mg/m ³	Undrained Triaxial Compression Tests (Total Stress)						Hand Vane kPa				
						Size mm	Lateral Pressure s ₃ kPa	Cohesion 1/2(s ₁ -s ₃) kPa	Average Cohesion kPa	Failure Strain %	Type of Failure	Peak	Residual			
80kg	1	48hr	112			33							30	5		
															32	5
															32	5
120kg	2	48hr	106			19							55	10		
															58	8
															60	10
160kg	3	48hr	173			19							38	8		
															43	10
															40	10
200kg	4	48hr	121			19							41	5		
															33	5
															40	7
240kg	5	48hr	106			19							66	8		
															61	5
															60	8
BOTTOM																
80kg	1	48hr	112			33							30	4		
															29	3
															29	4
120kg	2	48hr	106			19							61	10		
															63	12
															60	12
160kg	3	48hr	173			19							19	1		
															21	4
															20	2
200kg	4	48hr	121			19							38	8		
															40	7
															36	3
240kg	5	48hr	106			19							68	13		
															71	15
															70	15

SYMBOLS: RM: Remoulded MS: Multistage B: Brittle P: Plastic C: Compound Vane Size : 19mm/33mm



B. Sheep

D.P. Grant

29/11/13

Checked by:

Approved by:

Date of approval:

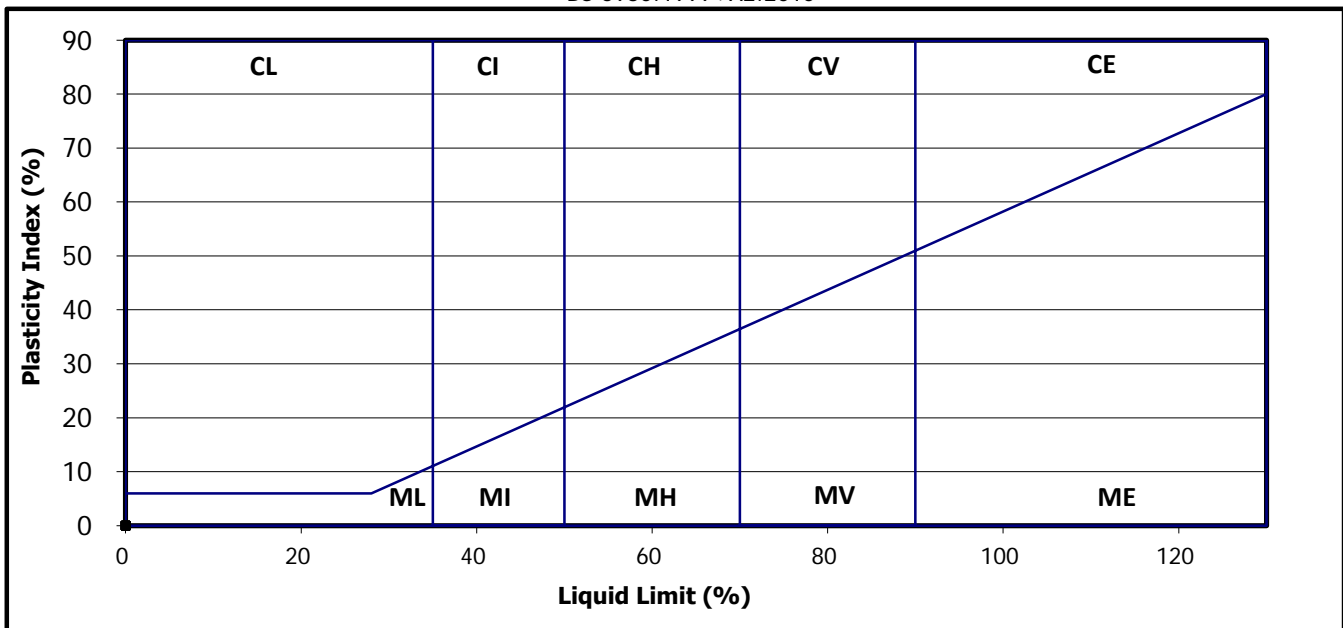
**Test Report: Method of the Determination of the plastic limit and plasticity index
BS 1377 : Part 2 : 1990 Method 5**

Client ref: TBC
Location: Docksway Landfill Site
Contract Number: 20915

Mix Ratio	Sample Type	Mix Type	Moisture Content % Cl. 3.2	Liquid Limit % Cl. 4.3/4.4	Plastic Limit % Cl. 5.	Plasticity Index % Cl. 6.	% Passing .425mm	Remarks
80kg/1	B	Wet - 120hr	108	137	63	74	100	ME Extremely High Plasticity
120kg/2	B	Wet - 120hr	169	197	64	133	100	CE Extremely High Plasticity
160kg/3	B	Wet - 120hr	143	176	66	110	100	ME Extremely High Plasticity
200kg/4	B	Wet - 120hr	148	179	66	113	100	ME Extremely High Plasticity
240kg/5	B	Wet - 120hr	111	141	79	62	100	ME Extremely High Plasticity

Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.
BS 5930:1999+A2:2010



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Checked By

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Approved By:

Date Approved: 29.11.13



SUMMARY OF SHEAR STRENGTH TESTS (TOTAL STRESS)
(B.S. 1377 : PART 7 : 1990)

Client ref: TBC
 Location: Docksway Landfill Site
 Contract Number: 20915
 Mix Type: Wet
 Mix Time: 120Hrs

Mix Ratio	Sample Number	Mix Time m	Moisture Content %	Bulk Density Mg/m ³	Dry Density Mg/m ³	Undrained Triaxial Compression Tests (Total Stress)						Hand Vane kPa		
						Size mm	Lateral Pressure s ₃ kPa	Cohesion 1/2(s ₁ -s ₃) kPa	Average Cohesion kPa	Failure Strain %	Type of Failure	Peak	Residual	
80kg	1	120hr	108			33							25	7
													27	7
													27	7
120kg	2	120hr	169			33							27	3
													23	4
													23	4
160kg	3	120hr	143			19							41	7
													3	7
													40	7
200kg	4	120hr	148			19							63	7
													66	10
													65	8
240kg	5	120hr	111			19							78	8
													70	10
													70	8
BOTTOM														
80kg	1	120hr	108			33							26	10
													27	10
													26	8
120kg	2	120hr	169			33							26	6
													27	3
													23	4
160kg	3	120hr	143			19							40	6
													43	7
													40	7
200kg	4	120hr	148			19							66	10
													65	7
													63	7
240kg	5	120hr	111			19							76	10
													70	10
													70	8

SYMBOLS: RM: Remoulded MS: Multistage B: Brittle P: Plastic C: Compound Vane Size : 19mm/33mm



B. Sheep

D.P. Grant

29/11/13

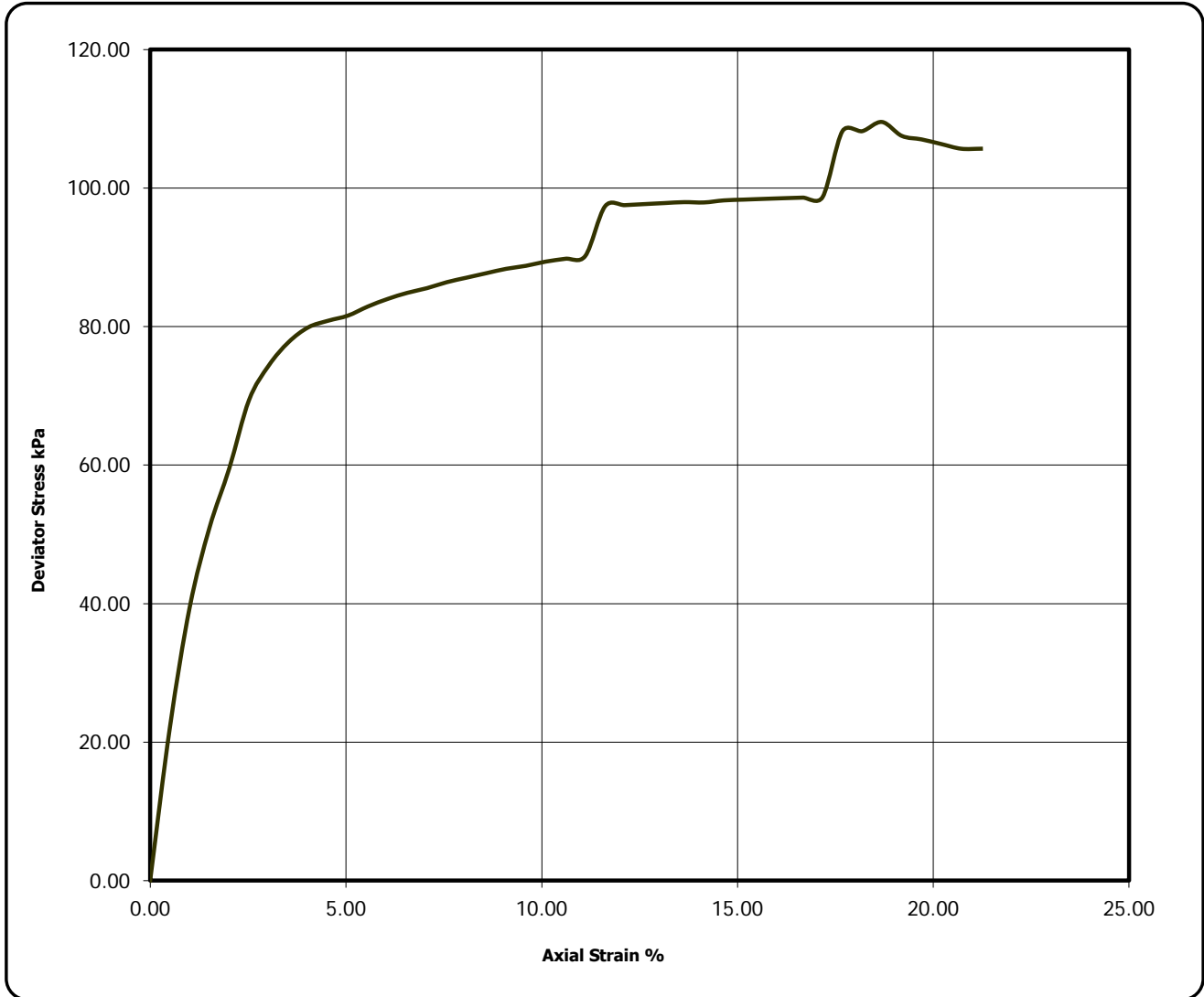
Checked by:

Approved by:

Date of approval:

Test Report: Undrained Shear Strength in Triaxial Compression
BS 1377 : Part7 : Clause 8 : 1990 Multistage Test
without measurement of Pore Pressure

Client ref: N/A
Location: Docksway Landfill Site
Contract Number: 20915
Hole Number: 200 Dry Mix (cured for 3 days prior to test)
Sample Number:
Depth (m) : N/A



Diameter (mm):		103		Height (mm):		200		Test:		100mm Multistage	
Specimen	Moisture Content (%)	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Remarks		
A	72	1.45	0.85	25	90	45	11.1	Compound	Sample taken from Top of tube		
				50	99	49	17.2				
				100	110	55	18.7				



B. S. P.

Checked By

D.P. Gans

Approved By:



Date Approved: 17.1.14

Test Report:

**Undrained Shear Strength in Triaxial Compression
BS 1377 : Part7 : Clause 8 : 1990 Multistage Test
without measurement of Pore Pressure**

Client ref: N/A
Location: Docksway Landfill Site
Contract Number: 20915
Hole Number 200 Dry Mix (cured for 3 days prior to test)
Sample Number:
Depth (m) : N/A



Post Test Specimen



Specimen Split

Diameter (mm):		103		Height (mm):		200		Test:		100mm Multistage	
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Remarks		
A	72	1.45	0.85	25	90	45	11.1	Compound	Rate of strain = 2 %/min Latex Membrane used mm thickness		
				50	99	49	17.2				
				100	110	55	18.7				



B Sharp

Checked By

D P Gans

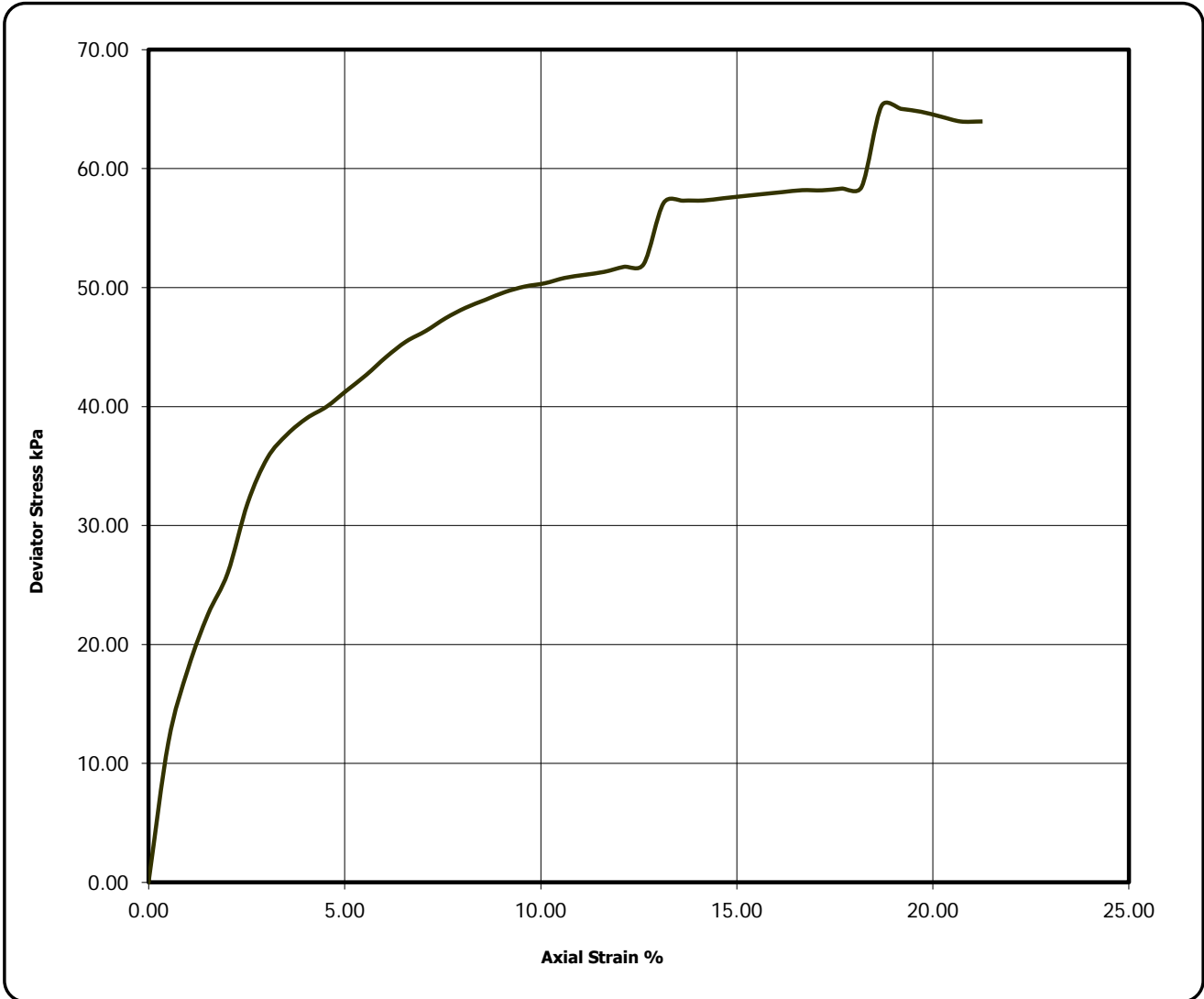
Approved By:



Date Approved: 17.1.14

Test Report: Undrained Shear Strength in Triaxial Compression
BS 1377 : Part7 : Clause 8 : 1990 Multistage Test
without measurement of Pore Pressure

Client ref: N/A
Location: Docksway Landfill Site
Contract Number: 20915
Hole Number: 200 Wet Mix (cured for 3 days prior to test)
Sample Number:
Depth (m) : N/A



Diameter (mm):		103		Height (mm):		200		Test:		100mm Multistage	
Specimen	Moisture Content (%)	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Remarks		
A	84	1.45	0.79	25	52	26	12.6	Compound	Sample taken from Top of tube Rate of strain = 2 %/min Latex Membrane used mm thickness		
				50	58	29	18.2				
				100	65	33	18.7				



BSAP

Checked By

DP Gans

Approved By:

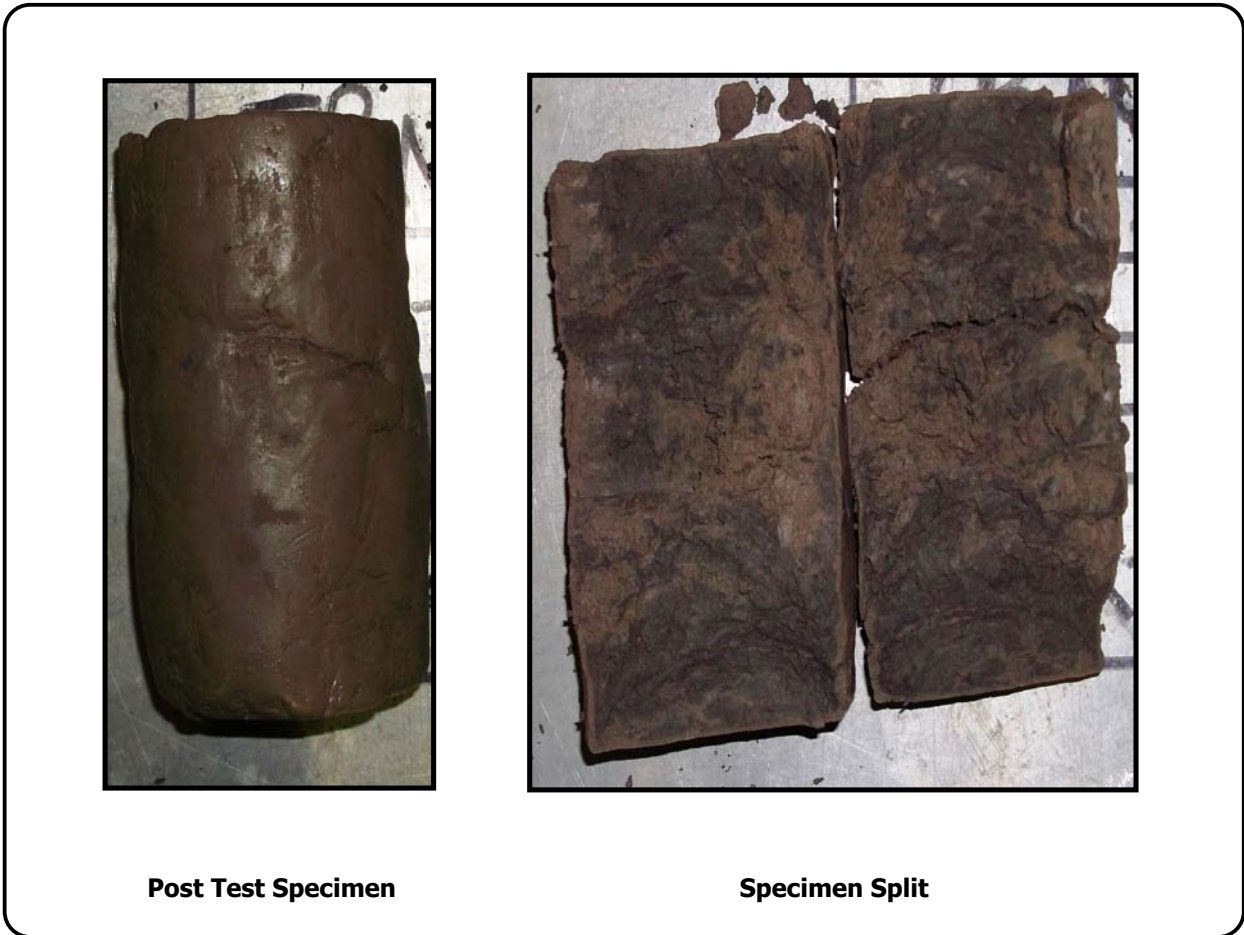


Date Approved: 17.1.14

Test Report:

**Undrained Shear Strength in Triaxial Compression
BS 1377 : Part7 : Clause 8 : 1990 Multistage Test
without measurement of Pore Pressure**

Client ref: N/A
Location: Docksway Landfill Site
Contract Number: 20915
Hole Number 200 Wet Mix (cured for 3 days prior to test)
Sample Number:
Depth (m) : N/A



Diameter (mm):		103		Height (mm):		200		Test:		100mm Multistage	
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Remarks		
A	84	1.45	0.79	25	52	26	12.6	Compound	Rate of strain = 2 %/min Latex Membrane used mm thickness		
				50	58	29	18.2				
				100	65	33	18.7				



B Sharp

Checked By

Date Approved: 17.1.14

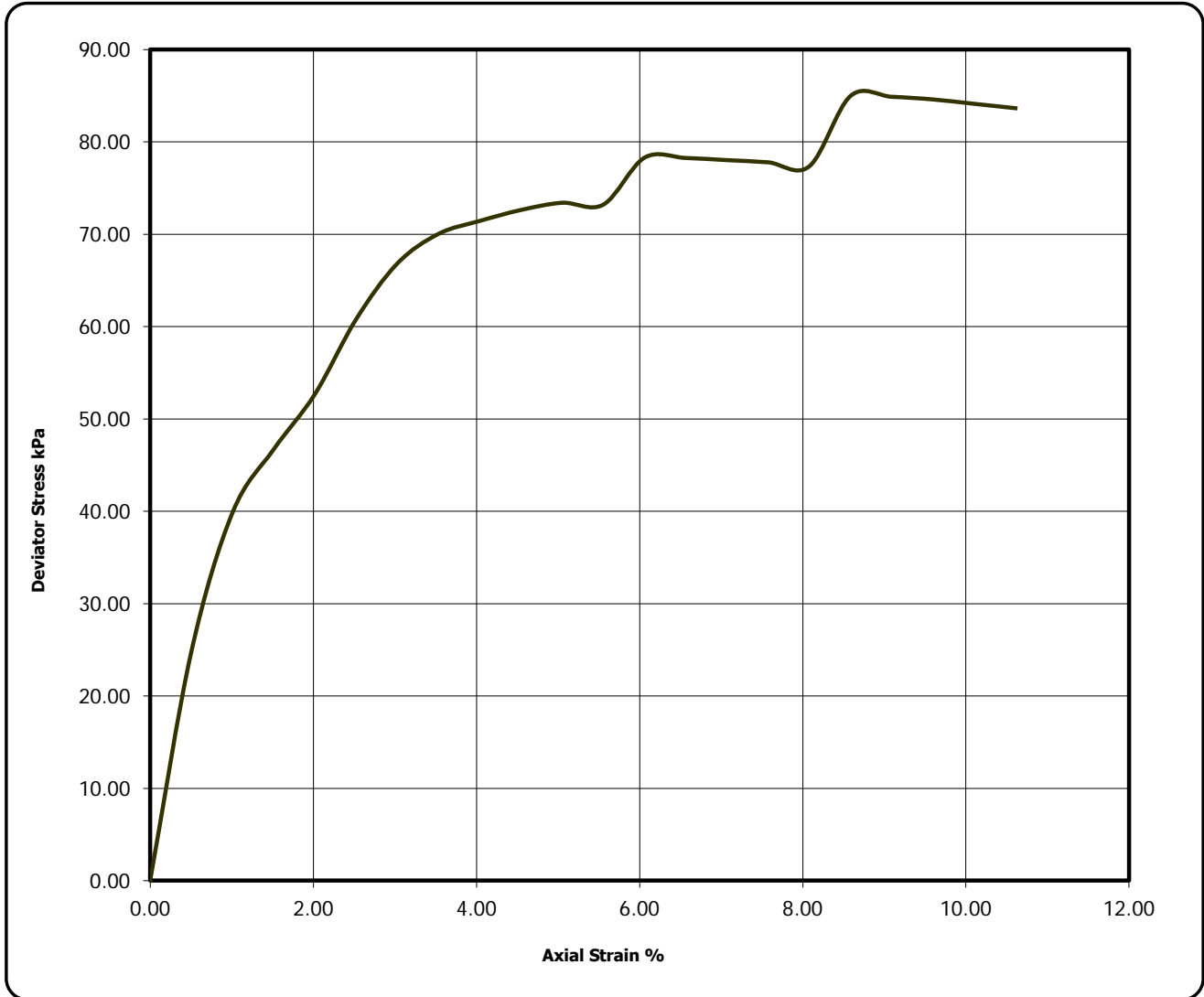
D P Gans

Approved By:



Test Report: Undrained Shear Strength in Triaxial Compression
BS 1377 : Part7 : Clause 8 : 1990 Multistage Test
without measurement of Pore Pressure

Client ref: N/A
Location: Docksway Landfill Site
Contract Number: 20915
Hole Number: 240 Dry Mix (cured for 3 days prior to test)
Sample Number:
Depth (m) : N/A



Diameter (mm):		103		Height (mm):		200		Test:		100mm Multistage	
Specimen	Moisture Content (%)	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Remarks		
A	67	2.16	1.29	25	73	37	5.1	Compound	Sample taken from Top of tube		
				50	78	39	6.1		Rate of strain = 2 %/min		
				100	85	42	8.6		Latex Membrane used mm thickness		



BSAP

Checked By

DP Gans

Approved By:



Date Approved: 17.1.14

Test Report:

**Undrained Shear Strength in Triaxial Compression
BS 1377 : Part7 : Clause 8 : 1990 Multistage Test
without measurement of Pore Pressure**

Client ref: N/A
Location: Docksway Landfill Site
Contract Number: 20915
Hole Number 240 Dry Mix (cured for 3 days prior to test)
Sample Number:
Depth (m) : N/A



Diameter (mm):		103		Height (mm):		200		Test:		100mm Multistage	
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Remarks		
A	67	2.16	1.29	25	73	37	5.1	Compound	Rate of strain = 2 %/min Latex Membrane used mm thickness		
				50	78	39	6.1				
				100	85	42	8.6				



B Sharp

Checked By

D P Gans

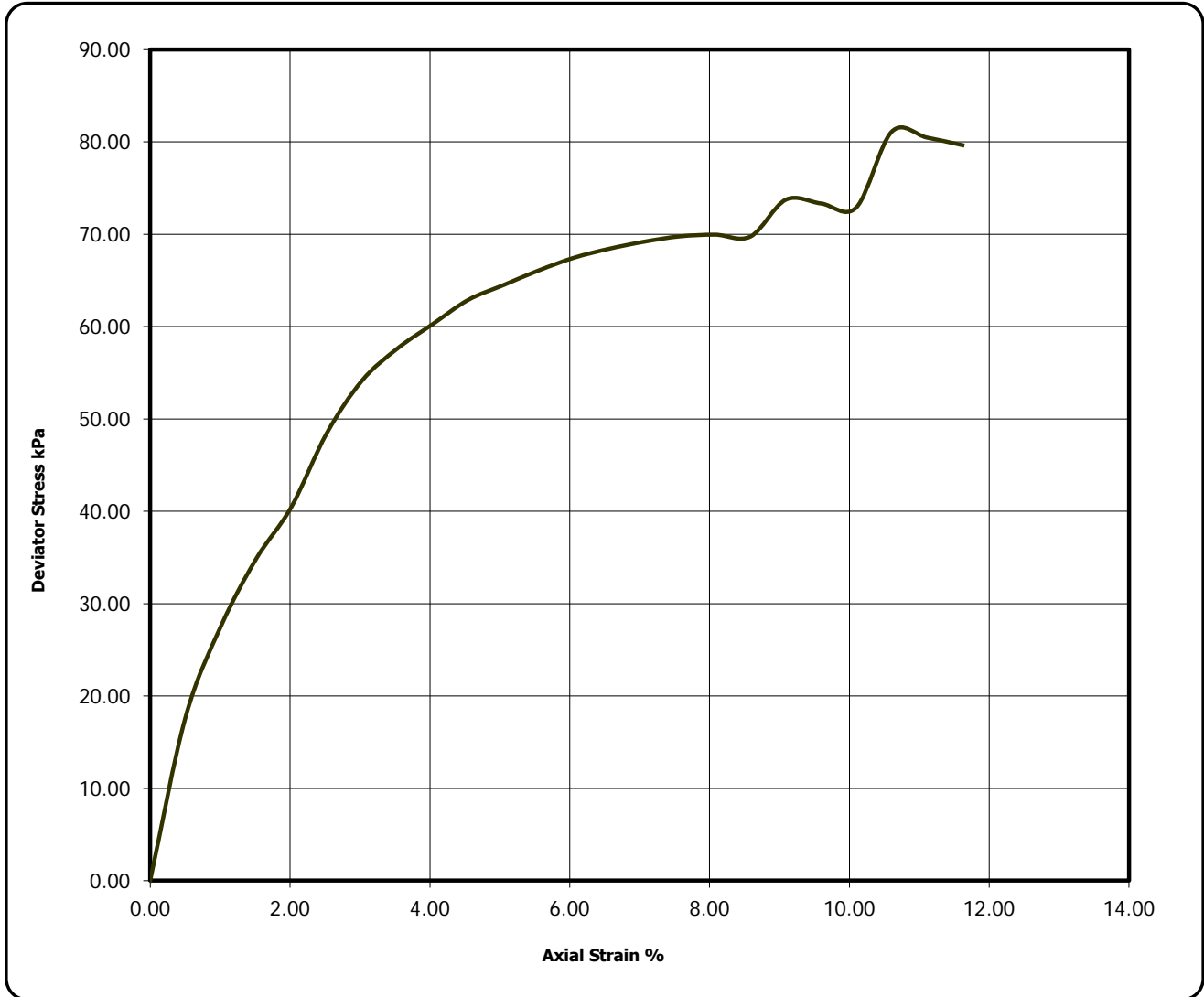
Approved By:



Date Approved: 17.1.14

Test Report: Undrained Shear Strength in Triaxial Compression
BS 1377 : Part7 : Clause 8 : 1990 Multistage Test
without measurement of Pore Pressure

Client ref: N/A
Location: Docksway Landfill Site
Contract Number: 20915
Hole Number: 240 Wet Mix (cured for 3 days prior to test)
Sample Number:
Depth (m) : N/A



Diameter (mm):		103		Height (mm):		200		Test:		100mm Multistage	
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Remarks		
A	86	1.47	0.79	25	70	35	8.1	Compound	Sample taken from Top of tube		
				50	74	37	9.1		Rate of strain = 2 %/min		
				100	81	41	10.6		Latex Membrane used mm thickness		



BSM

Checked By

D.P. Gans

Approved By:



Date Approved: 17.1.14

Test Report:

**Undrained Shear Strength in Triaxial Compression
BS 1377 : Part7 : Clause 8 : 1990 Multistage Test
without measurement of Pore Pressure**

Client ref: N/A
Location: Docksway Landfill Site
Contract Number: 20915
Hole Number 240 Wet Mix (cured for 3 days prior to test)
Sample Number:
Depth (m) : N/A



Diameter (mm):		103		Height (mm):		200		Test:		100mm Multistage	
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Remarks		
A	86	1.47	0.79	25	70	35	8.1	Compound	Rate of strain = 2 %/min Latex Membrane used mm thickness		
				50	74	37	9.1				
				100	81	41	10.6				



B Sharp

Checked By

Date Approved: 17.1.14

D P Gans

Approved By:



Permeability in a Triaxial Cell

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details

Borehole		200KG
Sample No.		DRY MIX
Depth	m	
Date		17/01/2014
Disturbed / Undisturbed		Remoulded 2.5kg

Description of Specimen

Brown silty CLAY

Initial Specimen Conditions

Height	mm	104.00
Diameter	mm	102.00
Area	mm ²	8171.28
Volume	cm ³	849.81
Mass	g	1316.10
Dry Mass	g	766.50
Density	Mg/m ³	1.55
Dry Density	Mg/m ³	0.90
Moisture Content	%	71.7
Void Ratio		1.938
Specific Gravity	kN/m ³	2.65
	(assumed/measured)	assumed

Final Specimen Conditions

Moisture Content	%	72.33
Density	Mg/m ³	1.58
Dry Density	Mg/m ³	0.92

Test Setup

Date started	08/01/2014
Date Finished	16/01/2014
Top Drain Used	y
Base Drain Used	y
Pressure System Number	PPERM3
Cell Number	CPERM3

D P Gans

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17/01/14
Date

Client Ref



Docksway Landfill Site

Contract No

20915

Permeability in a Triaxial Cell

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details

Borehole		200KG
Sample No.		DRY MIX
Depth	m	
Date		17/01/2014

Saturation

Cell Pressure Incr.	kPa	35.00
Back Pressure Incr.	kPa	35.00
Differential Pressure	kPa	0.00
Final Cell Pressure	kPa	145.00
Final Pore Pressure	kPa	140.10
Final B Value		1.00

Consolidation

Effective Pressure	kPa	35.00
Cell Pressure	kPa	145.00
Back Pressure	kPa	110.00
Excess Pore Pressure	kPa	30.10
Pore Pressure at End	kPa	110.00
Consolidated Volume	cm ³	837.11
Consolidated Height	mm	103.48
Consolidated Area	mm ²	8089.87
Vol. Compressibility	m ² /MN	20.2792
Consolidation Coef.	m ² /yr.	0.4965
Final Voids Ratio		1.894

Permeability

Cell Pressure	kPa	145.00
Effective Cell Pressure	kPa	35.00
Back Pressure Diff.	kPa	10.00
Mean Rate of Flow	ml/min	0.00398
Average Temperature	°C	20

Vertical Permeability m/s	8.29 x 10-10
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Docksway Landfill Site

Contract No

20915

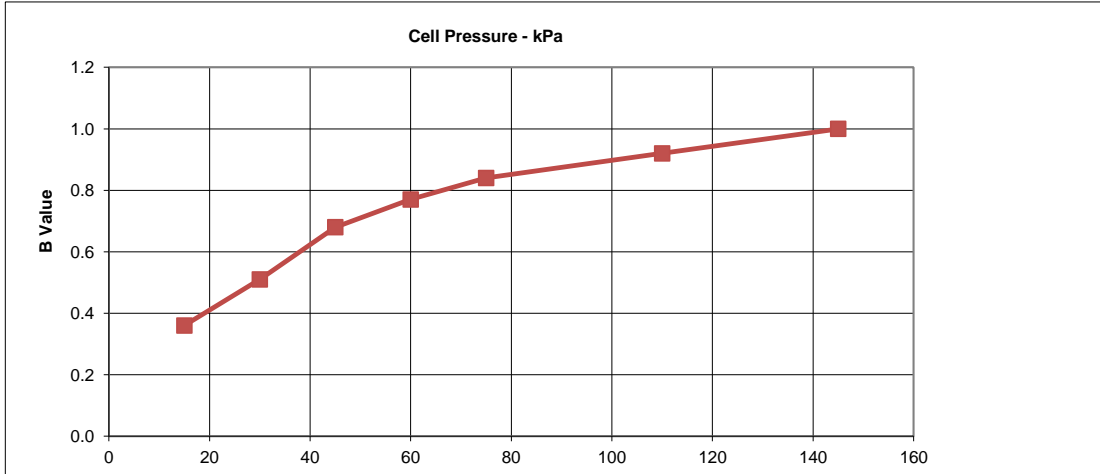
Permeability in a Triaxial Cell

BS 1377 : Part 6 : 1990 Clause 6

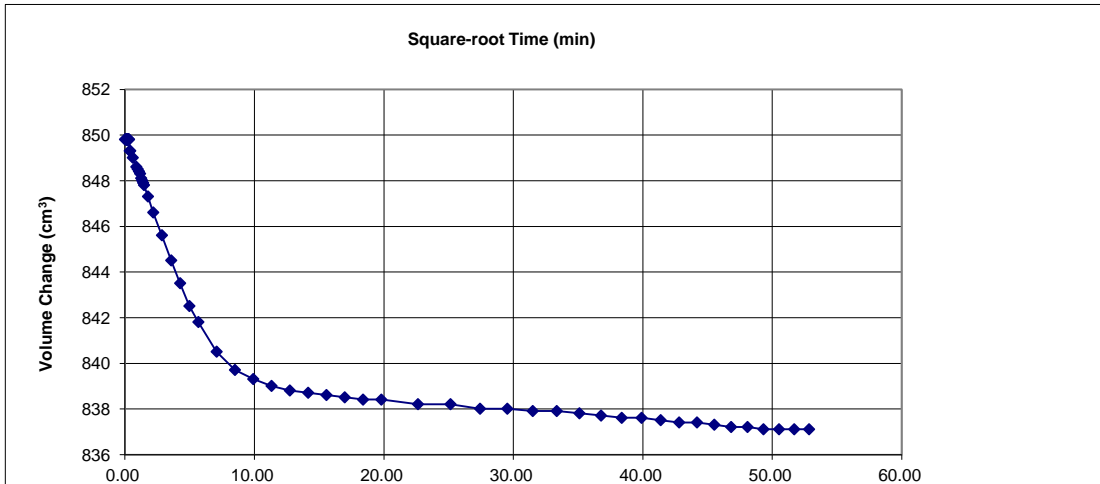
Specimen Details

Borehole		200KG
Sample No.		DRY MIX
Depth	m	
Date		17/01/2014

Saturation Stage



Consolidation Stage



D P Gans

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17/01/14
Date

Client Ref



Dockway Landfill Site

Contract No

20915

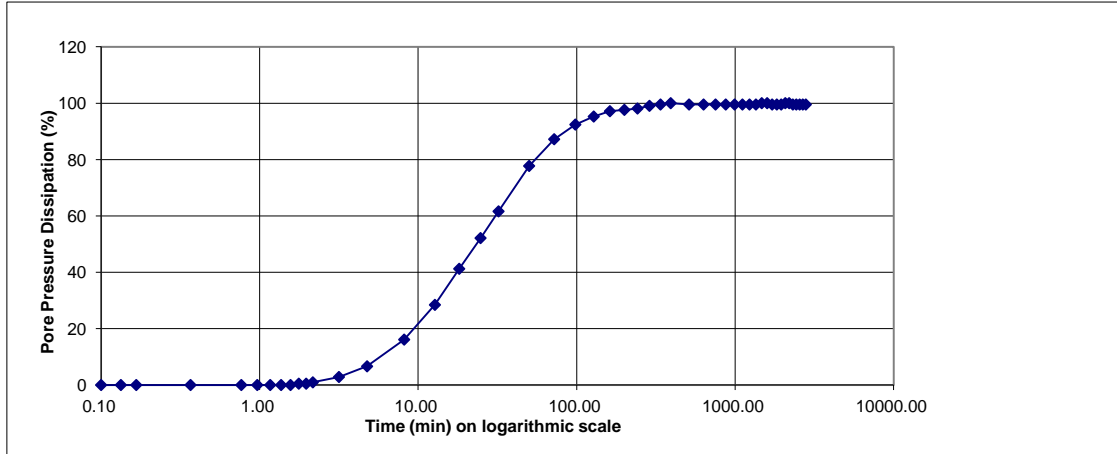
Permeability in a Triaxial Cell

BS 1377 : Part 6 : 1990 Clause 6

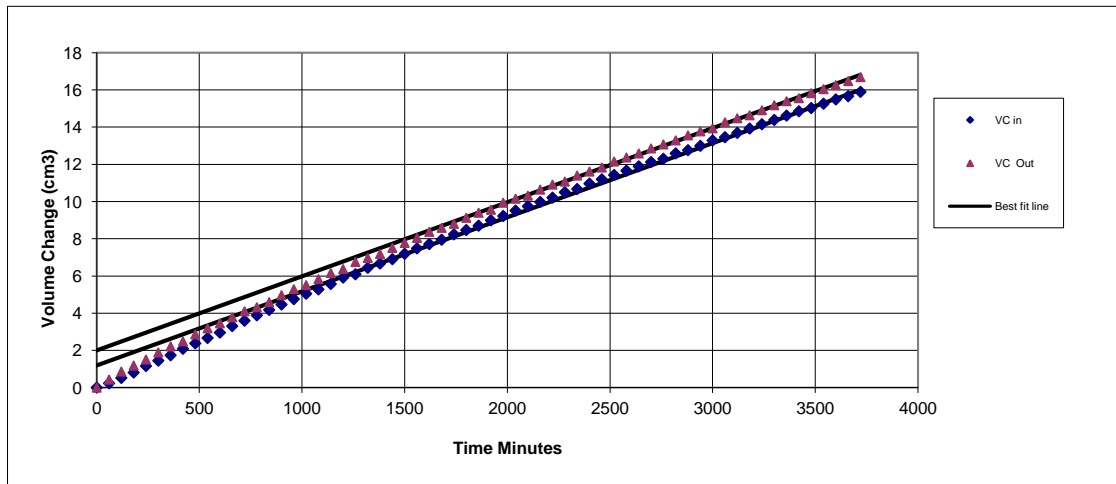
Specimen Details

Borehole		200KG
Sample No.		DRY MIX
Depth	m	
Date		17/01/2014

Consolidation Stage



Permeability Stage



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17/01/14
Date

Client Ref



Docksway Landfill Site

Contract No

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Permeability in a Triaxial Cell

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details

Borehole		200kg
Sample No.		wet mix
Depth	m	0
Date		17/01/2014
Disturbed / Undisturbed		Remoulded 2.5Kg

Description of Specimen

Brown sl silty CLAY

Initial Specimen Conditions

Height	mm	104.00
Diameter	mm	102.00
Area	mm ²	8171.28
Volume	cm ³	849.81
Mass	g	1284.20
Dry Mass	g	701.30
Density	Mg/m ³	1.51
Dry Density	Mg/m ³	0.83
Moisture Content	%	83.1
Voids Ratio		2.211
Specific Gravity	kN/m ³ (assumed/measured)	2.65 assumed

Final Specimen Conditions

Moisture Content	%	80.32
Density	Mg/m ³	1.55
Dry Density	Mg/m ³	0.86

Test Setup

Date started	08/01/2014
Date Finished	16/01/2014
Top Drain Used	y
Base Drain Used	y
Pressure System Number	PPERM 1
Cell Number	CPERM 1

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Client Ref



Docksway Landfill Site

Contract No

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Permeability in a Triaxial Cell

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details

Borehole		200kg
Sample No.		wet mix
Depth	m	0
Date		17/01/2014

Saturation

Cell Pressure Incr.	kPa	100.00
Back Pressure Incr.	kPa	103.00
Differential Pressure	kPa	-3.00
Final Cell Pressure	kPa	300.00
Final Pore Pressure	kPa	297.00
Final B Value		1.03

Consolidation

Effective Pressure	kPa	100.00
Cell Pressure	kPa	300.00
Back Pressure	kPa	200.00
Excess Pore Pressure	kPa	97.00
Pore Pressure at End	kPa	200.00
Consolidated Volume	cm ³	815.41
Consolidated Height	mm	102.60
Consolidated Area	mm ²	7950.77
Vol. Compressibility	m ² /MN	26.3210
Consolidation Coef.	m ² /yr.	0.4173
Final Voids Ratio		2.081

Permeability

Cell Pressure	kPa	300.00
Effective Cell Pressure	kPa	100.00
Back Pressure Diff.	kPa	20.00
Mean Rate of Flow	ml/min	0.02858
Average Temperature	'C	20

Vertical Permeability Kv	m/s	3 x 10⁻⁹
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Docksway Landfill Site

Contract No

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2788

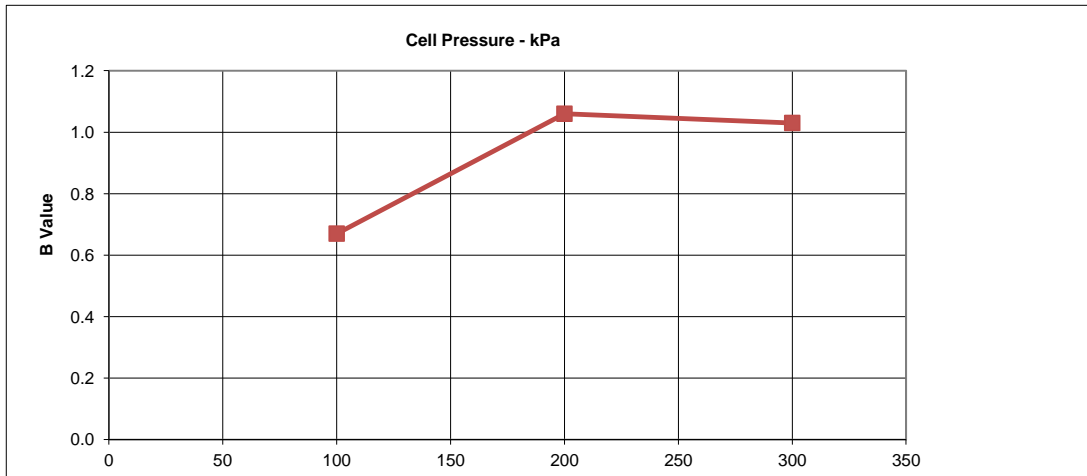
Permeability in a Triaxial Cell

BS 1377 : Part 6 : 1990 Clause 6

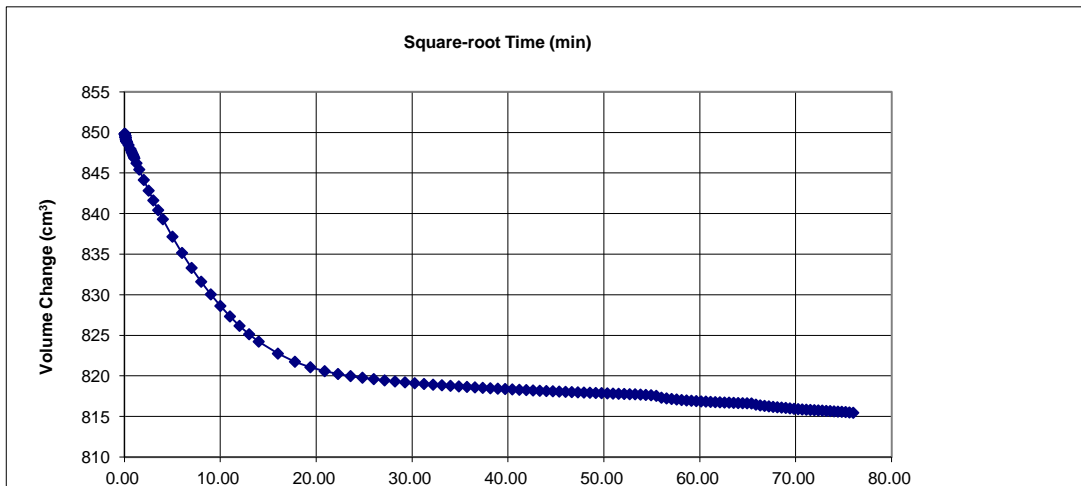
Specimen Details

Borehole		200kg
Sample No.		wet mix
Depth	m	0
Date		17/01/2014

Saturation Stage



Consolidation Stage



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17/01/14
Date

Client Ref

GSTL
GEO Site & Testing Services Limited

Dockway Landfill Site

Contract No

20915



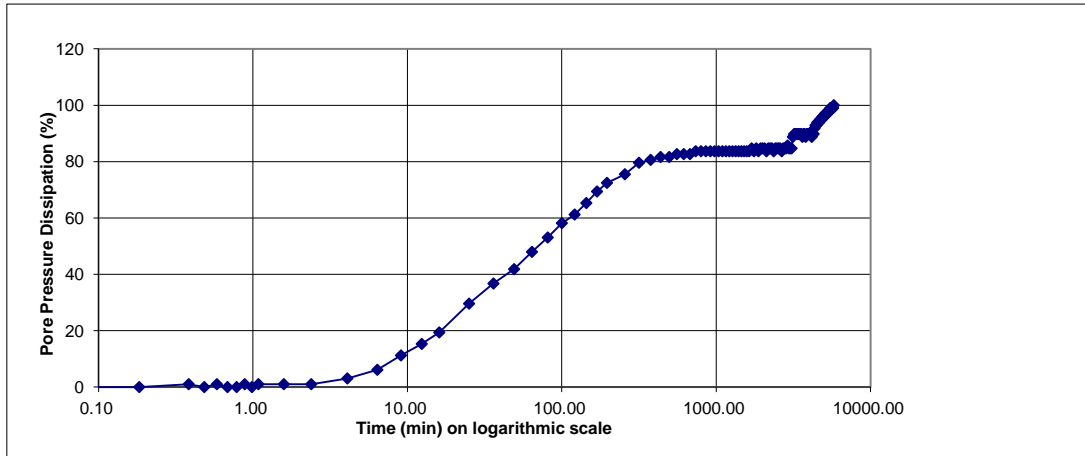
Permeability in a Triaxial Cell

BS 1377 : Part 6 : 1990 Clause 6

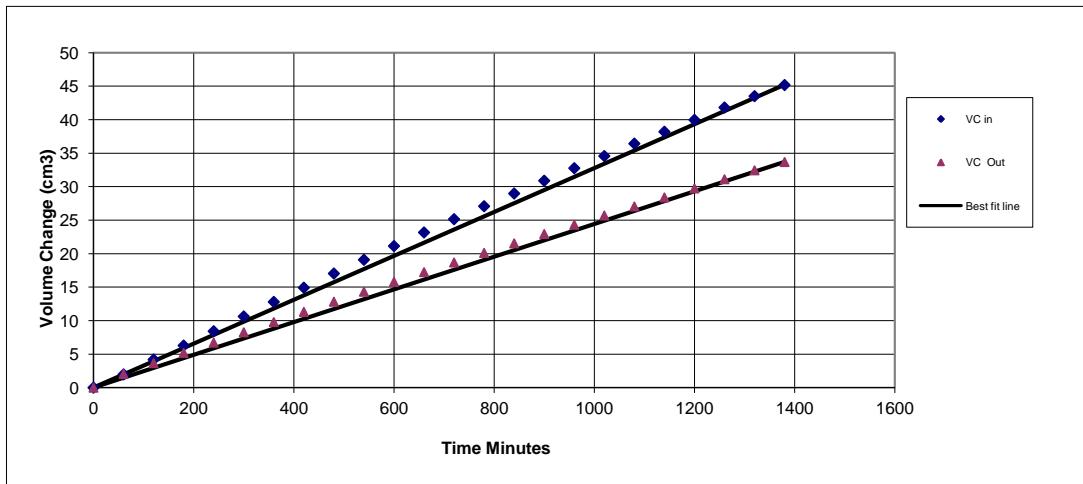
Specimen Details

Borehole		200kg
Sample No.		wet mix
Depth	m	0
Date		17/01/2014

Consolidation Stage



Permeability Stage



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Date



Docksway Landfill Site

Client Ref

Contract No

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Permeability in a Triaxial Cell

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details

Borehole		240kg
Sample No.		dry mix
Depth	m	0
Date		17/01/2014
Disturbed / Undisturbed		Remoulded 2.5Kg

Description of Specimen

Brown sl silty CLAY

Initial Specimen Conditions

Height	mm	104.00
Diameter	mm	102.00
Area	mm ²	8171.28
Volume	cm ³	849.81
Mass	g	1359.10
Dry Mass	g	815.60
Density	Mg/m ³	1.60
Dry Density	Mg/m ³	0.96
Moisture Content	%	66.6
Voids Ratio		1.761
Specific Gravity	kN/m ³	2.65
	(assumed/measured)	assumed

Final Specimen Conditions

Moisture Content	%	67.02
Density	Mg/m ³	1.64
Dry Density	Mg/m ³	0.98

Test Setup

Date started	08/01/2014
Date Finished	16/01/2014
Top Drain Used	y
Base Drain Used	y
Pressure System Number	PPERM 2
Cell Number	CPERM 2

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17/01/14
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Docksway Landfill Site

Contract No

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Permeability in a Triaxial Cell

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details

Borehole		240kg
Sample No.		dry mix
Depth	m	0
Date		17/01/2014

Saturation

Cell Pressure Incr.	kPa	100.00
Back Pressure Incr.	kPa	102.00
Differential Pressure	kPa	-2.00
Final Cell Pressure	kPa	500.00
Final Pore Pressure	kPa	497.00
Final B Value		1.02

Consolidation

Effective Pressure	kPa	100.00
Cell Pressure	kPa	500.00
Back Pressure	kPa	400.00
Excess Pore Pressure	kPa	97.00
Pore Pressure at End	kPa	400.00
Consolidated Volume	cm ³	831.31
Consolidated Height	mm	103.25
Consolidated Area	mm ²	8052.69
Vol. Compressibility	m ² /MN	43.7557
Consolidation Coef.	m ² /yr.	0.2244
Final Voids Ratio		1.701

Permeability

Cell Pressure	kPa	500.00
Effective Cell Pressure	kPa	100.00
Back Pressure Diff.	kPa	20.00
Mean Rate of Flow	ml/min	0.00308
Average Temperature	'C	20

Vertical Permeability Kv	m/s	3.21 x 10⁻¹⁰
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Docksway Landfill Site

Contract No

20915



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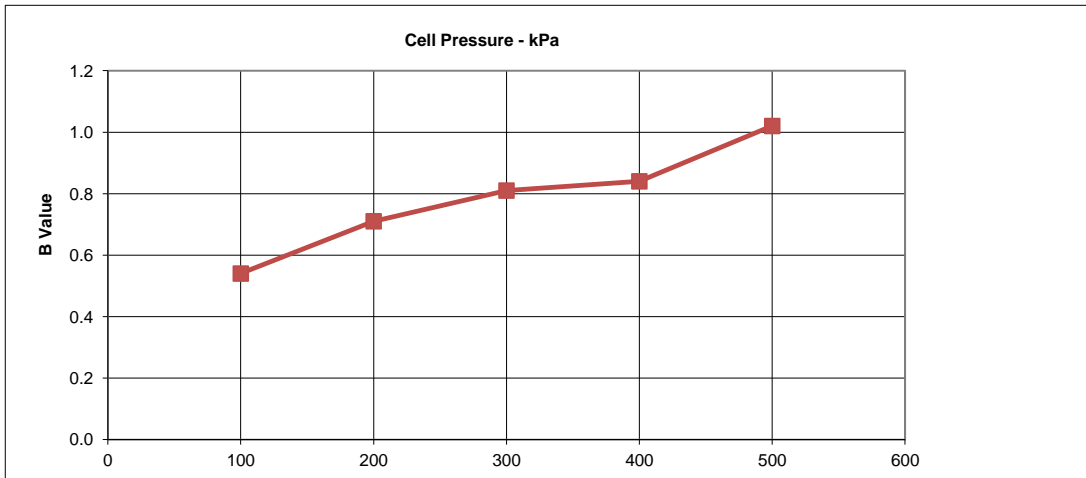
Permeability in a Triaxial Cell

BS 1377 : Part 6 : 1990 Clause 6

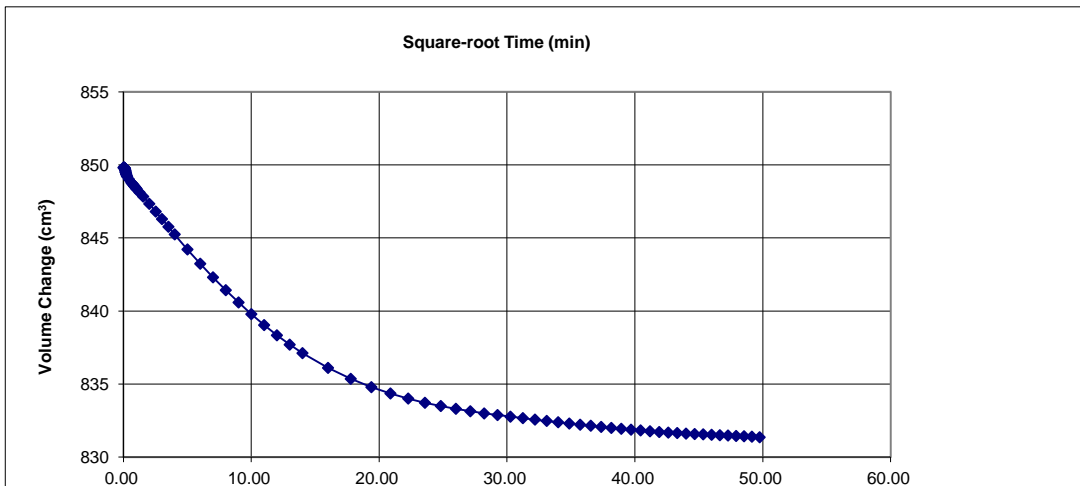
Specimen Details

Borehole		240kg
Sample No.		dry mix
Depth	m	0
Date		17/01/2014

Saturation Stage



Consolidation Stage



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17/01/14
Date

Client Ref



Dockway Landfill Site

Contract No

20915



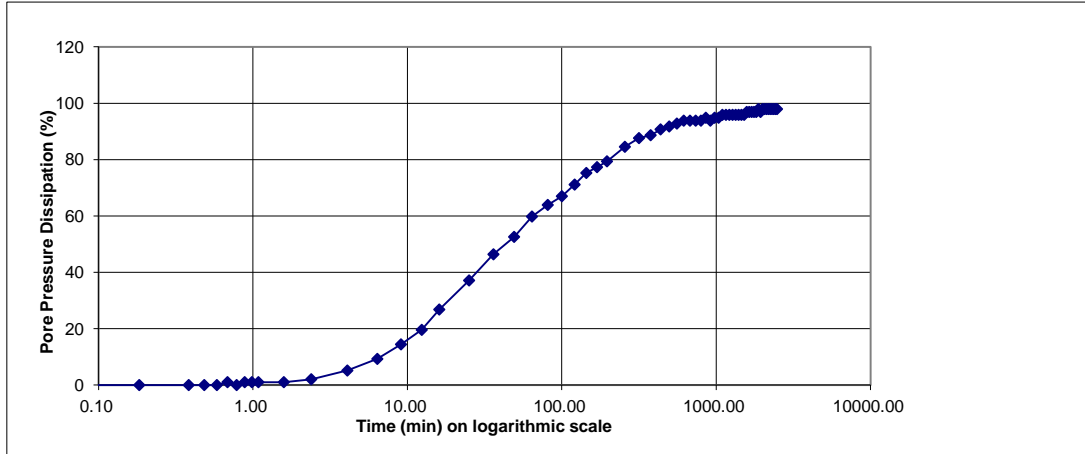
Permeability in a Triaxial Cell

BS 1377 : Part 6 : 1990 Clause 6

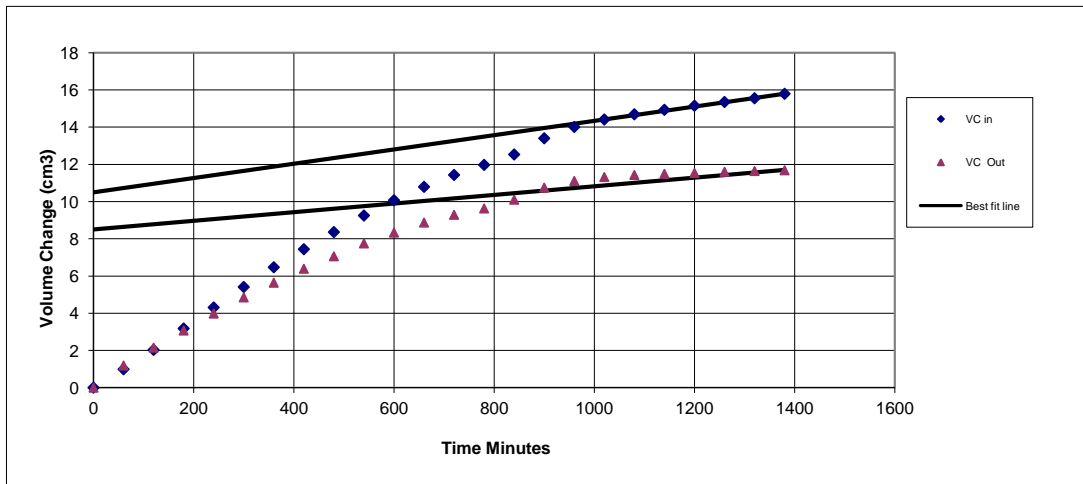
Specimen Details

Borehole		240kg
Sample No.		dry mix
Depth	m	0
Date		17/01/2014

Consolidation Stage



Permeability Stage



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17/01/14
Date



Docksway Landfill Site

Client Ref

Contract No

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2788

Permeability in a Triaxial Cell

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details

Borehole		240KG
Sample No.		WET MIX
Depth	m	
Date		17/01/2014
Disturbed / Undisturbed		Remoulded 2.5kg

Description of Specimen

Brown silty CLAY

Initial Specimen Conditions

Height	mm	104.00
Diameter	mm	102.00
Area	mm ²	8171.28
Volume	cm ³	849.81
Mass	g	1270.40
Dry Mass	g	677.70
Density	Mg/m ³	1.49
Dry Density	Mg/m ³	0.80
Moisture Content	%	87.5
Voids Ratio		2.323
Specific Gravity	kN/m ³	2.65
	(assumed/measured)	assumed

Final Specimen Conditions

Moisture Content	%	88.53
Density	Mg/m ³	1.53
Dry Density	Mg/m ³	0.81

Test Setup

Date started		10/01/2014
Date Finished		16/01/2014
Top Drain Used		y
Base Drain Used		y
Pressure System Number		PPERM4
Cell Number		CPERM4

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Client Ref



Docksway Landfill Site

Contract No

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Permeability in a Triaxial Cell

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details

Borehole		240KG
Sample No.		WET MIX
Depth	m	
Date		17/01/2014

Saturation

Cell Pressure Incr.	kPa	50.00
Back Pressure Incr.	kPa	47.50
Differential Pressure	kPa	2.50
Final Cell Pressure	kPa	500.00
Final Pore Pressure	kPa	489.80
Final B Value		0.95

Consolidation

Effective Pressure	kPa	35.00
Cell Pressure	kPa	500.00
Back Pressure	kPa	465.00
Excess Pore Pressure	kPa	24.80
Pore Pressure at End	kPa	465.00
Consolidated Volume	cm ³	836.41
Consolidated Height	mm	103.45
Consolidated Area	mm ²	8085.39
Vol. Compressibility	m ² /MN	1.2916
Consolidation Coef.	m ² /yr.	0.6358
Final Voids Ratio		2.271

Permeability

Cell Pressure	kPa	500.00
Effective Cell Pressure	kPa	35.00
Back Pressure Diff.	kPa	10.00
Mean Rate of Flow	ml/min	0.00221
Average Temperature	'C	20

Verticle Permiability Kv m/s	4.6 x 10-10
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D P Wong

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Docksway Landfill Site

Contract No

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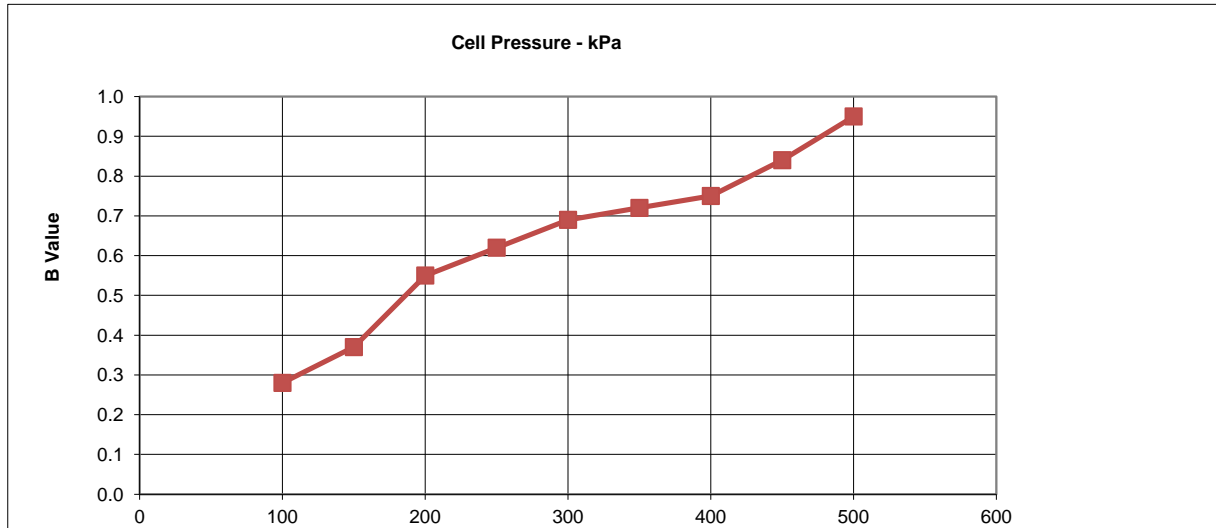
Permeability in a Triaxial Cell

BS 1377 : Part 6 : 1990 Clause 6

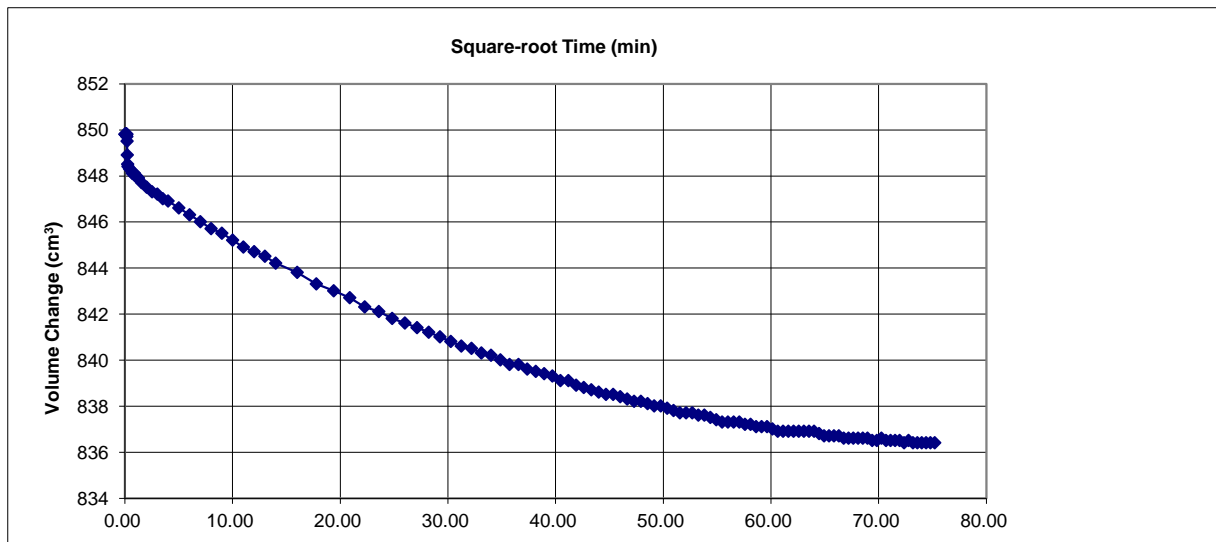
Specimen Details

Borehole		240KG
Sample No.		WET MIX
Depth	m	
Date		17/01/2014

Saturation Stage



Consolidation Stage



D P Grant

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17/01/14

Date

Client Ref



Docksway Landfill Site

Contract No

20915

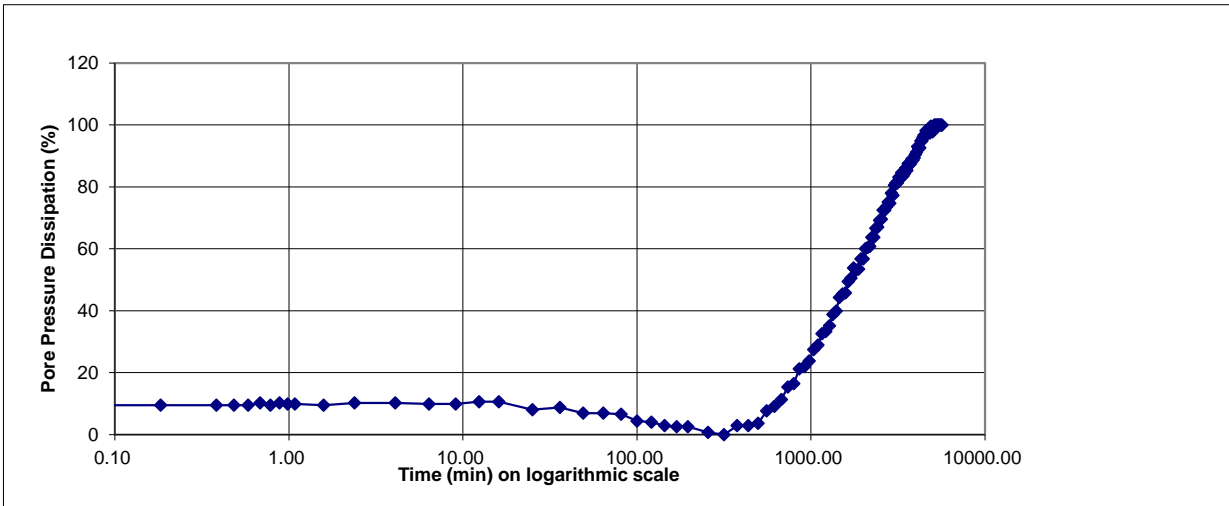
Permeability in a Triaxial Cell

BS 1377 : Part 6 : 1990 Clause 6

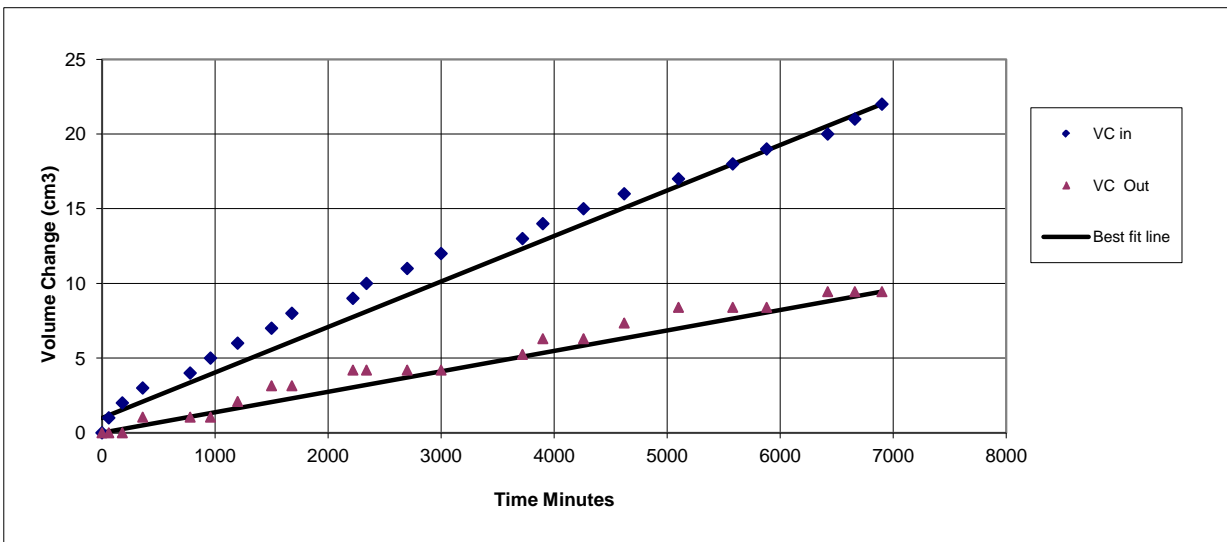
Specimen Details

Borehole		240KG
Sample No.		WET MIX
Depth	m	
Date		17/01/2014

Consolidation Stage



Permeability Stage



DP Gans

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17/01/14

Date

Client Ref



Docksway Landfill Site

Contract No

20915

Summary

Summary of Testing Completed – all testing undertaken using a cement/PFA binder with a ratio of 70% cement to 30% PFA

Test Type	No. Of Tests Completed
Moisture content, Plastic Limit and Plasticity Index (BS 1377: Part 2: 1990 Method 5)	34
Shear Strength (BS 1377: Part 7: 1990)	90
Permeability (BS 1377: Part 6: 1990 Clause 6)	4
Undrained Shear Strength in Triaxial Compression (BS 1377: Part 7: Clause 8: 1990 Multistage Test)	4

Summary of Test Results

Sample/ Sample No.	Mix Type	Plastic Limit and Plasticity Index					Permeability γ (Kv m/2)	Undrained Shear Strength				Shear Strength Tests (Total Stress)					
		Mix Time	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mix Time		Moisture Content (%)	Hand Vane (kPa)		
												Peak	Residual				
80kg/m ² /1	Wet	24 hour	151	160	84	76	-	-	-	-	-	-	24 hour	151	21	6	
															22	5	
															23	5	
															21	6	
															22	5	
															21	6	
		48 hour	112	154	61	93	-	-	-	-	-	-	-	48 hour	112	30	5
																32	5
																32	5
																30	4
29	3																
29	4																

Sample/ Sample No.	Mix Type	Plastic Limit and Plasticity Index					Permeabilit y (Kv m/2)	Undrained Shear Strength				Shear Strength Tests (Total Stress)					
		Mix Time	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesio n (kPa)	Failure Strain (%)	Mix Time		Moisture Content (%)	Hand Vane (kPa)		
												Peak	Residual				
120kg/m ² /2	Wet	24 hour	141	153	77	76	-	-	-	-	-	Top	24 hour	141	29	4	
															28	3	
															27	3	
															Bottom	27	3
																26	3
																26	3
		48 hour	106	142	48	94						Top	48 hour	106	55	10	
															58	8	
															60	10	
	Bottom														61	10	
															63	12	
															60	12	
	120 hour	169	197	64	133	Top						120 hour	169	27	3		
														23	4		
														23	4		
														Bottom	26	6	
															27	3	
															23	4	
Dry	24 hour	111	130	52	78	Top	24 hour	104	33	5							
									32	5							
									32	5							
									Bottom	34	6						
										33	5						
										31	6						

Sample/ Sample No.	Mix Type	Plastic Limit and Plasticity Index					Permeability γ (Kv m/2)	Undrained Shear Strength				Shear Strength Tests (Total Stress)										
		Mix Time	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mix Time		Moisture Content (%)	Hand Vane (kPa)							
												Peak	Residual									
		48 hour	103	128	67	61						103	48 hour	Top	48	10						
														Bottom	53	8						
															51	10						
															47	6						
															49	5						
		51	6																			
		120 hour	63	76	50	26												63	120 hour	Top	37	9
																				Bottom	37	9
																					37	6
																					47	8
49	9																					
51	6																					
160kg/m ³ /3	Wet	24 hour	124	139	59	80	-	-	-	-	-	124	24 hour	Top	30	5						
														Bottom	29	4						
															30	5						
															33	4						
															34	3						
		32	3																			
		48 hour	173	205	55	150												173	48 hour	Top	38	8
																				Bottom	43	10
																					40	10
																					19	1
21	4																					
20	2																					

Sample/ Sample No.	Mix Type	Plastic Limit and Plasticity Index					Permeability γ (Kv m/2)	Undrained Shear Strength				Shear Strength Tests (Total Stress)				
		Mix Time	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mix Time		Moisture Content (%)	Hand Vane (kPa)	
												Peak	Residual			
200kg/m ² /4	Wet	24 hour	114	138	60	78	3×10^{-9}	25	52	26	12.6	Top	24 hour	114	41	4
															41	5
															41	5
		Bottom	38	5												
			39	5												
			39	5												
		48 hour	121	160	70	90		Top	48 hour	121	41	5				
											33	5				
											40	7				
	Bottom	38	8													
		40	7													
		36	3													
	120 hour	148	179	66	110	Top	120 hour	148	63	7						
									66	10						
									65	8						
	Bottom	66	10													
		65	7													
		63	7													
Dry	24 hour	109	141	65	76	8.29×10^{-10}	25	90	45	11.1	Top	24 hour	109	53	10	
														46	10	
														50	8	
	Bottom	56	11													
		55	11													
		51	9													

Sample/ Sample No.	Mix Type	Plastic Limit and Plasticity Index					Permeability γ (Kv m/2)	Undrained Shear Strength				Shear Strength Tests (Total Stress)				
		Mix Time	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mix Time		Moisture Content (%)	Hand Vane (kPa)	
												Peak	Residual			
		48 hour	102	133	65	68	4.6×10^{-10}					Top	48 hour	102	61	17
															61	15
															58	13
															60	11
															61	11
		Bottom			61	9										
					73	13										
					70	13										
					73	13										
					71	11										
Top	120 hour	87	99	53	46						Bottom		87	70	10	
														69	12	
														42	5	
														44	7	
														44	5	
Bottom													108	42	5	
														41	5	
														41	5	
														66	8	
														61	5	
Top	24 hour	108	131	55	76								108	42	5	
														44	7	
														44	5	
														42	5	
														41	5	
Bottom													106	68	13	
														71	15	
														70	15	
														60	8	
														66	8	
Top	48 hour	106	141	79	62								106	66	8	
														61	5	
														60	8	
														68	13	
														71	15	
Bottom													106	70	15	
														70	15	
														60	8	
														66	8	
														61	5	

Docksway Landfill Soil Mixing Summary of Lab Test Results

Based on a preliminary review of the results of the laboratory testing of the various mix designs the following is a summary of observations. It will however be incumbent on the Contractor undertaking the design of the stabilisation works to undertake their own review of the laboratory test data in the process of determining appropriate methodologies and mix proportions for the stabilisation works.

In general it is observed from the results of the testing for both the wet and dry mixes that for a dose rate of 80kg/m^3 that there was a low initial strength gain and subsequent gains in strength with time were poor. With the higher dose rates the initial gains and time dependent gains in strength were much better. There also appears to be only marginal improvement in strength between the dose rate of 200kg/m^3 and 240kg/m^3 . There appears to be significant differences between the strength as determined by hand shear vane testing on the initial samples and the triaxial testing on the second stage of testing on the 200kg/m^3 and 240kg/m^3 dose rates with the triaxial testing indicating lower shear strength.

Based on the results of plasticity testing for both the wet and dry mixes it is apparent that for all dose rates the plasticity tends to reduce as the mixed soil gains strength. However the plasticity even after the 120 hours was still tending to be very high for the dry mixes and extremely high for the wet mixes.

The triaxial permeability testing tended to indicate that the dry mixes for both the 200kg/m^3 and 240kg/m^3 had slightly lower permeability than the respective wet mixes and that the higher dose rates for both wet and dry mixes had lower permeability than the lower dose rate samples. All the samples tested however met the permeability required.

APPENDIX – B

Construction Quality Assurance

APPENDIX – C

Pre Tender Information

APPENDIX – D

Form of Bond

This **GUARANTEE BOND** is made as a deed **BETWEEN** the following parties whose names and [registered office] addresses are set out in the schedule to this Bond (“the schedule”):-

- (1) The “Contractor” as principal
- (2) The “Guarantor” as guarantor, and
- (3) The “Employer”

WHEREAS

- (1) By a contract (the “Contract”) entered into or to be entered into between the Employer and the Contractor particulars of which are set out in the Schedule the Contractor has agreed with the Employer to execute works (the “Works”) upon and subject to the terms and conditions therein set out
- (2) The Guarantor has agreed with the Employer at the request of the Contractor to guarantee the performance of the obligations of the Contractor under the Contract upon the terms and conditions of the Guarantee Bond subject to the limitation set out in Clause 2.

NOW THIS DEED WITNESSES as follows:-

1. The Guarantor guarantees to the Employer that in the event of a breach of the Contract by the Contractor the Guarantor subject to the provisions of this Guarantee Bond satisfy and discharge the damages sustained by the Employer as established and ascertained pursuant to and in accordance with the provisions of or by reference to the Contract and taking into account all sums due or to become due to the Contractor.
2. The maximum aggregate liability of the Guarantor and the Contractor under this Guarantee Bond shall not exceed the sum set out in the schedule (the “Bond Amount”) but subject to such limitation and to clause 4 the liability of the Guarantor shall be co – extensive with the liability of the Contractor under the Contract.
3. The Guarantor shall not be discharged or released by any alteration of any of the terms conditions and provisions of the contract or in the extent or nature of the works and no allowance of time by the Employer under or in respect of the Contract or the Works shall in any way release reduce or affect the liability of the Guarantor under this Guarantee Bond.
4. Whether or not this Guarantee Bond shall be returned to the Guarantor the obligations of the Guarantor under this Guarantee Bond shall be released and discharged absolutely upon Expiry (as defined in the Schedule) save in respect of any breach of the Contract which has occurred and in respect of which a claim in writing containing particulars of such breach has been made upon the Guarantor before Expiry.
5. The Contractor having requested the execution of this Guarantee Bond by the Guarantor undertakes to the Guarantor (without limitation of any other rights and remedies of the Employer or the Guarantor against the Contractor) to perform and discharge the obligations on its part set out in the contract.

6. This Guarantee Bond and the benefits thereof shall not be assigned without the prior written consent of the Guarantor and the Contractor.
7. The parties to this Guarantee Bond do not intend that any of its terms will be enforceable, by virtue of The Contracts (Rights of Third Parties) Act 1999 or otherwise, by any person not a party to it.
8. This Guarantee Bond shall be governed by and construed in accordance with the laws of England and Wales and only the courts of England and Wales shall have jurisdiction hereunder

THE SCHEDULE

The Contractor: _____ whose registered office address is at

The Guarantor: _____ whose registered address is at:

The Employer: _____ whose address is at:

The Contract: A contract dated the _____ day of _____ to be entered into between the Employer and the Contractor in the form known as

**Docksway Waste Disposal Site Phase 2 Cell 3
Stabilisation**

for the construction of works comprising

**Deep Stabilization of river silts at Docksway
Waste Disposal Site.**

for the original contract sum of

£ (_____ pounds)

The Bond Amount: 20% of the contract value.

The Expiry Date: The date of issue of the Practical Completion Certificate of the Works under the Contract which shall be conclusive for the purposes of this Guarantee Bond.

IN WITNESS whereof the Guarantor and the Contractor have executed and delivered this Guarantee Bond as a Deed this day of 2014

EXECUTED AND DELIVERED as a deed by

In the presence of:

Director

Secretary

EXECUTED AND DELIVERED as a deed by

In the presence of:

Director

Secretary

APPENDIX – E

List of Technically Approved Providers

ORGANISATION	CONTACT	ADDRESS	PHONE
Deep Soil Mixing	Robert McGall Colin Critchlow	Deep Soil Mixing, Birchwood, Westoning Road, Greenfield MK45 5BH	07979 533 925 07977 117 180
Bachy Soletanche	Dan Adams	Tom Dando Close, Normanton, West Yorkshire, WF6 1TP	01924 224 220
Envirotrat	Neil Mcleod	Envirotrat Technologies Ltd, LCP House, The Pensnett Estate, Kingswinford, West Midlands. DY6 7NA	07968496927

APPENDIX – F

Sub Contractor Acceptance Procedure

Contract Ref: 2500.....

Name of Tenderer

Address

.....

Telephone No.



**SCHEME NO 2505
Docksway Waste Disposal Site
Phase 2 Cell 3 Stabilisation**

Subcontractor Assessment Procedure

**Phil Matley
Interim Head of Streetscene
Newport City Council
Civic Center
Godfrey Rd
Newport**

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Phase 2 Cell 3 Stabilisation

1 Introduction

This document provides guidance for the assessment panel on how the returned tenders are to be scored.

2 Background Information

The Council wishes to utilise its term contract agreement with Jim Davies Civil Engineering to stabilise the former river channel in order to develop the next phase of its landfill operation.

It is understood that Jim Davies Civil Engineering will have to engage a specialist sub-contractor for this work. NCC has posted a speculative notice on the sell to Wales website to ascertain whether or not there is suitable competition in the marketplace for this level of specialist activity. Previous stabilisation contracts have engaged a sole provider as there was not competition available in the market place.

We utilised our consulting Engineers to firstly screen the responses and secondly to interview those responders' in detail to ascertain their suitability to carry forward to tender stage. To this end a list of technically suitable contractors is included in Appendix E of the works information package.

The Term contractor shall engage the provider under option B of the Engineering and construction short subcontract.

Selection of the subcontractor will be made collaboratively between the term contractor and the employer by following the stages outlined below.

Assessment Procedure

Scoring Panel

The assessment of tenders will be carried out by the following personnel

Ian Fisher, Meirion Humphreys – Newport City Council
Andrew Miles – Jim Davies Civil Engineering

The tender assessment will be broken down into three phases.

PHASE 1

The contractor shall submit his designs in accordance with the requirements set out in section 2.3 of the works information. The contractor must satisfy the Project Manager via his appointed consulting Engineers of the technical suitability of their proposals.

This stage will not be scored. The design will be categorised as valid or invalid. Only those contractors with a valid design will be considered for scoring as set out in Phase 2 of the process.

PHASE 2

The final score of the submitted tender documents will be broken down as follows:-

Quality Submission (Envelope A) 60% refer to Appendix F1

The 60% available within the quality section of the returns is available over 7 separate questions. Each question is weighted according to its relative importance to the authority. Any submission scoring less than 40% in this section will be referred to the head of service who will make a decision on their continued involvement in the process.

Financial Submission (Envelope B) 40% refer to Appendix F2

The 40% available within the financial section of the returns is available by completion of the bill of quantities Presented in Appendix. The models are weighted according to the priority to the authority of that individual work element.

PHASE 3

3 Pre-Contract

The selected primary Contractor will be required to attend a pre-contract meeting before a formal appointment is made.

APPENDIX F1

Scoring of Envelope 'A' – Quality Submission. 60%

Scoring Criteria

STANDARDS	MARKS
Very high standard with no reservations at all about acceptability	100%
High standard	80-90%
Good standard - acceptable with minor reservations	50-70%
Acceptable - there are significant reservations but not sufficient to warrant rejection	10-40%
Not acceptable - rejection	0%

The quality assessment constitutes 7 differently weighted questions adding up to 100%. The sum of the scores out of 100% will determine each tenderers allocation of the 60% available for the Quality section.

Any submission scoring less than 40% in this section will be referred to the head of service who will make a decision on their continued involvement in the process.

Envelope 'A' should include comprehensive information in answer to the 7 published questions issued with the tender pack. Guidelines as to how each question is to be scored are included in red

- 1) A description of the steps you have taken during the design stage and how you propose to manage the contract, focusing on how you propose to reduce technical risk and ensure the best result for Newport City Council.

Score Weighting 50%

This question is an opportunity to demonstrate the steps you have taken to ensure the robustness of your design and to highlight the quality control techniques you intend to employ once onsite to ensure the specification is met.

Information provided may include subjects such as

- The type and result of laboratory testing undertaken on exsitu soil samples mixed to your proposed design. Extra credit will be given to any insitu trials undertaken pre contract.
- Resourcing of schemes with respect to manpower, plant, use of sub-contractors, agencies
- Coordination and management of subcontractors and suppliers
- Examples of proven track record to meet time scales and performance specifications.
- Quality Control protocols
- Health and Safety – Specific Method statements / Risk Register

- 2) The anticipated timescale of the work.

Score Weighting 15%

This aspect will be evaluated on the robustness of the programme. Shorter timescales will score higher only if supported by a demonstrable programme.

- 3) Proposed Project Management Structure including key personnel who will be specifically involved in the works. Include names, qualifications, experience and particular skills of the key individual who will be working with Newport City Council's Project Manager.

Score Weighting 10%

Demonstration that the contract will be suitably resourced. Does their management structure meet NCC requirements ie Director, Area Director, Health and Safety, Quantity Surveyor, Support Services, The lead person during the works should be the Project Manger (Supervisor). Good answers will include the names and qualifications of all persons likely to have an involvement in the contract. Also an idea of continued development would be beneficial.

- 4) Your organisations approach to Health and Safety and Risk Management. Include a draft Risk Register, with indicative mitigation strategies for each risk.

Score Weighting 10%

Health and Safety

An indication of the companies systems to manage Health and Safety. including details of company policy, organisation, planning, measuring performance, Auditing and reviewing performance. health and safety policy and Health and Safety Risk Management. Include details of any Management system your company adopts, for example HSG65 or BS OHSAS 18001:2007

Risk Reduction

This is intended to provide confidence that the contractor has the right approach to managing the scheme and what he intends to include in his risk register and how these risks can be overcome. All risk should have mitigation strategies. Risks can fall in to three brackets client, contractor or both. A demonstration of a completed risk register would be an advantage

- 5) Your understanding and approach to working under the auspices of Construction Quality Assurance schemes together with your experiences of such schemes

Score weighting 5%

A summary of the contractors understanding of CQA the requirements placed upon the client, and an indication of the various roles within the requirements focussing on that of the contractor. A summary of work undertaken under the auspices of CQA should be provided.

- 6) Your understanding and approach to working under the auspices of the Construction Design Management Regs 2007 together with your experiences of such.

Score weighting 5%

A summary of the contractors understanding of CDM the requirements with direct relation to managing the process in this scheme.

- 7) Give any examples of contracts undertaken for Local Authorities that are relevant to the description of work outlined in 1.5 above. Provide detail on Value, Quality, Duration, etc, to support your submission.

Score Weighting 5%

Assess the merits of each submission

APPENDIX F2

Scoring of Envelope 'B' – Financial Submission 40%

The Financial Scoring will be conducted by the Project Manager.

Envelope 'B' should include information in respect of the following:

- (i) The completed Bill of Quantities
- (ii) Form of Tender, the collusive tendering certificate.

Item (ii) will NOT be used for scoring, but if (ii) is not signed or dated by the appropriate person then the tender could be rejected.

As each tenderer will provide a bespoke solution the bill of quantities has been kept deliberately simple with additional scope for elements not covered.

Scoring will be conducted on the following basis.

The tenderer who submits the lowest price in each model will achieve full marks for that model. The rest of the tenderers will score based upon their relative prices as a % of the winning tender.

For example:

Assume you have 3 tenders for a particular model weighted as 20%. Tenderer 1 wins with a price of £10,000, tenderer 2 is second with £12,000 and tenderer 3 is third with £13,000. That will be used to benchmark the 20% with all other scores related to on a pro rata basis.

Tender 1 = 20%

Tender 2 = $10000/12000 \times 20 = 16.6\%$

Tender 3 = $10000/14000 \times 20 = 14.2\%$

The sum of the scores out of 100% will determine each tenderers allocation of the 40% available for the financial section.

APPENDIX – G

Bill of Quantities

PREAMBLES TO BILL OF QUANTITIES

General Directions

1. The Bill of Quantities has been prepared in accordance with the Method of Measurement for Highway Works as Section 1 of Volume 4 of the Manual of Contract Documents for Highway Works current at November 2002.

2. In the Bill of Quantities the sub-headings and item descriptions identify the work covered by the respective items, read in conjunction with the matters listed against the relevant marginal headings "Item coverage" in Chapter IV of the Method of Measurement for Highway Works, these Preambles and the amendments to the Method of Measurement immediately following these Preambles. The nature and extent of the work is to be ascertained by reference to the Drawings, Specification and Conditions of Contract. The rates and prices entered in the Bill of Quantities shall be deemed to be the full inclusive value of the work covered by the several items including the following, unless expressly stated otherwise:-

(i) Labour and costs in connection therewith.

(ii) The supply of materials, goods, storage and costs in connection therewith including delivery to Site. Taking delivery of materials and goods supplied by others, unloading, storage, and costs in connection therewith.

(iii) Plant and costs in connection therewith.

(iv) Fixing, erecting and installing or placing of materials and goods in position.

(v) Temporary Works.

(vi) The effect on the phasing of the Works or any element of the Works to the extent set forth or reasonably implied in the documents on which the tender is based.

(vii) General obligations, liabilities and risks involved in the execution of the Works set forth or reasonably implied in the documents on which the tender is based.

(viii) Establishment charges, overheads and profit.

(ix) Waste.

(x) Attendance and transport for sampling, testing, and supplying results of tests and providing test certificates.

(xi) Complying with Quality Assurance requirements of the Contract and providing certificates of conformity.

(xii) Preparation and supply of detailed working drawings.

(xiii) Awaiting approvals and or consents.

(xiv) Dewatering of the works.

Construction (Design and Management) Regulations	3. The rates and prices entered in the Bill of Quantities shall be deemed to include for complying with the statutory obligations arising from the appointment and duties of the principal contractor as set out in the Construction (Design and Management) Regulations 2007 at Regulation 16.
Measurement	4. (i) The measurement of work shall be computed net from the dimensions stated in the Contract unless otherwise stated in the Method of Measurement.
Pricing of Items	5. Each individual item shall have a rate or price entered against it. Rates and prices shall be expressed to two decimal places. 6. Not Used
Privately and Publicly Owned Services or Supplies	7. The information in the Contract as to the whereabouts of existing services and mains is believed to be correct but the Contractor shall not be relieved of his obligations under the Contract. The Contractor shall include in his rates and prices for locating and taking measures for the support and full protection of pipes, cables and other apparatus during the progress of the Works obtaining the written consent of the appropriate authority to interrupt the service or supply and for keeping the Engineer informed of all arrangements he makes with the owners of privately owned services or supplies, Statutory Undertakers and Public Authorities as appropriate.
Labours	8. Labours in connection with Nominated Sub-Contractors shall include:- (i) in the case of work or services executed - for affording the use of existing working space, access, temporary roads, erected scaffolding, working shelters, staging, ladders, hoists, storage, latrines, messing, welfare and other facilities existing on Site and the provision of protection, water, electricity for lighting and clearing away rubbish and debris arising from the work; (ii) in the case of goods, materials or services supplied - for taking delivery, unloading, storing, protecting and returning crates, cartons and packing materials.
Roadworks Overall Requirements	9. The Contractor shall allow in his rates and prices for complying with requirements in respect of pavement construction, horizontal alignments, surface levels and surface regularity of pavement courses, dealing with changes in weather conditions, use of surfaces by traffic and construction plant and general requirements for sub-bases and road bases.
Reimbursement by the Employer of Fees, Rates, Taxes and Engineers' Telephone Calls	10. The Employer will reimburse the Contractor the actual price paid by the Contractor in respect of:- (i) fees, rates and taxes - the sums certified by the Engineer as properly repayable to the Contractor in accordance with Clause 26 of the Conditions of Contract; (ii) Engineer's telephone calls - telephone calls charged to the number or numbers allocated to the Engineer. Any other cost, charge or expense in respect of these items shall be allowed for in the rates and prices for temporary accommodation.
Site Limitations and Constraints	11. The Contractor shall allow in his rates and prices for complying with any limitations and constraints on the use of the Site.

Hard Material	<p>12. For the purposes of the Contract the following are designated as Hard Material in accordance with Chapter 1 Definitions, paragraph 1(i)(i):-</p> <p>(a) * strata;</p> <p>(b) those deposits designated by limits shown on the Drawings;</p> <p>(c) existing pavements, footways, paved areas (but excluding unbound materials) and foundations in masses in excess of 0.20 cubic metres.</p>
Equivalent Products and Materials	<p>13. Where the Contractor offers an equivalent product or material in place of the one identified or specified, which is accepted for incorporation into the Works by the Engineer, then the rates and prices in the Bill of Quantities shall be deemed to include for all the obligations and costs associated with the incorporation of the equivalent into the Works, including design, provision of data and drawings certificates, awaiting approvals, resubmissions and modifications and amendments to the Works.</p> <p>Unless specifically stated to the contrary in the Contract the measurement of the Works affected by the incorporation of the equivalent products and materials shall be based on the Tender documents and not on the Works as amended and completed to incorporate the equivalent products and materials.</p>
Permanent Works Designed by the Contractor	<p>14. Where the Contract requires part(s) of the Permanent Works to be designed by the Contractor, the rates and prices in the Bill of Quantities shall include for all the obligations and costs associated with the incorporation of the Contractor's design into the Works, including design, provision of data and drawings, certificates, awaiting approvals, resubmissions and modifications and amendments to the Works.</p>
National Alterations for The Overseeing Departments of Scotland, Wales and Northern Ireland	<p>15. Where a paragraph in Chapter IV of the Method of Measurement for Highway Works (Units and Methods of Measurement) or in the Notes for Guidance on the Method of Measurement for Highway Works or in the Library of Standard Item Descriptions for Highway Works is prefixed by # this indicates that this particular paragraph has National Alteration for one or more of the Overseeing Departments of Scotland, Wales or Northern Ireland. The use of national paragraphs is permitted only within the countries to which they specifically apply and they are deemed to replace corresponding paragraphs in the main body of Chapter IV of the Method of Measurement for Highway Works (Units and Methods of Measurement) or in the Notes for Guidance on the Method of Measurement for Highway Works or in the Library of Standard Item Descriptions for Highway Works as appropriate. The National paragraphs correspond to the particular requirements of the National Alterations for the Overseeing Departments of Scotland, Wales or Northern Ireland contained in Volume 1 of the Manual of Contract Documents for Highway Works as amended August 1993. The substitute or additional paragraphs are located at the end of the relevant Series.</p>
Working Hours	<p>16. The rates supplied shall take due allowance for the programme constraints and shall allow for work outside of normal working hours where applicable.</p>
Amendments to the Method of measurement	<p>17. For the purposes of the Contract the Method of Measurement for Highway Works is amended in accordance with the pages immediately following.</p>

AMENDMENTS TO CHAPTER IV OF THE METHOD OF MEASUREMENT

**PREAMBLES
SERIES 600
EARTHWORKS**

Ground Improvement – Establishment of Site Plant

Paragraph 96

Add the following additional feature to Group I of the Group/Feature table:

Itemisation 96

Group	Feature
I	3 Establishment of soil mixing plant.

Itemisation

Group	Feature	
I	1	Total area of soil stabilisation
	2	Soil mixed columns
II	1	Different total areas
	2	Different maximum diameters
III	1	Different methods of installation
	2	Different methods of installation
IV	1	Columns not exceeding 2m in length
	2	Columns exceeding 2m in length

Note: Group II, III and IV features only apply to Group I Feature 1.

Total area soil stabilisation

109A The items for Total area Soil stabilisation shall be in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage

- (a) comply with design criteria;
- (b) certificates;
- (c) provision of data and drawings;
- (d) resubmissions and modifications;
- (e) amendments to the Works;
- (f) air or water supply;
- (g) effluent/slurry disposal;
- (h) precautions to prevent ingress of surface water or foreign matter;
- (i) preliminary treatment areas;
- (j) trial areas including standing down period if required by the contractor.
- (k) demonstrations;
- (l) site control, observations, records and reports;
- (m) Establishment of testing plant. eg. PORT rig. etc.
- (n) All Testing and reporting stabilised areas including trial areas and main works
- (o) additional materials required due to over dig or establishment of access / egress into the site over surrounding ground.

- (p) Maintenance of Temporary tracks or accesses used as vehicular routes for contractors plant or material supply.
- (q) additional fill, deposition, compaction or disposal resulting from the process of soil mixed columns.
- (q) creation of surface water pathways (grips) in final stabilised surfaces
- (r) All dewatering of working areas
- (s) Cleaning of offsite carriages subject to contamination from the contractors activities.

Soil Mixed Columns 109B The items for soil mixed columns shall be in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage

- (a) comply with design criteria;
- (b) certificates;
- (c) provision of data and drawings;
- (d) resubmissions and modifications;
- (e) amendments to the Works;
- (f) air or water supply;
- (g) effluent/slurry disposal;
- (h) precautions to prevent ingress of surface water or foreign matter;
- (i) preliminary treatment areas;
- (j) trial areas including standing down period if required by the contractor.
- (k) demonstrations;
- (l) site control, observations, records and reports;
- (m) Establishment of testing plant. eg. PORT rig. etc.
- (n) All Testing and reporting on working columns including trial areas and main works .
- (o) additional materials required due to over dig or establishment of access / egress into the site over surrounding ground.
- (p) Maintenance of Temporary tracks or accesses used as vehicular routes for contractors plant or material supply.
- (q) additional fill, deposition, compaction or disposal resulting from the process of soil mixed columns.
- (r) All dewatering of working areas
- (s) Cleaning of offsite carriages subject to contamination from the contractors activities.

Ref	Description	Qty	Unit	Rate	Amount
	<u>PRELIMINARIES</u>				
	<u>TEMPORARY ACCOMMODATION</u>				
1	Erection of principal offices for the Engineer		Sum		
2	Servicing of principal offices for the Engineer		Wk		
3	Dismantling of principal offices for the Engineer		Sum		
4	Erection of offices and messes for the Contractor		Sum		
5	Servicing of offices and messes for the Contractor		Wk		
6	Dismantling of offices and messes for the Contractor principal offices for the Engineer		Sum		
7	Erection of stores and workshops for the Contractor		Sum		
8	Servicing of stores and workshops for the Contractor		Wk		
9	Dismantling of stores and workshops for the Contractor		Sum		
10	<u>PROVISIONAL SUMS</u>				
	Additional Geotechnical testing above the frequency itemised in table 2.7.2a		Sum		15,000
	Additional areas of stabilisation		Sum		40,000
WDS Stage 2 Cell 3 Stabilization				To Part Summary	

Ref	Description	Amount
	<p>PART SUMMARY</p> <p>Page: 1/1</p>	
	<p>WDS Stage 2 Cell 3 Stabilization</p> <p style="text-align: right;">To Grand Summary</p>	

Ref	Description	Qty	Unit	Rate	Amount
	<u>EARTHWORKS</u>				
	<u>GROUND IMPROVEMENT – SOIL MIXING</u>				
	<i>Include here the costs associated with the conduction, testing, and stand down time associated with the site trial.</i>				
12	Ground Improvement to total defined area. To a minimum depth of 2m. contractor designed	15000	M ²		
	Or				
13	Ground Improvement using soil mixed columns, 2m deep contractor designed		Nr		
14	<u>IMPORTED FILL</u>				
	Imported acceptable material 6F1 to areas of column stabilisation 0.3m thick	4800	M ³		
15	<u>COMPACTION OF FILL</u>				
	Compaction of 6F1 material in 0.3m layer	4800	M ³		
16	<u>GEOTEXTILES</u>				
	Geotextiles contractor designed as load transfer blanket	16000	M ²		
17	Method Related Charges Include here any charges associated with the prospective solution that are required but not included in specific bill items.				
WDS Stage 2 Cell 3 Stabilization				To Part Summary	

Ref	Description	Qty	Unit	Rate	Amount
	WDS Stage 2 Cell 3 Stabilization		To Part Summary		

Ref	Description	Qty	Unit	Rate	Amount
	WDS Stage 2 Cell 3 Stabilization		To Part Summary		

Ref	Description	Amount
	<p>PART SUMMARY</p> <p>Page: 2/1</p> <p>Page: 2/2</p> <p>Page: 2/3</p>	
	<p>WDS Stage 2 Cell 3 Stabilization</p>	<p>To Grand Summary</p>

Ref	Description	Amount
	<p>GRAND SUMMARY</p> <p>PRELIMINARIES</p> <p>MAIN WORKS</p> <p>PRINT NAME:.....</p> <p>SIGNED:</p> <p>COMPANY:</p>	
WDS Stage 2 Cell 3 Stabilization	To Grand Summary	

APPENDIX – H

Drawings

JNA 2505 – 01 – Site Plan

JNA 2505 – 02 - General Arrangement