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Our Ref: PSM1541-113L REV3

9 September 2015

Goodman Property Services (Aust) Pty Ltd
Level 17, 60 Castlereagh Street
SYDNEY NSW 2000

ATTENTION: KYM DRACOPOULOS
kym.dracopoulos@goodman.com

Dear Kym,

RE: OAKDALE SOUTH ESTATE – SALINITY MANAGEMENT PLAN

1 INTRODUCTION

This letter presents a Salinity Management Plan (SMP) prepared by Pells Sullivan Meynink (PSM) for Oakdale South Estate (OSE). This was prepared to accompany our salinity investigation in accordance with our email proposal dated 5 June 2015.

This SMP has been prepared to inform a State Significant Development Application (SSDA) for the staged development of the OSE. The aim of the SMP is to provide controls for the potential impacts of the proposed development on site salinity and has been prepared in accordance with WSROC Salinity Code of Practice (2004) salinity management guidelines.

The letter responds to the Secretary's Environmental Assessment Requirements (SEARs) as they relate to salinity impacts as documented in Table 1. This letter supports an Environmental Impact Statement (EIS) prepared in respect of the proposal and should be read in conjunction with the EIS and development plans submitted with the SSDA.

TABLE 1
SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS (SEARs) FOR
SOILS AND WATER

RELEVANT SEARs	RESPONSE
An outline of the proposed water requirements, including a consolidated site water balance, details of water supply sources, usage data and efficiency measures.	By other consultants, i.e. hydrologist or civil designers.
A detailed assessment of potential soil (including contamination and acid sulphate soil), surface water, groundwater and salinity impacts of the proposed development, including adequate mitigating and monitoring measures.	Mitigation and monitoring measures are discussed within this document (Ref. PSM1541-113L). Assessment of soil, in terms of salinity and acid sulphate soils is described within the soil salinity and aggressivity investigation letter (Ref. PSM1541-112L). We understand that contamination is dealt with by other consultants, i.e. an environmental consultant
An assessment of the potential impacts of the development on Ropes Creek, its on-site tributaries and riparian areas.	By other consultants, i.e. civil designers.
An assessment of flooding impacts associated with the proposal including details of any flood liability of the site and changes to floor behaviour.	By other consultants, i.e. hydrologist or civil designers.
Description of the proposed erosion and sediment controls during construction and operation.	Some erosion and sediment controls are discussed within this document.
Proposed cut and fill works associated with the development, and measures to minimise the extent of cut and fill.	By other consultants, i.e. civil designers.

2 PROPOSED DEVELOPMENT

The SSDA for the OSE seeks approval for:

An overarching planning framework to guide the staged development of the OSE including:

- An Indicative Master Plan and Structure Plan
- Development Controls for the OSE
- A Biodiversity Offset Strategy

Stage 1 Development of the Estate including:

1. A package of estate-wide site preparation works to be implemented in stages including:
 - Subdivision.
 - Bulk earthworks (including construction of detention basins).
 - Construction of retaining walls, road and utility infrastructure/services.
 - Environmental management measures and protocols for the site.
2. Development for the purposes of warehousing and distribution including:
 - The construction of warehouse buildings in Precincts 1, 4 and 5.
 - The construction of hardstand, loading, car parking and landscaping in Precincts 1, 4 and 5.
 - The fit out and use of buildings in Precincts 1, 4 and 5 for generic warehousing and distribution uses.

3 DOCUMENTS RELIED UPON

In preparing the SMP, we have taken into consideration:

1. The results of the salinity assessment completed by PSM and presented in our letter (Ref. PSM 1541-112L).
2. Details of the proposed developments as presented in the "*Oakdale South Earthworks Cut/Fill Plan*" by AT&L (ref. SKC004 14-193 issue P1 dated 3 December 2014).
3. WSROC Salinity Code of Practice (2004) salinity management guidelines.

4 OBJECTIVE OF SMP

The objective of this SMP is to effectively manage site salinity, to minimise the effect of the proposed development on the salinity processes and to protect the proposed development from salinity damage.

5 SALINITY ASSESSMENT

The PSM salinity assessment noted that:

1. The soils present on site are sodic to highly sodic.
2. The soils present on site are non-saline with some slightly to moderately saline.

6 RECOMMENDATIONS

6.1 Development components

This SMP addresses the components of the proposed development at both the construction stage and for the permanent works. Recommendations regarding the following development components are provided in the following sections:

1. Earthworks
2. Gardens and landscaped areas
3. Roads, footpaths and hardstand areas
4. Surface water, stormwater and drainage
5. Detention basins
6. Durability of concrete structures in contact with the ground
7. Masonry structures
8. Groundwater management.

6.2 Earthworks

We understand that the development will be sympathetic to the site topography and the environment and thus aim to minimise the cut and fill. The design and construction of the earthworks should consider the following recommendations:

1. Vegetation cover should be established and maintained on permanent batters as soon as practical upon completion to control erosion.
2. The final surface of all areas of the development should be graded to prevent the ponding of surface water.
3. Subsoil drainage should be considered for areas where the designer considers accumulation of groundwater may occur. We do not consider that any significant such areas are likely at this site.
4. Erosion control of temporary batters, stockpiles and disturbed areas should be planned prior to undertaking the earthworks and implemented during the earthworks. Consideration should be given to:
 - a. Grading and sealing partially completed surfaces.
 - b. Installation of clearly visible fencing and traffic control measures to prevent unnecessary trafficking of areas and ensuing site disturbance.
 - c. Establishing set vehicular access points and roads.
 - d. Protecting stockpiles (temporary vegetation or mulching) where these are to be left in place for long durations.
5. Sediment control shall be implemented by means of sediment traps and silt fencing where considered necessary.
6. Where for landscaping purposes or erosion control the designer requires gypsum or lime stabilisation, these should be planned to be undertaken as part of the initial earthworks.

6.3 Gardens and landscaped areas

The proposed development will result in the majority of the site comprising roads, footpaths, and hardstand areas. Garden and landscaped areas are likely to be of limited extent. The design and construction of the gardens and landscaped areas should consider the following recommendations:

1. Where possible areas of established vegetation, particularly large trees, should be retained.
2. Selection of plant species should consider the soil conditions, including moderate salinity, relatively poor fertility and clayey low permeability soil profiles. Promotion of successful revegetation is likely to require use of nutrient rich topsoil. Saline topsoils should not be imported to site.

3. Recharge of groundwater and potential for water logging should be minimised by:
 - a. Adopting plant species with minimal watering requirements.
 - b. Adopting 'waterwise' gardening principles.
 - c. Minimising use of potable water in landscaped areas.
 - d. Properly designed and implemented irrigation systems.
 - e. Establishment of perennial species and deep rooted trees.

6.4 Roads, footpaths and hardstand areas

As stated, the proposed development will result in the majority of the site comprising roads, footpaths, and hardstand areas. The design and construction of roads, footpaths and hardstand areas should consider the following recommendations:

1. Roads, footpath and hardstand surfaces should be graded and the grades maintained at all times to prevent ponding of surface water at locations where this can result in infiltration into the underlying soils (e.g. pavement joints).
2. Connections between the roads, footpath and hardstand surfaces and the surface water and stormwater drainage infrastructure should be designed, constructed and maintained to restrict infiltration into underlying soils.
3. Services that are to be located below the roads, footpath and hardstand surfaces should be installed, where practical, at the time of construction.

6.5 Surface water, stormwater and drainage

Surface water, stormwater and drainage design should aim at restricting infiltration into the ground resulting in groundwater recharge. The design and construction of surface water, stormwater and drainage measures should thus consider the following recommendations:

1. Disturbance of natural drainage patterns should be reduced. Where these are disturbed or altered appropriate artificial drainage should be installed.
2. Stormwater and surface water should be managed to restrict infiltration.
3. Temporary water retaining structures used during construction should be managed to restrict infiltration.
4. Stormwater and surface water infrastructure should be designed and constructed to minimise the likelihood of leakage.
5. Guttering and down pipes should be connected and maintained.
6. Surface water runoff should be directed around all exposed surfaces, temporary stockpiles and landscaped areas.

6.6 Detention basins

Detention basins should be designed such that recharge into the groundwater system is controlled. On this basis, the design of temporary and permanent on site detention will need to consider the requirement to line the basin with an impermeable liner (clay layer or synthetic liner) or simply vegetate the exposed base.

In assessing the above requirement the design will need to consider the proposed basin location, the subsurface conditions at the basin, the proximity of the basin to other structures, the proposed storage volume and storage depth and the likely duration of water storage.

In saline environments reducing the water infiltration into the soil and groundwater recharge is considered desirable. On this site, the majority of the site is to be developed with roads and paved areas thus significantly reducing surface water infiltration. The amount of infiltration that can be tolerated at the detention basins will need to be assessed in terms of the overall water balance on site.

Where ponds intended to be permanently full are proposed, such as recreational or aesthetic ponds or fountains, it is recommended that the base of the permanent pond be lined with an impermeable liner. The liner to be adopted (clay or synthetic) shall be a matter of design.

6.7 Durability of concrete structures in contact with the ground

In designing structural concrete elements in contact with the ground the design should consider the results of the salinity, sulphate, chloride and pH testing on the soil and groundwater and the durability requirements in AS2159:2009 and AS3600:2009.

Both these standards provide guidance on minimum concrete grade/strength and minimum cover requirements.

Based on the results of the salinity assessments it is recommended that:

1. The design of structural concrete members in contact with the ground (excluding piles) adopt an A2 exposure classification as defined in AS3600:2009.
2. The design of concrete cast in situ piles adopt a mild classification as defined in AS2159:2009.

6.8 Masonry structures

Having given consideration to the very low to moderate soil salinity on site, the relatively deep water table, and the low permeability soils present on site it is considered that the design and construction of masonry structures including damp proof courses, moisture barriers and selection of brick and construction materials should be undertaken in accordance with the relevant building industry standard. We do not expect special attention to salinity will be required.

6.9 Groundwater management

The intention of groundwater maintenance at this site is to reduce the likelihood of recharge of the groundwater resulting in rising of the groundwater table to near the ground surface.

The very low to moderate soil salinity on site, the relatively deep water table, and the low permeability soils combine to reduce the likelihood of a rising groundwater table. Further, the development involves a very significant reduction in infiltration over the site.

Furthermore, the recommendations in Section 5.3 to 5.6 regarding gardens and landscaped areas, roads, footpaths and hardstand areas, surface water, stormwater and drainage and detention basins are aimed at reducing the potential for groundwater recharge.

In addition to these recommendations, it is recommended that use of infiltration pits to disperse surface water be avoided.

6.10 Importation of soil

It may be required to import topsoil or other soil onto site. Materials to be imported to site should be assessed for suitability for the intended use. Saline or contaminated soils should not be imported to site.

7 SIGN OFF

We recommend the following:

The designer and contractor responsible for construction of the various development components be required to sign-off their design and the as built, certifying that:

"The works have been designed/constructed having given appropriate consideration to the recommendations in the SMP (Ref. PSM1541-113L dated xxx)".

The designer and contractors should contact PSM during the works if they have any queries with regards to the requirements in the SMP or if conditions significantly differ from those described in this SMP.

Please do not hesitate to contact the undersigned if you have any queries.

For and on behalf of
PELLS SULLIVAN MEYNINK



AGUSTRIA SALIM
Senior Geotechnical Engineer



GARRY MOSTYN
Chief Engineer