



# CONSULTING EARTH SCIENTISTS

**QUALITY ASSURANCE / QUALITY CONTROL PLAN: FILL  
VERIFICATION MONITORING PROGRAMME – NON LICENSED AREA**  
MANGROVE MOUNTAIN LANDFILL,  
HALLARDS ROAD, CENTRAL MANGROVE, NSW.  
PREPARED FOR VERDE TERRA PTY LTD  
CES DOCUMENT REFERENCE: CES110703-VDT-FH

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### Revision Register

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## **1. INTRODUCTION AND PURPOSE**

Verde Terra Pty Ltd (Verde Terra) has engaged Consulting Earth Scientists Pty Ltd (CES) to prepare this Quality Assurance/Quality Control (QA/QC) Plan with regard the placement of fill in the Non-Regulated areas A, C and D for remodelling of the Mangrove Mountain Memorial Club and Golf Course at Central Mangrove, New South Wales. The location of the Non-Regulated Area (to be amended during the progress of the remodelling works) is shown in Figure C of the Landfill Environmental Management Plan (LEMP 2014).

This QA/QC Plan forms a sub-plan under the LEMP 2014. The objective of this Plan is to provide fill verification QA/QC requirements for the management of filling activities associated with the Golf Course Remodelling Agreement and new golf course architectural design proposed by McKay & Sons (Refer to Appendix III of LEMP 2014).

For the purpose of this sub-plan, the Non-Regulated Area shall be referred to as “the Site”.

## **2. MATERIAL DESCRIPTION**

The materials to be utilised in the contouring and remodelling of the Site will be:

- Soil or broken rock obtained from excavation or borrow areas on the Site or fill imported into the Site.
- Imported fill shall be certified as Virgin Excavated Natural Material (VENM) or Excavated Natural Material (ENM) or other suitable Recycled Material that is permitted to be used as fill that is subject to a General or Specific Resource Recovery Exemption approved by the NSW Environment Protection Authority. Any waste-derived material the subject to a resource recovery exemption received at the Site must be accompanied by documentation as to the material’s compliance with the exemption conditions.

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- Geotechnically suitable fill, where geotechnically suitable fill is necessary for the foundation of the golf course, is fill that is capable of being compacted to form a homogeneous mass capable of supporting the proposed golf course and associated infrastructure and which does not contain the following Unsuitable Materials.
- - a. Organic soils, such as topsoil, severely root-affected subsoils and peat.
  - b. Material not assessed as Virgin Excavated Natural Material (VENM) or Excavated Natural (ENM) or materials not subject to a General or Specific Resource Recovery Exception that is permitted to be used as fill, as approved by the EPA.
  - c. Any waste-derived material the subject of a resource recovery exemption received at the Site that is not accompanied by documentation as to the material's compliance with the exemption conditions.
  - d. Materials containing substances which can be dissolved or leached out in the presence of moisture, or which undergo volume change or loss of strength when disturbed and exposed to moisture.
  - e. Silts or materials that have the deleterious engineering properties of silt.
  - f. Fill which contains significant amounts of wood, metal, plastic, boulders or other deleterious material.
  - g. Loose, soft, wet or unstable soil or rock.
  - h. Any material deemed unsuitable by the geotechnical engineer.
- Any geotechnically suitable fill required for the foundation of the golf course shall be good quality non-expansive durable material with grading requirements to the satisfaction of the geotechnical engineer; and
- Any geotechnically suitable fill required for the foundation of the golf course shall be assessed by the geotechnical engineer to be geotechnically suitable for the purpose prior to import to the site of emplacement.

### 3. VALIDATION OF FILL MATERIAL

#### 3.1. Validation of Fill Derived from Excavated Natural Materials Obtained From Inside the Regulated Area

The source of fill from within the Regulated area will primarily be the excavation of landfill Cells W, X, Y and Z (refer to Figure D of LEMP 2014). The natural ground conditions within the Regulated Area in the areas of landfill Cells W, X, Y and Z, comprise a thin layer of topsoil (typically less than 200mm), overlying natural Residual Soil (typically medium dense and dense silty sand) to depths of between 1m and 4m, which in turn overlies Sandstone rock.

There are no known occurrence of acid sulfate soils or sulfidic ores and the areas to be excavated for landfill Cells W, X, Y and Z are not known to be contaminated or have been previously used for landfilling or manufacturing purposes. It is also understood that there will be minimal time between excavation of fill from the Regulated Area and transport and deposition on the Site.

In consideration of the above, the natural soil (Residual Soil and crushed Sandstone) excavated from the landfill Cells W, X, Y and Z, is anticipated to be classifiable as Virgin Excavated Natural Material (VENM). The following procedures and validation shall be undertaken to confirm this:

- A suitably trained and experienced representative of Verde Terra will be designated to maintain records of VENM sourced from the Regulated Area. The following information shall be maintained for a period of at least 7 years, the designated member(s) of Verde Terra staff will be trained to identify natural soils and to understand the requirements of the VENM classification and maintain the following records.
  - The GPS location and elevation of the source of the material excavated.
  - A description of the material excavated and photographic records. Confirmation that the material is VENM and that no foreign materials or contamination have been incorporated into the fill during excavation and loading that would invalidate the classification.
  - An estimate of the volume of excavated and material to be transported and a record of the number of truck/equipment movements required to transport the fill to the Site.
  - A unique identifier shall be assigned to each truck/equipment movement.
  - Records of the type, size and capacity of the trucks/equipment used to transport the fill.

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- At the location of fill deposition on the Site, the following records shall be maintained.
  - The GPS location and elevation of the fill deposited.
  - A description of the material excavated and photographic records and confirmation that the classification of VENM remains valid.
  - A record of the unique identifier of for each truck/equipment movement transporting and depositing the fill.
  - An estimate of the volume of fill deposited.
  
- An independent Environmental/Geotechnical Consultant shall review the above records on a monthly basis to confirm compliance with the procedures.
  
- The independent Environmental/Geotechnical Consultant shall also undertake regular site visits to confirm compliance with the above procedures and VENM classification. Site visits by the independent Environmental Consultant shall be at least one site visit per month or one site visit per every 10,000m<sup>3</sup> of fill imported to the Site, whichever results in the more site visits.

### **3.2. Validation of Imported Fill Material (That are not Natural Materials Originating from the Regulated Area).**

The validation of fill material will include:

- Validation of fill material at the source location;
- Materials tracking of the fill material from the source site to the place of deposition; and
- Checking of fill materials as it enters the Non-Regulated Areas to ensure it is consistent with the materials described in Section 2.

Each of the above validation activities are described in the following subsections.

#### **3.2.1. Validation of Fill Material (Not Originating from the Regulated Area).**

The validation procedure for fill (other than natural materials sourced from the Regulated Area) will be as follows:

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- A suitably trained and experienced representative of Verde Terra will be designated to maintain records of VENM/ENM or materials subject to a General or Specific Resource Recovery Exemption that is imported to the Site.
- Materials not assessed as Virgin Excavated Natural Material (VENM) or Excavated Natural (ENM) or materials not subject to a General or Specific Resource Recovery Exception that is permitted to be used as fill, as approved by the EPA, will not be allowed to be imported and will not be used as fill on the Site.
- Any waste-derived material the subject of a resource recovery exemption received at the Site that is not accompanied by documentation as to the material's compliance with the exemption conditions will not be used as fill on the Site and the load(s) will be rejected.
- All imported material classified as VENM must be accompanied by a Waste Classification provided by an experienced and reputable environmental consultant.
- A suitably trained and experienced representative of Verde Terra will be designated to maintain records of VENM or materials subject to a Resource Recovery Order (RRO) and Resource Recovery Exemption (RRE) that are imported and used as fill on the Site. The following information shall be maintained for a period of at least 6 years The designated member(s) of Verde Terra staff will be suitably trained and maintain the following records.
  - A copy of the Waste Classification or RRO certification provided by a reputable and experienced environmental consultant.
  - The location and detailed description of the source location of the material excavated.
  - A description of the material imported and photographic records. Confirmation that the material received and deposited is as per the Waste Classification or RRO certification and that no foreign materials or contamination has been incorporated into the fill during excavation and loading that would invalidate the Waste Classification/RRO.
  - An estimate of the volume of material to be transported and a record of the number of truck/equipment movements required to transport the fill to the Site.
  - A unique identifier shall be assigned to each truck/equipment movement.

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- Recording of load specific data including truck registration, drivers name, asset number of contractors name, carrying capacity of the truck in tonnes, source site location, project site supervisors name, project number along with the date on a material tracking form. Material rejected will be recorded on the same form and include the above information along with the location material was taken to i.e. back to origin site if the material has not been unloaded or to a licensed waste disposal facility.
- At the location of fill deposition on the Site, the following records shall be maintained.
  - The GPS location and elevation of the fill deposited (correlatable with the unique load identifier).
  - A description of the material excavated and photographic records and confirmation that the classification VENM or RRO remains valid.
  - A record of the unique identifier for each truck/equipment movement transporting and depositing the fill.
  - An estimate of the volume of fill deposited.
- An independent Environmental/Geotechnical Consultant shall review the records maintained for the imported fill on a monthly basis.
- The independent Environmental/Geotechnical Consultant shall also undertake regular site visits to confirm compliance with the above procedures. Site visits by the independent Environmental Consultant shall be at least one site visit per month or one site visit per every 10,000m<sup>3</sup> of fill imported to the Site, whichever is the more frequent.

### **3.3. Checking of Material as it Enters the Site & Volumetric Survey**

The following would apply at the Site:

- Only material pre-validated as VENM or ENM or subject to a RRE/RRO will be permitted on the Site.

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- The Verde Terra site representative will be advised of the relevant truck details for each source prior to deliveries.
- Each load will be inspected by the Verde Terra representative or delegate as it enters the site and then as it is tipped to confirm consistency with the approved material, and confirm that there is no evidence of material inconsistent with the approved classification. This would complete the validation process for individual loads and not further tracking of material would be undertaken after it passes these inspections; and
- Should non-complying material be observed in the truck prior to tipping, that load should not be permitted to enter the tipping area. Should any non-complying material be identified after the load is tipped, that material would be isolated from other material using appropriate environmental controls. This material will either be reloaded and returned to the source site or be assessed for waste classification prior to off-site disposal to an appropriately licensed facility. Should either of these events occur, the site representative will cease excavation at the project source site and investigate the non-conformance and identify subsequent preventative measures.
- At intervals of no greater than every six months, a volumetric survey of the Site shall be undertaken by a suitably qualified Surveyor. The survey should be in a format suitable to the EPA and the Geotechnical Practitioner and should contain sufficient information to allow the Environmental/Geotechnical Consultant to cross correlate and confirm fill placement records with volumes of fill placed and to allow estimation of the degree of fill compaction.

#### **4. FILL PLACEMENT & COMPACTION**

Fill that is confirmed as VENM, ENM or acceptable material subject to an RRO and RRE that is deemed geotechnically suitable for application on the Site, will be compacted to provide a stable landform for the golf course development. The following will be required:

- Fill shall be placed in maximum 300 mm loose layers and compacted by at least 6 passes of suitable compaction plant/equipment to form a stable foundation for the subsequent layers.

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- Adequate compaction of fill shall be verified by an appropriately qualified Geotechnical Practitioner. Verification of adequate compaction shall be confirmed using one or a combination of the following methods:
  - Observation of Proof Roll Tests by a suitably qualified and experienced Geotechnical Engineer.
  - Insitu density testing of the fill using such methods as a Nuclear Density Gauge, Insitu Sand Replacement methods or indirect methods such as the use of Dynamic Cone Penetration Test (DCP) (as generally described in AS 1289.5.3.1, AS 1289.5.3.2, AS 1289.5.8.1, AS 1289.5.5, AS 1289.6.3.2, AS 1289.6.3.3 and/or AS 1289.6.5.1).
  - Review of fill volume/mass placement records and survey data records.
- Compaction verification testing shall be undertaken as advised by the Geotechnical Practitioner. Verification of adequate compaction shall be confirmed in accordance with the following testing frequency (whichever is the more frequent):
  - 1 test per layer per material type per 5,625m<sup>3</sup>; or
  - 1 test per 7,500m<sup>3</sup> distributed reasonably evenly throughout full depth and area.
- Following completion of placement of the fill, at designated stages or at intervals recommended by the Geotechnical Practitioner, a report will be prepared that contains the results of the filed compaction testing and an assessment as to whether or not the fill has been compacted to a condition assessed geotechnically suitable for the purpose of the foundation and landform for the proposed Golf Course Development.

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