Moorebank Precinct West Intermodal Terminal Facility - Modification
Geotechnical and Contamination Memorandum

Part 4, Division 4.1, State Significant Development

June 2016
1.0 INTRODUCTION

The Moorebank Intermodal Company (MIC) has received Concept Plan Approval, under Part 4, Division 4.1 of the Environmental Planning and Assessment Act 1979 (EP&A Act), to develop the Moorebank Precinct West Intermodal Terminal Project (MPW Project) on the western side of Moorebank Avenue, Moorebank, in south-western Sydney (the MPW site).

On 4 June 2015, the MIC, with the approval of the Commonwealth Government, entered an agreement with the Sydney Intermodal Terminal Alliance (SIMTA) under which SIMTA will obtain approvals, build and operate all stages of the MPW Project at Moorebank. SIMTA is seeking approval to modify the MPW Concept Proposal and Stage 1 (Early Works) approval (SSD_5066) (MPW Concept Plan Approval).

The Environmental Impact Assessment (EIS) prepared for the Concept Plan Approval identified that fill material required for the development of the MPW site would be largely sourced from excavations within the MPW site and hence imported fill volumes for the project would be relatively minor. Subsequent civil design development for the MPW Project has identified that fill required to be imported to the MPW site is estimated at 1,600,000 cubic metres (m$^3$). It is proposed to undertake additional site preparatory works, including the import, placement and stockpiling of clean fill, as a modification to the approved Stage 1 (Early Works).

This Geotechnical and Contamination Memorandum has been prepared to support an application made under section (s) 96(2) of the EP&A Act to modify the MPW Concept Plan Approval (SSD_5066) to allow for the Modification Proposal. The Modification Proposal includes the importation, direct placement, compaction and stockpiling of a total of 1,600,000m$^3$ of fill to the primary earthworks area. Figure 1 shows the location of the proposed Modification Proposal, including the area of impact and the primary earthworks area, where direct placement and stockpiling of material would be undertaken.

This memorandum has been prepared in accordance with the request (received from Nathan Cairney of Tactical, 20th April 2016) and our proposal of 22nd April 2016 (Ref: 1416224-026-P-Rev0).
Figure 1: Proposed earthworks (MPW Concept Plan Modification)
1.1 Purpose of this memorandum

This Geotechnical and Contamination Memo assessment report has been prepared to provide further information on, and environmental assessment of, the Modification Proposal. The Modification Proposal has been reviewed against the Secretary’s Environmental Assessment Requirements (SEARs, SSD 5066) and documentation prepared for the MPW Concept Plan Approval and applicable legislation and guidelines to determine whether the works and associated impacts of the Modification Proposal are ‘substantially the same development’ as that proposed under the MPW Concept Plan Approval.

This memorandum highlights the geotechnical and contamination issues pertaining to the area of the proposed imported fill stockpile (primary earthworks area) and the anticipated impact of the proposed stockpile on the existing site conditions. The memorandum also addresses the development of the detail design of the stockpile material and arrangement.

2.0 EXISTING SITE CONDITIONS

The MPW Concept Plan Approval (SSD 5066), includes conceptual approval to use the land held by MIC as an intermodal terminal, and to undertake “Early Works (Stage 1)”. The NSW Department of Planning and Environment draft conditions of consent, defined the Early Works (Stage 1) as:

- removal of existing hardstand/roads/pavements and infrastructure associated with existing buildings including services termination and diversion
- rehabilitation of the excavation / earthmoving training area;
- remediation of contaminated land;
- removal of underground storage tanks;
- minor clearing and grubbing of the temporary stockpiling area
- heritage impact remediation works; and
- the establishment of construction facilities and access, including site security.

The primary earthworks area that is the area of proposed filling covers a variety of previous land-use. A large part of the area is grassed with scattered trees, occupied by low rise warehouses, administration and training buildings, and residential housing associated with the former Army School of Engineering (SME). Paved access roads, along with paved and unpaved open space and landscaped sporting fields occupy a large proportion of the site. A number of ponds are present in the north eastern corner of the proposed stockpile area. An existing stormwater system comprising pits, pipes and open channels runs through the area. However it is anticipated that these features will be removed, redirected and remediated as appropriate as part of the approved Early Works.

A summary of the geology, soils and contamination of the area and key geotechnical and contamination aspects of subsurface conditions, relating to the Modification Proposal are discussed below.

2.1 Geology

The published 1:100,000 Penrith Geological Map (NSW Department of Minerals, 1991) indicates that the area of impact is characterised by Tertiary alluvial deposits (Ta) of Pliocene age with terraces of more recent Quarternary (Holocene) age (<10,000 years) alluvial deposits (Qha) adjacent to the Georges River. The geological map indicates that the underlying rock conditions in the area are either Triassic Hawkesbury Sandstone (Rh) or Ashfield Shale (Rwa). A brief overview of the ground conditions encountered within the area of impact is provided below. Geological conditions at the MPW site are discussed in further detail in the Golder Geotechnical Interpretive Report (Ref. 147623070-011).

2.2 Soils
Outside of existing structures, a variety of paved and unpaved surfaces are present across the area of impact. In unpaved areas, the site is characterised by a relatively thin layer of predominantly granular topsoil, underlain by alluvial soils over bedrock. The topsoil thickness encountered during investigation varies up to approximately 0.2 m thickness but is typically 0.1 m thickness or less. The organic content varies but is typically minor. At selected investigation locations evidence of prior topsoil layers being filled over was observed. Locally thicker and more humic topsoil is to be expected in the immediate proximity of established vegetation (e.g. stands of trees and bushes). In some areas locally deep anthropogenic fill has been encountered up to 4 metres (m) deep (for detail reference can be made to the Golder Post Phase 2 ESA, Ref: 147623070-019, 2015).

In the primary earthworks areas, the natural alluvial material is a mixture of granular/sand (typically medium dense or denser) and cohesive/clay material (typically of very stiff consistency or harder). Cohesive alluvial material predominates over granular alluvial material, which is typically present as sand seams or bands within a clay profile. The depth to bedrock varies across the area typically in the range of 10m below ground surface to 25m below ground surface.

Following site preparation, in accordance with activities noted as being part of Early Works above, the foundation for filling is anticipated to typically include sand fill, clay fill, alluvial clay and alluvial sand. As discussed in the Golder Geotechnical Interpretive Report (Ref: 147623070-11), significantly different performance can be expected between the granular (i.e. sand) and cohesive (i.e. clay) material as a subgrade/stockpile foundation (i.e. differing soaked CBR values and swell potential). Differing performance is also likely between the alluvial and fill material of similar grain size (e.g. both clay or both sand), although to a lesser degree.

The exception to this is the anthropogenic fill which due to the nature of its placement (inferred to be uncontrolled) and inclusions (such as timber, steel and concrete building debris and general rubbish) will typically not be suitable as a foundation in its current condition.

Due to historic site use, the lateral extent of fill will vary at similar elevations. Likewise sand seams and bands within the dominantly clay alluvium will be laterally discontinuous. Delineation of zones of granular versus cohesive subgrade may prove difficult, even with relatively extensive investigation, prior to stripping and exposure of subgrade.

Foundation preparation requirements will be addressed in the site specific Earthworks Specification (the Earthworks Specification) as discussed further in Section 3.0 of this memorandum.

2.3 Groundwater
Groundwater beneath the primary earthworks areas has been recorded as typically between 9 to 12m below existing ground surface (i.e. approximately RL 2m to RL 6m) and flowing towards the Georges River (west). This was broadly corroborated by the recent Stage 2, 2016 investigation undertaken by Golder Associates except at GA-TP-3112 which recorded groundwater inflow at 2.9m below ground surface. This was inferred to be a local effect resulting from the proximity of an existing pond.

The impact of the proposed stockpile on groundwater levels will be dependent on numerous factors including the manner in which the foundation of the stockpile is prepared, the nature of the stockpile material and surface drainage provided within and around the stockpile. We note that ongoing groundwater monitoring is expected as part of the long term environmental management plan. More detailed assessment of groundwater impacts may be appropriate dependent on the duration of the proposed temporary stockpiling and the level of sensitivity of the management measures for groundwater risk to fluctuations in groundwater level.

2.4 Contamination
The contamination on the site has been subject to numerous investigations with the most current investigation documents included in the MPW Concept Plan EIS. These included the Phase 1 and Phase 2 Environmental Site Assessment Reports and the provisional Remediation Action Plan (RAP), prepared by PB in 2014, and the Post Phase 2 Environmental Site Assessment Report and Validation Plan - Principals prepared by Golder Associates in 2015.
Subsequently as part of the Early Works, the site will be remediated to the extent permissible under the MPW Concept Plan Approval (SSD - 5066). These remediation works will be audited by an accredited contaminated land Auditor, and that the Auditor will prepare a section A, Site Audit Statement at the completion of the remediation works. The Site Audit Statement will be provided to the consent authority to satisfy the obligations under Clause 7(1) of State Environmental Planning Policy 55 and the MPW Concept Plan Approval Minister’s Conditions of Approval (MCoA) B1 to B3.

2.4.1 Early Works Remediation

The remediation to be completed under the Early Works will include:

- the demolition, excavation and remediation of known underground storage infrastructure and associated contaminated soils impacted with petroleum hydrocarbons;
- the excavation and remediation of known stockpiles of building demolition waste and/or asbestos contaminated soils;
- the excavation and remediation of known areas of soil contamination (‘hotspots’) including soils impacted with lead, and petroleum hydrocarbons at concentrations which present an unacceptable risk to the future use of the site;
- the assessment and if required remediation of materials suspected of being contaminated with polychlorinated bi-phenols (PCBs), organochlorine pesticides (OCP) and per- and poly-fluorinated alkyl substances (PFAS); and
- the assessment and if required remediation of underground utilities suspected as either being made of or suspected of containing hazardous or contaminated materials.

The remediation and validation works will be completed in accordance with the guidelines endorsed by the NSW Environmental Protection Authority (EPA) under Section 105 of the Contamination Land Management Act 1997 (CLM Act).

The NSW EPA’s preferred position on the selection of remediation options, as stated in the DEC, NSW (2006) Auditor Guidelines, is to preference on-site treatment of the soil so that the level of contaminant is either destroyed or the associated hazard is reduced to an acceptable level ahead other remediation options. Onsite treatment is applicable for the identified hydrocarbon contaminants which are amenable to onsite biological treatment through land farming. However, recalcitrant contaminants such as heavy metals and asbestos are often not amenable to onsite treatment, and alternative options such as excavation and isolation, excavation and disposal, or leaving contaminated material in situ with management controls are appropriate options for consideration. This prioritisation is supported by the NSW EPA Waste Avoidance and Resource Recovery Strategy [WARR] (EPA 2014), which adopts the waste minimisation hierarchy and is aimed at avoiding and reducing the generation of waste.

The remediation works will include the preparation of documents expected to be required to facilitate the progression of the remediation and ensure appropriate mitigation measures are implemented during the future development of the site:

- **Stage specific Remediation Action Plans (RAPs)** – a RAP specific to each stage of development will be required to accommodate the detailed engineering design within the adopted remedial approaches, as well as to align with the staged development approval process. The stage specific RAPs are to refer to the Preliminary RAP (PB, 2014b), and the Site Validation Principles (Golder, 2015c) and are to include validation plans appropriate for each proposed stage of development which includes remediation actions.

- **Stage specific Remediation and Validation Reports (RVR)** – at the appropriate time and where required, a RVR will be prepared for each development area. These reports will document the remediation and validation activities completed within a specific area. These reports will facilitate the Auditor’s review of the remediation and validation activities;

- **Construction Environmental Management Plan (CEMP)** – a CEMP will be developed specific to each stage of development, and where required the CEMP will draw on the requirements of MCoA D19, the
processes described in the Preliminary RAP (PB, 2014a), the Validation Plan - Principles and the Remediation Specification (Golder 2015c), as well as the Stage Specific RAP developed for that stage of the MPW Project. The CEMP will also stipulate the actions to be taken should additional contamination be identified during the development of the site (i.e. an unexpected finds protocol).

- **EOW and UXO Management Plan** – a site wide, and/or stage specific EOW/UXO Management Plan will need to be developed as part of the CEMP to ensure a safe working environment is established during earthworks.

- **Asbestos in Soils Management Plan (AMP)** - the AMP will be prepared to specifically address the management of asbestos in or on soils during the remediation and staged development of the site. The AMP will define the actions, roles and responsibilities associated with the management of asbestos in or on soils during the proposed development works. Any management or remediation actions undertaken in relation to asbestos in soils will be undertaken in accordance with the Safe Work NSW requirements, including but not limited to the guidelines for Managing asbestos in or on soil (2014), and Codes of Practice - How to Safely Remove Asbestos (2011) and How to Manage and Control Asbestos in the Workplace (2011). Asbestos works will also be undertaken by appropriately trained persons including those with Class A licences for the removal of friable asbestos and / or Class B licences for the removal of non-friable asbestos. The remediation and/or management actions will include:
  - Onsite in-situ containment through the direct placement of cover fill materials to prevent future disturbance of the impacted materials and therefore minimise the potential for the materials to generate airborne fibres. The cover will be nominally minimum 0.5 meters (m) depth. However, in areas where the final design require less than 0.5m of cover, visible ACM fragments will be removed and the area nominated for closer management within the Long Term Environmental Management Plan;
  - Onsite excavation and containment through the excavation and replacement of asbestos impacted soils in a nominated containment area. The onsite containment areas will be nominated in consultation with the appointed Site Auditor, will consider positions on the site which present minimal impact to the proposed development and minimise the potential for disturbance during the future operation of the site. Containment will include the placement of materials at depths generally greater than 1.5m, and will include a minimum of 0.5 m cover to minimise the potential for the materials to generate air borne fibres. Onsite containment locations will be mapped and noted for closer management within the Long Term Environmental Plan;
  - Excavation and offsite *disposal* through the excavation, transport and offsite disposal of soils impacted with asbestos. Excavation works will be completed at areas where impacted soils are not considered suitable or onsite in situ containment, or are unsuitable for inclusion within an onsite containment area. Excavated materials will be disposed of in accordance with the requirements of the Waste Management Plan, and will be disposed at a facility appropriately licenced by the NSW EPA for the receipt of friable asbestos wastes.

The AMP will include general requirements for the management of asbestos works including consultation requirements, licencing requirements, health monitoring and air monitoring requirements. The AMP will also include protocols for un-expected finds of asbestos during future development earth works. It is expected that where warranted the AMP will be updated and reissued at the completion of the Early Works remediation activities, and as each stage of development is completed.

- **Long Term Environmental Management Plan (LTEMP)**, a site wide LTEMP will be developed at the completion of the remediation works and will prescribe the protocols for the ongoing maintenance and /or monitoring or any long term remedial or mitigation measures implemented during the remediation. The LTEMP will include the roles and responsibilities for implementation, the consultation requirements, and licencing requirements. The LTEMP will stipulate the actions to be taken should additional contamination be identified during the post development occupation of the site (i.e. an unexpected finds protocol, an asbestos in soils response plan and UXO/EOW response plan). It is expected that where warranted the LTEMP will be updated and reissued as each stage of development is completed.
3.0 MODIFICATION WORKS

It is proposed to undertake additional site preparatory works, including the import, placement and stockpiling of clean fill, as a modification to the approved Early Works. The proposed modification would result in an intensification of activity associated with the approved Early Works. The works, for which a modification is sought (the Modification Proposal), include the following:

- Minor vegetation removal (not Endangered Ecological Communities, slightly above that provided within Early Works)
- Import, by truck, of approximately 1,600,000 m³ of fill (from offsite locations)
- Stripping and stockpiling of topsoil within the area of impact, cut and fill (within the primary earthworks areas) and stockpiling of clean fill within the primary earthworks areas (see Figure 1)
- Temporary sediment and erosion control works, including onsite detention basins (greater than those envisaged within the Early Works)
- Establishment of temporary internal haulage routes, construction compounds (including, but not limited to, a materials crusher and other plant and equipment) (additional to those included within Early Works).

Figure 1, above, shows the location and extent of the Modification Proposal, which would occur largely within the footprint of the approved Early Works.

3.1 Earthworks

The nature of the fill to be imported for permanent placement and stockpiling is understood to be a clean, non-expansive, sandstone fill, in general accordance with a material derived from the sandstone bedrock indicated in borehole logs LDS-BH-1042 and LDS-BH-1050 (Attachment 1). The stockpile layout is shown in the Earthworks Plan (Drawing No. MCPN-ARC-CV-DWG-0111, Issue 01), provided as Attachment 2.

The materials are likely to be sourced from a local Sydney tunnel that is to be excavated with road headers, producing a spoil mix comprising sands, gravels and cobbles. Some fine grained materials will also be present but are expected to make up less than 10% by weight. Dependent on the grading of the as received material some processing (possibly screening only or crushing and screening) will be required to provide a material suitable for permanent placement in accordance with the Earthworks Specification.

In general the material would also need to be equivalent to Class 1 or 2 materials (i.e. compliant with the NSW EPA definitions of Virgin Excavated Natural Materials or Excavated Natural Materials) as discussed in the in the Validation Plan – Principles (Golder, 2015) and as included in the MPW Concept Plan application. To be compliant with the above mentioned definitions, consideration will also be given to the potential for acid rock conditions within potential fill sources and dependent on the material source (and its variability) laboratory testing for acid rock conditions will be completed.

Furthermore, the importation and placement of permanent fill will need to conform to the project Earthworks Specification, which is yet to be developed. The Earthworks Specification will include details on earthworks material criteria, handling and placement requirements, embankment and cutting formation (including foundation, batter and benching requirements), unsuitable material and bridging layer requirements, conformance testing methods and acceptance criteria (e.g. for material acceptance and compaction control). It is noted that for the upper zone of the permanently placed fill (which may form subgrade to pavement or foundation to structures) particular requirements will exist to mitigate against, for example, stress concentrations around cobbles sized material underlying pad footings.

Permanent fill and the overlying temporary stockpile will be derived from material which performs as an earthfill rather than a rockfill. Meaning, the fill should be constructed such that its strength and stability are obtained from compaction of finer material (dominantly sand grain size), embedding larger rock pieces (to the maximum particle size and in proportions satisfying the requirements of the project Earthworks Specification) rather than mechanical interlock (as might apply in a rock fill embankment). The material
grading adopted within the Earthworks Specification for imported sandstone should be such that validation testing of compaction is possible by conventional methods. This will require that rock material is sufficiently broken down and evenly distributed through the fill material, with sufficient finer material surrounding to produce, dense, compact fill layer to the project Earthwork Specification requirements.

Laboratory testing of proposed imported fill material should be undertaken to confirm suitability in accordance with the project Earthworks Specification. In view of the sandstone fill proposed for importation such testing, for material intended for permanent placement will include:

- Laboratory compaction testing
- Soaked CBR testing (with prior pre-treatment in accordance with RMS T102 and T103)
- Particle Size Distribution (as received and post pre-treatment in accordance with RMS T102 and T103)
- Atterberg Limit Testing.

3.2 Direct placement of fill

Direct placement of fill will require foundation preparation in accordance with the project Earthworks Specification. In general foundation preparation will typically involve clearing and grubbing, grading, levelling, moisture conditioning and compaction of an upper zone of the subgrade. General clearing should include removal of everything on or above the site surface, including rubbish, vegetable matter and organic debris, scrub, trees, timber, stumps, boulders and rubble, slabs, foundations, retaining walls, paving, abandoned services and the like. Before commencing foundation preparation any infrastructure (e.g. relocated services) will be located, marked and documented in the areas that will be affected by the earthworks operations. It is noted that poorly documented infrastructure locations could present a significant risk to future development, particularly should deep foundations be required.

Due to the variable nature and depth of ‘topsoil’, assessment will be made in accordance with the Earthworks specification as to the appropriate depth of topsoil stripping at specific locations. Scalping of vegetation (e.g. grass cover) will be necessary as part of general grading and preparation for filling. Some localised areas free of topsoil will likely be encountered based on the proposed footprint of stockpiling. In other areas locally deeper topsoil will be encountered (e.g. within zones of established vegetation). Final depths of topsoil stripping will be determined in accordance with the Earthworks Specification. However, for planning purposes an average allowance of 0.1 m of topsoil stripping is made.

Provision for addressing unforeseen zones of ‘unsuitable’ material will be addressed within the Earthworks Specification. It is noted that higher compaction requirements are likely to be required for the foundation and direct placed fill itself than may be acceptable for the temporary fill stockpile. There is potential for ACM and EOW /UXO to be encountered during topsoil stripping and this will be managed in accordance with the Asbestos in Soil Management Plan and EOW/UXO Management Plan.

The height of areas of direct placed fill is understood to vary, general comments on management of surface water, potential scour, slope stability and protection from fouling with vegetation provided in Section 3.3 apply also to the lower portion of placed fill intended to be left in place permanently.

3.3 Stockpiling of fill

Stockpiles will be placed and compacted in accordance with the Earthworks Specification. Adequate compaction will be required to achieve necessary stability, mitigate against erosion and provide a sufficiently trafficable surface to enable maintenance and inspection. However, compaction requirements for the stockpile material will likely be less than that for permanent fill placement.

Compaction requirements adopted in the Earthworks Specification should be developed in consideration of the intended life of the stockpile (i.e. how long it will be in place) and performance requirements including accessibility. As a preliminary guide, a relative compaction of 90% Standard Maximum Dry Density (SMDD) will likely be acceptable for temporary stockpiles. A higher level of compaction will be considered if proposed batter slope angles or vehicle loading necessitate it. Consideration will also be given to the allowable proximity of plant and equipment to the crest/edge of the temporary stockpile.
The Earthworks Plan, (Drawing No. MCPN-ARC-CV-DWG-0111, Issue 01), provided as Attachment 2, indicates a stockpile height of 6m with batter slopes of 1V:3H. Adequate stability is likely to be readily achievable for an imported sandstone product such as could be produced from the sandstone bedrock shown on the provided borehole logs, when adequately compacted. Maximum batter slope limits should be provided in the Earthworks Specification but would likely be limited to 1V:2H for temporary stockpiles. This steeper slope angle (than the 1V:3H indicated in the provided drawing) should be readily achievable for an adequately compacted sandstone fill. However, it is noted that shallower slopes may be suitable in consideration of potential maintenance and access requirements (particularly so for the base of the stockpile which will be left as a permanent feature).

For heights greater than 4m, benching will be implemented. A bench will also be incorporated at the top of the permanent fill placement such that some flexibility exists in the maximum height of the temporary fill batter above. This may also present an advantage in installation of erosion protection and drainage measures as discussed below. The bench height will be set above finished level for permanent placement, such that ‘fouling’ of the near surface of the bench, during operation of the temporary stockpile, could be addressed by stripping an upper zone (say 1 to 2 lifts up to 500mm) off the zone of the perimeter bench at the time of removal of the overlying stockpile.

To maintain trafficability and manage surface water, the temporary stockpile will be graded and potentially provided with a temporary surfacing in some or all areas dependent on access requirements and usage. The surfacing appropriate will be dependent on the nature of the imported fill adopted and the access and usage requirements of the stockpile. In view of this, surfacing may be restricted to provision of (zones) of spray polymer or durable inert crushed rock (e.g. ‘blue metal’). If high quality imported fill is obtained and/or frequent access to and usage of the surface of the stockpile is not required it may not be necessary to provide any surfacing.

The potential for fouling of the upper lifts(s) of the stockpile with vegetation will be addressed in the Earthworks Specification and in consideration of appropriate surfacing. It is noted that, given the large areal extent of the stockpile, unintended spread of vegetation (e.g. grasses) within unprotected surfaces could result in the need for treatment of a large volume of otherwise ‘ready to place’ material.

If considered appropriate, a grass cover will be established over the lower portion of the fill, intended as permanent placement early on, to manage erosion and surface flow issues associated with the overlying temporary stockpile. A bench at the approximate interface between the permanent and temporary filling (as described above) would also have the advantage of separating these zones with different batter slope protection measures.

Temporary erosion and sediment control measures will be required for the stockpile and will include the installation of crest drains and batter chute drains, as required. These will be detailed within a Sediment and Erosion Control Plan prepared in accordance with the requirements of the Landcom, Soils and Construction, Managing Urban Stormwater Volume 1 4th Edition, March 2004.

The magnitude of surface drainage measures will be developed based upon suitable hydrological assumptions pertinent to the site. The sophistication and durability of the drainage measures will be developed in consideration of the intended life of the stockpile. However, the impact of the surface drainage elements adopted on the permanent fill placement below will also be considered. For example, appropriate frequency of chute drains and what level of energy dissipation might be appropriate. Seeding of a lower permanent batter should provide protection against scour and erosion. Mitigation of the grass spreading into the overlying temporary batter and (potentially fouling the materials) would be aided by physical separation with a bench at the approximate boundary of the permanent fill materials and temporary stockpiles materials and might be addressed by spraying with an acceptable herbicides.

4.0 CONCLUSION

Importation of sandstone fill presents a number of benefits for the management of asbestos contamination, potential UXO/EOW and subgrade performance issues. Management of quality control aspects of the permanent fill and risks associated with temporary stockpiling should be addressed by a site specific earthworks specification (the Earthworks Specification) developed in consideration of the final design layout adopted and operational requirements relating to the stockpiling during construction stage.
Key geotechnical and contamination benefits resulting from the importation of non-expansive sandstone fill meeting the Earthworks Specification requirements are:

- Provision of a more consistent less moisture sensitive working platform
- Provision of a laterally consistent layer for which pavement design can be developed consistently over large areal extents (where appropriate to design loads and operational requirements), with possible economy in pavement design
- Possible economy in pavement design due to potentially higher CBR values being achievable for the imported fill than existing site material (dependent on the actual level of subgrade, resulting from design fill heights and pavement thicknesses)
- Potential improvement of foundation performance via “pre-loading” effect of the temporary stockpile

In summary, impacts on geotechnical considerations within the area of impact associated with the Modification Proposal constitute a small change from those assessed for the Early Works under the MPW Concept Plan EIS, Response to Submissions (RtS) and Supplementary Response to Submissions (SRtS). Through the implementation of the mitigation measures approved for the MPW Concept Plan and the RMCoA, impacts associated with the Modification Proposal are expected to be consistent with the impacts predicted within the MPW Concept Plan EIS.

The recommended mitigation measures include the development and implementation of the following, in accordance with the MPW Concept Plan Approval and supporting documentation:

- Earthworks Specification
- Sediment and Erosion Control Plan
- Construction Environmental Management Plan (CEMP)
- EOW and UXO Management Plan
- Asbestos in Soils Management Plan (AMP); and
- Long Term Environmental Management Plan (LTEMP).

5.0 CLOSURE

We trust this memorandum provides sufficient input to your supporting memorandum as requested. If you have any questions, please do not hesitate to contact the undersigned in our Sydney Office.

Attachments:
Attachment 1 – Borehole Logs provided by client
Attachment 2 – Earthworks Plan, Drawing No. MCPN-ARC-CV-DWG-0111, Issue 01, Arcadis

Nathan Steggles       Greg Stratton
Senior Geotechnical Engineer      Principal Environmental Engineer

NRS/GVS:BJF/nrs
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Conditions may exist which were undetectable given the limited nature of the enquiry Golder was retained to undertake with respect to the site. Variations in conditions may occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been taken into account in the Document. Accordingly, additional studies and actions may be required.

In addition, it is recognised that the passage of time affects the information and assessment provided in this Document. Golder’s opinions are based upon information that existed at the time of the production of the Document. It is understood that the Services provided allowed Golder to form no more than an opinion of the actual conditions of the site at the time the site was visited and cannot be used to assess the effect of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations.

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Attachment 1 – Borehole Logs
This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.
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### Soil/Rock Material Description

<table>
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<th>Penetration Resistance</th>
<th>Soil/Rock Material Description</th>
<th>USCS Symbol</th>
<th>Moisture Condition</th>
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<th>Structure and Additional Observations</th>
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</tr>
</tbody>
</table>

**Note:**
- **METHOD**
- **SAMPLE OR FIELD TEST**
- **SOIL/ROCK MATERIAL DESCRIPTION**
- **DRILL RIG:** Hydropower Scout
- **CONTRACTOR:** Hagstrom Drilling Pty Ltd
- **LOGGED:** MHA/JN
- **CHECKED:** GMcN
- **DATE:** 8/1/16
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### Field Material Description

<table>
<thead>
<tr>
<th>DEPTH (m)</th>
<th>ROCK / SOIL MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>26.69</td>
<td>SANDSTONE WITH 5% SILTSTONE LAMINATIONS medium to coarse grained, pale grey, indistinctly bedded at 0-20°, slight iron staining on bedding</td>
</tr>
<tr>
<td>28.09</td>
<td>Continuation of Sheet 3</td>
</tr>
</tbody>
</table>

**Defect Information**

- **INFERRED STRENGTH (f<sub>ck</sub>, MPa):**
  - MW: 1.5

- **DEFECT DESCRIPTION & Additional Observations:**
  - 28.91 m: B, 7°, Un, Ro, Ct, clayey sand
  - 28.41 m: B, 7°, Un, Ro, Cn

**Notes:**

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**REVISION C REPORT OF BOREHOLE: LDS-BH-1042**

**CLIENT:** CDSJV  
**PROJECT:** WestConnex - The New M5  
**LOCATION:** M5 East Motorway  
**JOB NO:** 1524285  
**COORDS:** 329653.0 m E 6243541.0 m N MGA94 56  
**DRILL RIG:** Hydrapower Scout  
**CONTRACTOR:** Hagstrom Drilling Pty Ltd  
**LOGGED:** MHA/JN  
**CHECKED:** GMcN

---

**Table: Rock/Soil Material Description**

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Material Description</th>
<th>Defect Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>48.60</td>
<td>SANDSTONE WITH 3% SILTSTONE LAMINATIONS</td>
<td></td>
</tr>
<tr>
<td>50.08</td>
<td>SANDSTONE fine to medium grained, massive, pale grey, with trace clasts</td>
<td></td>
</tr>
<tr>
<td>50.57</td>
<td>SANDSTONE WITH 10% SILTSTONE LAMINATIONS</td>
<td></td>
</tr>
<tr>
<td>50.99</td>
<td>SANDSTONE WITH SILTSTONE FLECKS</td>
<td></td>
</tr>
<tr>
<td>51.48</td>
<td>SANDSTONE fine to medium grained, massive, pale grey</td>
<td></td>
</tr>
<tr>
<td>53.41</td>
<td>SANDSTONE WITH 1% SILTSTONE LAMINATIONS</td>
<td></td>
</tr>
<tr>
<td>55.34</td>
<td>SANDSTONE fine to medium grained, massive, pale grey, brown staining on sandstone from 55.98m to 56.94m (possibly siderite nodules)</td>
<td></td>
</tr>
<tr>
<td>55.54</td>
<td>SANDSTONE medium to coarse grained, massive, pale grey</td>
<td></td>
</tr>
<tr>
<td>57.57</td>
<td>Brown staining on sandstone from 57.57m to 57.86m (possibly siderite nodules)</td>
<td></td>
</tr>
<tr>
<td>59.85</td>
<td>SANDSTONE with 3% SILTSTONE LAMINATIONS</td>
<td></td>
</tr>
</tbody>
</table>

---

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### REVISION C REPORT OF BOREHOLE: LDS-BH-1042

<table>
<thead>
<tr>
<th>DEPTH (m)</th>
<th>ROCK / SOIL MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>SANDSTONE WITH SILTSTONE FLECKS</td>
</tr>
<tr>
<td>70.45</td>
<td>fine to medium grained, massive, pale grey, with trace</td>
</tr>
<tr>
<td>70.48</td>
<td>fine to medium grained clasts and siltstone fragments</td>
</tr>
<tr>
<td>70.90</td>
<td>CORE LOSS - 400 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DEPTH (m)</th>
<th>ROCK / SOIL MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>70.94</td>
<td>SANDSTONE WITH SILTSTONE FLECKS</td>
</tr>
<tr>
<td>70.97</td>
<td>fine to medium grained, massive, pale grey, with trace</td>
</tr>
<tr>
<td>71.03</td>
<td>fine to medium grained clasts and siltstone fragments</td>
</tr>
<tr>
<td>71.21</td>
<td>SANDSTONE WITH SILTSTONE LAMINATIONS</td>
</tr>
<tr>
<td>71.32</td>
<td>fine to medium grained, pale grey, indistinctly bedded at 32°</td>
</tr>
<tr>
<td>71.54</td>
<td>SANDSTONE WITH SILTSTONE FLECKS</td>
</tr>
<tr>
<td>71.62</td>
<td>fine to medium grained, massive, pale grey, with trace</td>
</tr>
<tr>
<td>71.66</td>
<td>fine to medium grained clasts and siltstone fragments</td>
</tr>
<tr>
<td>71.69</td>
<td>CORE LOSS - 360 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DEPTH (m)</th>
<th>ROCK / SOIL MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>71.84</td>
<td>SANDSTONE WITH 5% SILTSTONE LAMINATIONS</td>
</tr>
<tr>
<td>72.00</td>
<td>fine to medium grained, pale grey, indistinctly bedded at 0-24°, iron stained adjacent to joints</td>
</tr>
<tr>
<td>72.02</td>
<td>SW</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DEPTH (m)</th>
<th>ROCK / SOIL MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>72.29</td>
<td>SANDSTONE WITH SILTSTONE FLECKS</td>
</tr>
<tr>
<td>72.42</td>
<td>fine to medium grained, massive, pale grey, with trace</td>
</tr>
<tr>
<td>72.45</td>
<td>fine to medium grained clasts and siltstone fragments</td>
</tr>
<tr>
<td>72.56</td>
<td>CORE LOSS - 50 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DEPTH (m)</th>
<th>ROCK / SOIL MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>72.63</td>
<td>SANDSTONE WITH SILTSTONE LAMINATIONS</td>
</tr>
<tr>
<td>72.66</td>
<td>fine to coarse grained siltstone from 73.56</td>
</tr>
<tr>
<td>72.70</td>
<td>to 75.96m</td>
</tr>
<tr>
<td>72.73</td>
<td>fine to medium grained, no failure</td>
</tr>
</tbody>
</table>

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### Field Material Description

<table>
<thead>
<tr>
<th>DEPTH (metres)</th>
<th>ROCK / SOIL MATERIAL DESCRIPTION</th>
<th>DEFECT DESCRIPTION &amp; Additional Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>SANDSTONE WITH 5-10% SILTSTONE LAMINATIONS: medium to coarse grained, pale grey, indistinctly bedded at 0-24°, with trace fine to medium grained clasts</td>
<td></td>
</tr>
<tr>
<td>81</td>
<td>Indistinctly bedded at 0-10°</td>
<td></td>
</tr>
<tr>
<td>82</td>
<td>SANDSTONE WITH 20-30% SILTSTONE LAMINATIONS: medium grained, pale grey, distinctly bedded at 0-13°, with trace fine to medium grained clasts</td>
<td></td>
</tr>
<tr>
<td>83</td>
<td>Fine to medium grained, with trace medium to coarse grained siltstone gravel</td>
<td></td>
</tr>
<tr>
<td>84</td>
<td>Fine to medium grained, massive, pale grey</td>
<td></td>
</tr>
<tr>
<td>85</td>
<td>SANDSTONE WITH SILTSTONE FLECKS: fine to medium grained, sandy clayey gravel</td>
<td></td>
</tr>
<tr>
<td>86</td>
<td>SANDSTONE WITH 5-10% SILTSTONE LAMINATIONS: medium to coarse grained, pale grey, indistinctly bedded at 0-24°, with trace fine to medium grained clasts</td>
<td></td>
</tr>
<tr>
<td>87</td>
<td>Indistinctly bedded at 0-24°, becoming very coarse grained, with 5-10% fine quartz gravel</td>
<td></td>
</tr>
</tbody>
</table>

### Defect Information

<table>
<thead>
<tr>
<th>DEPTH (metres)</th>
<th>DEFECT DESCRIPTION &amp; Additional Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>82.08</td>
<td>B, 8°, Un, Ro, Cn</td>
</tr>
<tr>
<td>84.49</td>
<td>J, 61°, Pl, Ro, Cn, =100 mm</td>
</tr>
<tr>
<td>84.78</td>
<td>B, 11°, Un, Ro, Cn</td>
</tr>
<tr>
<td>85.33</td>
<td>J, 63°, Pl-Un, Ro, Cn, =115 mm</td>
</tr>
<tr>
<td>85.49</td>
<td>C, 7°, Un, Ro, Cn</td>
</tr>
<tr>
<td>85.51</td>
<td>C, 5°, Un, Ro, Cn</td>
</tr>
<tr>
<td>85.71</td>
<td>B, 6°, Pl, Ro, Cn</td>
</tr>
<tr>
<td>85.86</td>
<td>CS, 26°, sandy clayey gravel, =68 mm</td>
</tr>
<tr>
<td>86.22</td>
<td>CS, 0-15°, Pl-Un, Ro, sandy clayey gravel</td>
</tr>
<tr>
<td>88.04</td>
<td>B, 18°, Un, Ro, Cn</td>
</tr>
</tbody>
</table>

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### Field Material Description

<table>
<thead>
<tr>
<th>Depth (metres)</th>
<th>Soil/Rock Material Description</th>
<th>Moisture Condition</th>
<th>Structure and Additional Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.20</td>
<td>TOPSOIL: CLAY</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>0.60</td>
<td>FILL: Sandy CLAY</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>1.10</td>
<td>FILL: Silty SAND</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>0.63</td>
<td>FILL: Gravelly SAND</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>0.43</td>
<td>FILL: SAND</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>0.23</td>
<td>SAND</td>
<td>L</td>
<td>fine grained, rounded, with some organic plant material</td>
</tr>
<tr>
<td>1.75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00</td>
<td>SPT 1.50-1.95 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.27</td>
<td>SPT 4.50-4.95 m</td>
<td></td>
<td>fine to medium grained, medium grey, with some shell fragments</td>
</tr>
<tr>
<td>4.50</td>
<td>SPT 6.00-6.45 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.00</td>
<td>SPT 7.50-7.95 m</td>
<td></td>
<td>Clayey SAND fine to medium grained, dark grey, low plasticity clay</td>
</tr>
<tr>
<td>9.30</td>
<td>UTS 9.00-9.40 m</td>
<td></td>
<td>Sandy CLAY high plasticity, pale grey, fine to medium grained sand</td>
</tr>
<tr>
<td>9.57</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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### Soil/Rock Material Description

<table>
<thead>
<tr>
<th>Sample/Field Test</th>
<th>Soil/Rock Material Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH</td>
<td>Sandy CLAY high plasticity, pale grey, fine to medium grained sand</td>
</tr>
<tr>
<td>ML</td>
<td>Clayey SAND medium to coarse grained, sub-rounded to sub-angular, pale grey, with dark grey to black clay nodules</td>
</tr>
<tr>
<td>SP</td>
<td>SAND medium to coarse grained, sub-rounded, pale grey</td>
</tr>
<tr>
<td>CH</td>
<td>Interbedded CLAY and SAND high plasticity, grey, medium to coarse grained sand, pale grey</td>
</tr>
<tr>
<td>ML</td>
<td>Interbedded Clayey SILT and SAND medium plasticity, dark grey to black, clayey silt with trace fine grained gravel/charcoal, medium to coarse grained, sub-rounded, pale grey sand</td>
</tr>
<tr>
<td>ML</td>
<td>Clayey SAND medium to coarse grained, sub-rounded to sub-angular, pale grey, with dark grey to black clay nodules</td>
</tr>
</tbody>
</table>

### Additional Observations

- Casing dropped @ 10.80 m
- Organic material throughout, peat inferred

---

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---

**REVISION C**

---

**GAP 8.11.11/2160 BS-P004 04/10/2016 15:44:00 PM**
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**REVISION C REPORT OF BOREHOLE: LDS-BH-1050**

**CLIENT:** CDSJV  
**PROJECT:** WestConnex - The New M5  
**LOCATION:** M5 East Motorway  
**JOB NO:** 1524285

**Coordinates:** 329791.2 m E 6243654.9 m MGA94 56  
**Surface RL:** 1.7 m  
**Datum:** AHD  
**Inclination:** -90°  
**Hole Depth:** 87.00 m  
**Drill Rig:** Hydopower  
**Contractor:** Hagstrom Drilling Pty Ltd  
**Logged:** MBB  
**Checked:** GMcN  
**Date:** 7/1/16

---

### Sampling Table

<table>
<thead>
<tr>
<th>Drilling</th>
<th>Sampling</th>
<th>Field Material Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Method</strong></td>
<td><strong>Penetration Resistance</strong></td>
<td>** Soil/Rock Material Description**</td>
</tr>
<tr>
<td>H</td>
<td>30</td>
<td>SPT 30.00-30.17 m 10, 34/26mm N=34</td>
</tr>
<tr>
<td></td>
<td>31</td>
<td>SPT 31.50-31.95 m 7, 8, 10 N=18</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>SPT 33.00-33.45 m 13, 9, 8 N=17</td>
</tr>
<tr>
<td></td>
<td>33</td>
<td>SPT 34.00-34.20 m 5, 11, 9 N=20</td>
</tr>
<tr>
<td></td>
<td>34</td>
<td>SPT 34.50-34.95 m 5, 11, 9 N=20</td>
</tr>
<tr>
<td></td>
<td>35</td>
<td>SPT 35.00-35.60 m 9, 12, 14 N=26</td>
</tr>
<tr>
<td></td>
<td>36</td>
<td>SPT 36.00-36.45 m 9, 12, 14 N=26</td>
</tr>
<tr>
<td></td>
<td>37</td>
<td>SPT 37.00-37.45 m 9, 12, 14 N=26</td>
</tr>
<tr>
<td>H</td>
<td>38</td>
<td>For Continuation Refer to Sheet 5</td>
</tr>
</tbody>
</table>

---

**Additional Observations:**
- Refusal of SPT in second interval
- Groundwater flowing under pressure

---

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### Sandstone

- **Description**: Fine to medium grained, yellow-brown, rounded, with some clays in bands, very dense

- **Continuation**: Sheet 4

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>36.27</td>
<td>Sandstone, well to medium grained, yellow-brown, rounded, with some clays in bands, very dense</td>
</tr>
<tr>
<td>37.27</td>
<td>Sandstone, medium grained, massive, pale grey, indistinct laminations dip 5-10°, trace lithic fragments</td>
</tr>
</tbody>
</table>

**Defect Information**

- **Defect Description & Additional Observations**
  - 38.24 m: DS, 8°, Un, Ro, Cn, 50 mm
  - 38.90 m: B, 9°, Un, Ro, clay Ct
  - 39.87 m: B, 10°, Un, Sm, clay Ct

**Average Defect Spacing (mm)**

- **90 mm**

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<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>ROCK / SOIL MATERIAL DESCRIPTION</th>
<th>INFERRED STRENGTH</th>
<th>DEFECT DESCRIPTION &amp; Additional Observations</th>
<th>AVERAGE DEFECT SPACING (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.03</td>
<td>SANDSTONE, medium grained, massive, grey, bedding indistinct, dips 0-20°, with trace siltstone lenses</td>
<td>FR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>66.24</td>
<td>SANDSTONE WITH 10% SILTSTONE LAMINATIONS fine to medium grained, pale grey, cross bedding 10°</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>66.25</td>
<td>SANDSTONE, medium to coarse grained, massive, grey</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>66.26</td>
<td>becoming indistinctly laminated, dip 0-10°</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>66.42</td>
<td>CONGLOMERATE, coarse grained, massive, grey, poorly sorted, with sub-rounded quartz and lithics to 5 mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>66.55</td>
<td>CONGLOMERATIC SANDSTONE, medium grained, pale and dark grey</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>66.63</td>
<td>SILTSTONE, fine grained, dark grey, thinly laminated</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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### Field Material Description

<table>
<thead>
<tr>
<th>DEPTH (metres)</th>
<th>GRAPHIC LOG</th>
<th>ROCK / SOIL MATERIAL DESCRIPTION</th>
<th>AVERAGE DEFECT SPACING (mm)</th>
<th>DEFECT DESCRIPTION &amp; Additional Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td></td>
<td>SANDSTONE WITH 15-20% SILTSTONE LAMINATIONS, medium to coarse grained, grey, cross bedded, 0-30° dip</td>
<td>0.03</td>
<td>FR</td>
</tr>
<tr>
<td>81.53</td>
<td></td>
<td>SANDSTONE WITH 5% CARBONACEOUS LAMINATIONS, coarse grained, pale grey, 15° dip, planar, with trace of siltstone fragments</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>84.58</td>
<td></td>
<td>SANDSTONE WITH 10% SILTSTONE LAMINATIONS, medium to coarse grained, grey, 10° dip, cross-bedded</td>
<td>0.30</td>
<td></td>
</tr>
<tr>
<td>85.33</td>
<td></td>
<td>SANDSTONE WITH 5% SILTSTONE FLECKS, medium grained, massive, grey, sparse laminations, dip 5-20°</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>87.00</td>
<td></td>
<td>END OF BOREHOLE @ 87.00 m</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Attachment 2 – Drawing No. MCPN-ARC-CV-DWG-0111, Issue 01, Arcadis
EARTHWORKS PLAN
PRELIMINARY ONLY
NOT TO BE USED FOR CONSTRUCTION

APPROXIMATE VOLUME OF PERMANENT FILL
APPROXIMATE VOLUME OF STOCKPILE FILL
1% FALL
BATTERS 1:3
RL 19.5
RL 20.2
RL 19.5
RL 22.0
RL 18.8
RL 20.5
RL 18.8

TYPICAL BATTER ≥4m HIGH DETAIL

SCALE 1:200

APPROXIMATE PERMANENT FILL LEVEL
SUBJECT TO FINAL DESIGN

APPROXIMATE STOCKPILE LEVEL
SUBJECT TO FINAL DESIGN

TYPICAL BATTER ≥4m HIGH DETAIL

SCALE 1:200

DEPTHS RANGE LEGEND

0.00
2.00
4.00
6.00
8.00
10.00

DEPTH OF CUT
DEPTH OF FILL

EARTHWORKS Notes/Assumptions
1. the cut/fill volumes assume the existing surface has been stripped of 300mm of topsoil and the existing surcharge mound has been removed within the development area.
2. no allowance for bulking factors.
3. no allowance for trench excavation.
4. contours shown on this plan are finished surface contours.
5. the vertical alignment is subject to final design.

Earthworks Notes/Assumptions
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Fax No: +61 2 8907 9001
arcadis.com

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