Our Ref 89914020
Contact Sean Porter

Level 9
The Forum
203 Pacific Highway
St. Leonards NSW 2065

P.O. Box 19
St Leonards NSW 1590
Australia

Phone: +61 2 9496 7700
Fax: +61 2 9439 5170

www.cardno.com

9 December 2014

Glyn Richards
Development Manager, Communities
Lend Lease
Level 2, 88 Phillip Street
Parramatta NSW 2124
Australia

Dear Glyn,

Central Precinct, St Marys – Salinity Assessment Review

1 Introduction

This letter report presents the results of salinity assessment review undertaken by Cardno for the proposed Central Precinct residential development located at St Marys, Sydney.

The aim of the assessment is to support a subdivision Development Application for the project. A review of the site history and background has been undertaken as a part of this assessment and comprised:

- Review of the published geological data and salinity maps.
- A review of the previous investigations undertaken at the site.

The following reports were provided for the purpose of this assessment:

- Water, Soil and Infrastructure report by SKM, May 2009 [1] St Marys Project, Central Precinct. As a part of this report, a salinity investigation was undertaken by Douglas Partners (DP) which included non-intrusive electromagnetic (EM) profiling and reporting.
- Three investigations were undertaken by Cardno which were mainly focused on subsurface conditions and groundwater sampling and testing. These reports are as follows:
    - Factual report on earthwork investigation or Central Precinct dated 09/05/2014. This investigation was undertaken to merely assess the subsurface profile within a small portion of the site for suitability of the future development.
    - Factual report on geotechnical investigation for Central Precinct, dated 29/07/2014. This investigation was undertaken to assess the soil permeability and other properties at the proposed location of potential future detention basins.
    - Factual report on installation of piezometers for Central Precinct dated 17/11/2014. This investigation was undertaken to provide further information regarding the hydrology of the site and groundwater contamination assessment.

While the factual reports prepared by Cardno provides valuable information regarding the site soils and groundwater conditions, the current assessment mainly utilises the findings of the SKM and DP reports which are more salinity focused.

2 Desktop Study and Site Investigations

2.1 Geology

Reference to Penrith 1:100,000 geological map (geological series sheet 9030) indicates that the site is underlain by:

- Quaternary aged deposits of fine grained sand, silt and clay which is located along the South Creek banks to the east and northern boundary of the site.
- Bringelly Shale Formation which forms the western portion of the site. This formation generally comprises shale carbonaceous claystone, laminate, fine to medium grained lithic sandstone and rare coal and tuff.

2.2 Salinity

A review of the Department of Infrastructure, Planning and Natural Resources: Salinity Potential in Western Sydney Map (2002) [2] indicates that the site is situated within an area of moderate salinity potential with areas high salinity potential present on site generally following the South Creek east-west trending tributary located north of the site.

2.3 Soil Acidity and Acid Sulphate Soils

A search of NSW Environment and Heritage NR Atlas data base revealed that the site is situated within an area with no known or low probability of occurrence. Based on our experience from the similar projects within the area, acid sulphate soils are not considered to be an issue and would not affect the development of the site.

2.4 Topography and Soil Landscape

Topographically the site is located within relatively flat trains associated with South Creek alluvial plains with the site slightly sloping up towards south where residual profiles are located.
Based on the Penrith 1:100,000 soil landscape map the site comprises two soil units including Luddenham (lu) and South Creek (sc) soil landscapes (SL). The location of the two SLs is almost identical to the geology of the site in that Luddenham SL is present alongside the Bringelly Shale formation and the South Creek SL follows the Quaternary aged alluvial deposits.

Reference to the salinity potential of western Sydney map, the areas with high salinity generally present within the South Creek SL and Quaternary aged deposits along the South Creek tributary. In addition, areas with medium salinity are present within the Luddenham SL and residual formations of Bringelly Shale to the west of the site.

2.5 Site and Regional Hydrology

SKM report indicates that two groundwater-bearing systems are present on site which are referred as shallow and deep aquifers. The shallow aquifer system is more-or-less fresh, relatively permeable, but

only ephemerally saturated; while the deeper aquifers are tighter, permanently saturated and much more saline with salt content approaching that of sea water in places.

The salinity of the shallow aquifer at the site is less than 1,000 mg/L, which is consistent with the surface water salinity of 100 to 2,510 mg/L indicating that discharge from this aquifer maintains the surface water baseflow.

On the other hand, the maximum salinity recorded within the deeper aquifer was 8,000 mg/L with some values less than 1,000 mg/L encountered suggesting the mixing with fresh water from upper aquifer.

2.6 Site investigation

The information gathered during the SKM and DP site investigations have been obtained from:

- On-site conductivity testing carried out on 1:5 soil/water suspensions using a TPS water quality meter at 0.25m intervals at each test bore location. The results are attached in Table 5-2 (SKM report).
- Laboratory testing was conducted in the Department of Lands soil laboratory in Scone NSW on the soils samples collected by SKM at test bore locations at 0.25m intervals. The results of the analysis are extracted from DP report and are attached to this report (Table 1). This table also compiles the results of the field salinity testing.
- Assessment of the groundwater salinity in the piezometers previously installed by Mackie Martin in 1991with the results presented in Figure 5-10 of SKM report (this figure is of low quality in the provided copy of the SKM report and the results of testing is unclear).
- Electro-magnetic induction (EMI) or non-intrusive electromagnetic (EM) profiling as stated in the DP report 2008 was carried out across the Central Precinct area to measure ground conductivity.

2.6.1 Ground Conditions

Twenty three test bores were drilled to depth of 3m with three deeper bores drilled to 10m in May 2008 by SKM. Piezometers were installed in the three deeper boreholes and were screened at water level for the subsequent sampling and monitoring of groundwater. The location of the test bores along with the salinity contour plans derived from the salinity test results are attached (Figure5-5, Figure 5-6, Figure 5-7 and Figure 5-8 of SKM report).

The investigation revealed that subsurface profile encountered within 3m deep test bores comprises yellow to brown clayey and fine sandy silt which grades to silty clay and clayey sand in some locations. The deeper test bores indicated that alluvial silty clays and clayey silts of stiff to hard consistency and low to medium plasticity extend to depths ranging from 5 to 8m. This alluvial layer is underlain by 1-2m of residual clay derived from shale bedrock and shale respectively.

2.6.2 Soil Salinity Results

Results of analytical testing of the soils at the site were compared to the following guideline values derived from of Department of Land Water Conservation NSW, 2002: Site Investigations for urban salinity [3].
It is noted that the values provided in Site Investigations for urban salinity [3], were derived for agricultural purposes although are considered appropriate when used in conjunction with the soil aggressivity values outlined further in this report.

The adopted criteria are listed in Table 1 below.

Table 1. Salinity Class Assessment Criteria in Soil

Class	EC_e (dS/m)
Non- saline	<2
Slightly saline	2-4
Moderately saline	4-8
Very saline	8-16
Highly saline	>16

Notes to table:
1. Based on Table 6.2 of Department of Land Water Conservation NSW, 2002: Site Investigations for urban salinity.

A multiplication factor has been used for calculation of the EC based on the material types. The conversion factor has been adopted based on the Table 6.1 of Department of Land Water Conservation NSW, 2002: Site Investigations for urban salinity.
Based on the summary of the analytical results presented in Table 1 attached (extracted from DP report), considering the adopted guideline criteria and 0.25m depth intervals:

- Depth 0.25 m, with ECe ranging from 1.4 dS/m to 6.8 dS/m, equating to 19% non-saline, 54% slightly saline and 27% moderately saline.
- Depth 0.5 m, with ECe ranging from 1.4 dS/m to 5.6 dS/m, equating to 27% non-saline, 50% slightly saline and 23% moderately saline.
- Depth 1.0 m, with ECe ranging from 1.4 dS/m to 6.5 dS/m, equating to 23% non-saline, 50% slightly saline and 27% moderately saline.
- Depth 3.0 m, with ECe ranging from 1.4 dS/m to 6.4 dS/m, equating to 30% non-saline, 26% slightly saline and 43% moderately saline.

No direct correlation between material properties or origin and the salinity is evident; however, the samples that indicated slight or moderate salinity were generally obtained from greater depths.

The results indicate that the site soils salinity ranges from non-saline to moderately saline. Increase in accumulation of the salts with depth correlates with the salinity of the site aquifers.

2.6.3 Electromagnetic Soil Testing

The electromagnetic induction (EMI) survey was carried out across the site by DP on May 2008 with the results of the assessment presented in the DP report attached to SKM report.

The survey results indicate low apparent conductivities (ECa) ranging from 60 to 100 ms/m near to the gullies and low lying areas on the alluvial terrace surface. Higher conductivity results were surveyed at more elevated site areas ranging from 100 to 200 ms/m. Overall, the survey results indicate that the site soils are non-saline to slightly saline, however, greater variability was observed compared to the field salinity measurements by SKM (Table 5-2). The reason for this discrepancy was summarised in SKM report to be the difference of depths at which the results were collected (SKM depths of investigation was to a maximum depth and the EMI survey was to a depth of 6m). In addition, a number of other factors affect the EMI results including variation in mineral content, moisture content of clay, presence of lateritic ferruginous gravel and presence of saline waters at depths below 3m which was outside the depth investigated by SKM.

2.7 Aggressivity

This section provides assessment criteria to assess the exposure classification for a steel piles and concrete piles and is considered applicable for other buried concrete structures.

2.7.1 Exposure to Steel Piles

The results were compared to the following Table 6.5.2(C) in Section 6 of Australian Standard (AS) 2159 - 2009: Piling Design and Installation [4]. A Soil Condition B for low permeability soils (such as silts and clay soils) or all soils above groundwater was adopted for assessment as being representative of the on-site conditions.
The classification system is presented in Table 2 below.

Table 2. Exposure Classification for Steel Piles in Soil

pH	Chlorides (Cl) in Soil (ppm)	Resistivity (Ωcm)	Exposure Classification Soil Condition B
>5	<5,000	>5,000	Non-aggressive
4-5	5,000-20,000	2,000-5,000	Non-aggressive
3-4	20,000-50,000	1,000-2,000	Mild
<3	>50,000	<1,000	Moderate

No laboratory analysis was undertaken to assess the resistivity or chloride values and as such the aggressivity has been assessed based on the pH values presented in Table 1 attached (extracted from DP report).
On the basis of the pH results of the samples collected by SKM, all samples could be classified as non-aggressive to steel structures. However this should be confirmed by measurement of the Chloride and Resistivity parameters.

2.7.2 Exposure to Concrete Piles

The results were compared to the following Table 6.4.2(C) in Section 6 of Australian Standard (AS) 2159 - 2009: Piling Design and Installation [4].

A Soil Condition B for low permeability soils (such as silts and clays) or all soils above groundwater was adopted for the assessment as being representative of the on-Site conditions.

The classification system is presented in Table 3 below.

Table 3. Exposure Classification for Concrete Piles in Soil

pH	Sulfates (SO_4) in Soil (ppm)	Exposure Classification: Soil Condition B
>5.5	<5,000	Non-aggressive
4.5-5.5	5,000-10,000	Mild
4-4.5	10,000-20,000	Moderate
<4	>20,000	Severe

No laboratory analysis was undertaken to assess the sulfates values in soil and as such the aggressivity to concrete structures has been assessed merely based on the pH values presented in Table 1 attached (extracted from DP report). Based on the pH results, all the samples classified as non-aggressive with the exception of three samples which were classified as mildly aggressive. However this should be confirmed following measurement of the sulfate content.

3 Comments and Recommendations

The relevant guidance to development in saline soils, at the Site, is outlined in the following documents:

- Western Sydney Regional Organisation of Councils Ltd (2003, Amended 2004) Western Sydney Salinity Code of Practice [5];
- Department of Infrastructure, Planning and Natural Resources (2003): Building in a Saline Environment [6];
- Department of Infrastructure, Planning and Natural Resources (2003): Roads and Salinity [7]; and
- Department of Infrastructure, Planning and Natural Resources (2004): Waterwise Parks and Gardens [8].

With reference to the recommendations of the management of saline soils, outlined in Site Investigations for Urban Salinity [3] and the proposed developments to be undertaken on-Site, it is considered that minimal disturbance of saline soils would be expected. It is recommended that the management options recommended for the proposed development in the SKM Water, Soil and Infrastructure report [1] summarised in Table 5-4 attached be used for the Central Precinct development. In addition, the following site management considerations are recommended by Cardno based on the site characteristics and experience from similar developments.

3.1 Erosion and Dispersive Soil

Prior to earthworks, appropriate site surface drainage and other measures shall be implemented to prevent ponding and scouring during the construction. These measures should include temporary drains, surface grading along with erosion and sediment control, and should be appropriately reinstated following construction.

Dispersive soils are susceptible to erosion with these properties of soil can be evaluated by undertaking laboratory testings such as Emerson Class and Exchangeable Sodium Percentage (ESP). While it is understood that these laboratory analyses were not undertaken as a part of the previous investigations, based on experience from similar sites in the area, it is expected that the Central Precinct soils are susceptible to erosion. The dispersion potential can be ameliorated by regimented compaction and moisture control during fill placement.

As such, a significant reduction in the risk of erosion following moisture / density control during the earthworks is expected. Nonetheless, the soils should be covered by a suitable thickness of topsoil to further reduce the risk of erosion and the formation of a sodic crust which may inhibit vegetation growth. Suitable vegetation protection should be established together with the provision of adequate drainage and where the soils are exposed, other appropriate protection measures should be employed. Appropriate surface drainage should be installed to intercept and reduce the velocity of up-slope overland surface flows and to restrict overland surface flows onto adjacent areas where practical. All collected stormwater should be appropriately detained in on-site storage or detention basins and discharged in a controlled manner.

3.2 Earthworks

It is noted that the construction of the Central Precinct development is proposed to comprise placement of a fill platform over the site and as such minimal disturbance to the underlying saline soils is expected.

Where excavation of the site soils is proposed, particular care must be taken to avoid the reversing or mixing the soil profile. This effect will negatively impact on the salinity profile i.e. increasing the salinity from slightly saline to moderately saline. The excavation and placement of in situ material of moderate salinity could be coordinated with the excavation of non-saline to slightly saline material of similar consistency and origin from other areas of the site at similar depths. This should have the effect of reducing overall salinity into the slightly saline category. As the salinity increases with depth in the Western Sydney Basin, residual clays and shale excavated from depths generally in excess of 1m should be replaced in their original order in which they were removed.

The same methodology applies to the imported fill material to the site in that slightly saline soils should be placed in the bottom fill layers and non-saline soils placed in top layers of the embankment. The fill material should be assessed by a geotechnical engineer prior to the importation to the site and is expected to comprise the following:

- Classified as Virgin Excavated Natural Material (VENM) in accordance with the NSW DECC Waste Classification Guidelines Part 1 - Classifying Waste [9], or Excavated Natural Material (ENM) as per the Protection of the Environment Operations (Waste) Regulation 2005 The Excavated Natural Material Exemption 2012 [10].
- Non saline to slightly saline soils which are not aggressive to slightly aggressive to concrete and steel structures.
- The material to be placed within the residential allotments to comprise low reactivity soils.
- To be free of organic matter or any other deleterious material and not containing acid sulphate soils.

3.3 Construction Requirements for Areas with Salinity Potential

3.3.1 Landscaping

The following precautions should be adopted in the landscape plan:

- Where planting is required in discharge areas then salt tolerant species should be chosen.
- Use low water requiring species in gardens and landscaping.
- Adopt carefully designed irrigation systems to prevent over watering and appropriate maintenance to minimise the potential for leaks.
- Use mulching in landscaped areas to minimise evaporation and reduce irrigation requirements.
- Use non-saline soils in landscaped areas where practicable.

3.3.2 Stormwater and Drainage

The following should be considered in the design of stormwater and drainage systems:

- The design slope of exposed / open concrete slabs and surrounding areas should be designed to minimise ponding and the potential for increased infiltration.
- Drainage systems should be designed to minimise leakage and infiltration.
- As far as practicable the natural drainage patterns at the site should be maintained.

It is understood that the future residential structures and underground services will be predominantly placed within the imported fill material and subject to importation of suitable material, salinity, aggressivity and sodicity is not expected to impose risk to these structures. As a precautionary measure, consideration to the following should be adopted:

- Install a properly constructed damp proof course beneath buildings, paths and driveways.
- Using 'exposure quality bricks'.
- Using polybutylene or polyethylene pipes for water supply.
- Using polyvinyl chloride pipes for plumbing and stormwater utilities.

Yours faithfully

Alireza Mohiti
Geotechnical Engineer
For Cardno

Attachments:

Table 5-2 and Table 5-4 (SKM report)
Table 1 from DP EMI report
Figure5-5, Figure 5-6, Figure 5-7 and Figure 5-8 of SKM report

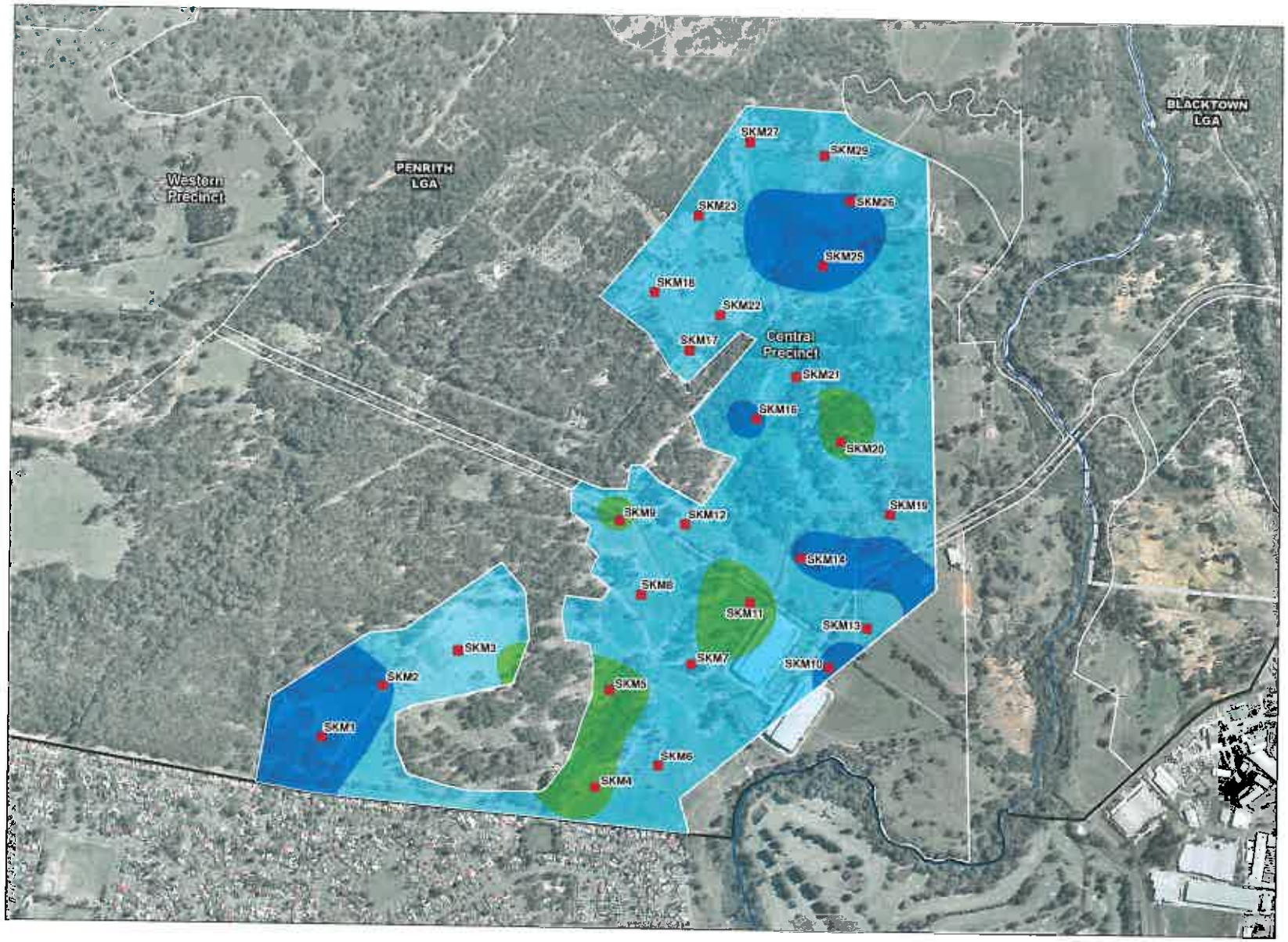
Table 5-2 Summary of Soil Salinity EC_e (dS/m) Results

Soil Bore	Depth (m bgl)	EC_e (dS/m)
SKM1	0.25	2.3
	0.5	1.7
	0.75	2.2
	1	5.0
	1.25	2.6
	1.5	2.1
	1.75	3.5
	2	2.3
	2.25	2.8
	2.5	3.1
	2.75	6.6
	3	5.9
SKM2	0.25	2.4
	0.5	1.7
	1	2.8
	1.5	2.9
	2	4.6
	0.25	3.6
	0.5	3.9
	0.75	4.1
	1	3.6
	1.25	3.9
SKM3	1.5	4.1
	1.75	3.8
	2	3.8
	2.25	3.6
	2.5	3.8
	2.75	3.9
	3	3.6
SKM4	0.25	4.6
	0.5	4.4
	0.75	3.9
	1	4.6
	1.25	5.9
	1.5	3.6
	1.75	4.7
	2	4.0
	2.25	3.1
	2.5	3.9
	2.75	4.2
	3	3.1
SKM5	0.25	4.2
	0.5	4.7
	0.75	4.6
	1	4.7
	1.25	4.8
	1.5	8.9
	1.75	7.5
	2	6.0
	2.25	6.4
	2.5	6.1
	2.75	6.6
	3	5.9
SKM6	0.25	2.2
	0.5	2.9
	0.75	3.3
	1	3.7
	1.25	5.3
	0.25	5.2
	0.5	3.9
	1	4.6
SKM7	1.5	3.7
	2	4.4
	2.5	3.7
	3	4.3

Soil Bore	Depth (m bgl)	EC_e (dS/m)
	0.25	5.2
	0.5	3.9
	1	4.6
SKM7	1.5	3.7
	2	4.4
	2.5	3.7
	3	4.3
	0.25	1.8
	0.5	2.0
	0.75	1.9
	1	2.2
	1.25	2.1
SKM8	1.5	2.4
	2	2.5
	2.25	2.3
	2.5	2.1
	2.75	2.2
	3	3.0
	0.25	5.0
	0.5	4.2
	0.75	4.4
SKM9	1	3.9
	1.25	3.7
	1.5	4.3
	0.25	1.5
	0.5	1.5
	1	1.6
SKM10	1.5	1.6
	2	1.6
	2.5	1.6
	3	1.7
	0.25	5.5
	0.5	5.6
	0.75	7.2
	1	6.5
	1.25	5.7
SKM11	1.5	5.9
	1.75	5.3
	2	6.1
	2.25	5.4
	2.5	5.2
	2.75	6.2
	3	5.3
SKM12	0.25	4.3
	0.5	3.9
	1	3.4
	1.5	2.9
	2	4.9
	2.5	5.1
	3	4.3
SKM13	0.25	2.3
	0.5	2.2
	1	2.3
	1.5	1.4
	2	1.6
	2.5	1.6
	3	1.5
SKM14	0.25	1.4
	0.5	1.5
	0.75	1.5
	1	1.5
	1.25	1.5
	1.5	1.5
	1.75	1.5
	2	1.5
	2.25	1.6
	2.5	1.7
	2.75	1.7
	3	1.8

Soil Bore	Depth (m bgl)	EC_e (dS/m)
	0.25	1.5
	0.5	1.5
	1	1.5
SKM16	1.5	1.5
	2	1.5
	2.5	1.5
	3	1.6
	0.25	2.5
	0.5	2.3
	1	2.6
SKM17	1.5	2.7
	2	2.3
	2.5	1.8
	3	1.8
	0.25	2.6
	0.5	3.2
	0.75	3.4
	1	4.3
	1.25	4.1
SKM18	1.5	3.6
	1.75	4.3
	2	2.6
	2.25	4.8
	2.5	7.0
	2.75	5.4
	3	5.0
	0.25	2.0
	0.5	2.1
	0.75	1.9
	1	1.9
	1.25	2.0
SKM19	1.5	2.0
	1.75	1.9
	2	1.7
	2.25	2.6
	2.5	2.5
	2.75	2.6
	3	3.1
	0.25	6.8
	0.5	4.6
	0.75	4.4
	1	5.1
	1.25	4.2
SKM20	1.5	8.4
	1.75	9.3
	2	7.1
	2.25	7.3
	2.5	6.4
	2.75	6.5
	3	5.5
SKM21	0.25	3.4
	0.5	4.0
	1	3.9
	1.5	4.7
	2	5.0
	2.5	4.5
	3	3.5
SKM22	0.25	2.8
	0.5	2.2
	0.75	2.6
	1	2.7
	1.25	2.3
	1.5	2.2
	1.75	1.9
	2	2.1
	2.25	2.1
	2.5	3.1
	2.75	3.2
	3	3.0

Soil Bore	Depth (m bgl)	EC_e (dS/m)
	0.25	2.5
	0.5	2.2
	0.75	2.2
	1	2.4
	1.25	2.4
SKM23	1.5	2.1
	1.75	2.4
	2	2.5
	2.25	4.1
	2.5	4.4
	2.75	4.7
	3	4.4
	0.25	1.4
	0.5	1.4
	0.75	1.4
	1	1.4
	1.25	1.4
SKM25	1.5	1.4
	1.75	1.4
	2	1.4
	2.25	1.4
	2.5	1.4
	2.75	1.4
	3	1.4
	0.25	3.2
	0.5	1.9
	1	1.8
SKM26	1.5	1.9
	2	1.6
	2.5	1.6
	3	1.7
	0.25	2.6
	0.5	2.0
	0.75	2.7
	1	2.9
	1.25	3.3
SKM27	1.5	4.0
	1.75	3.6
	2	3.4
	2.25	6.6
	2.5	6.2
	2.75	6.2
	3	6.4
	0.25	2.5
	0.5	2.4
	0.75	2.4
	1	2.9
	1.25	2.6
SKM29	1.5	4.0
	1.75	3.4
	2	3.4
	2.25	8.3
	2.5	6.3
	2.75	6.0
	3	4.0



Legend

SREP 30 boundaries

Site boundary

(Sydney Regional Environmental Plan Nr 30 – St Marys Structure Plan Amendment No 1. Environmental Planning and Assessment Act, 1979. 11/04/2006. NSW Department of Planning.)

Property boundaries (LPI 2007)

LGA boundaries (LPI 2007)

Soil Bore Locations

Soil Salinity

Class	EC_e (dS/m)
Non-Saline	<2
Slightly Saline	2-4
Moderately Saline	4-8
Very Saline	8-16
Highly Saline	>16

2007 Aerial Photography by AUSIMAGE

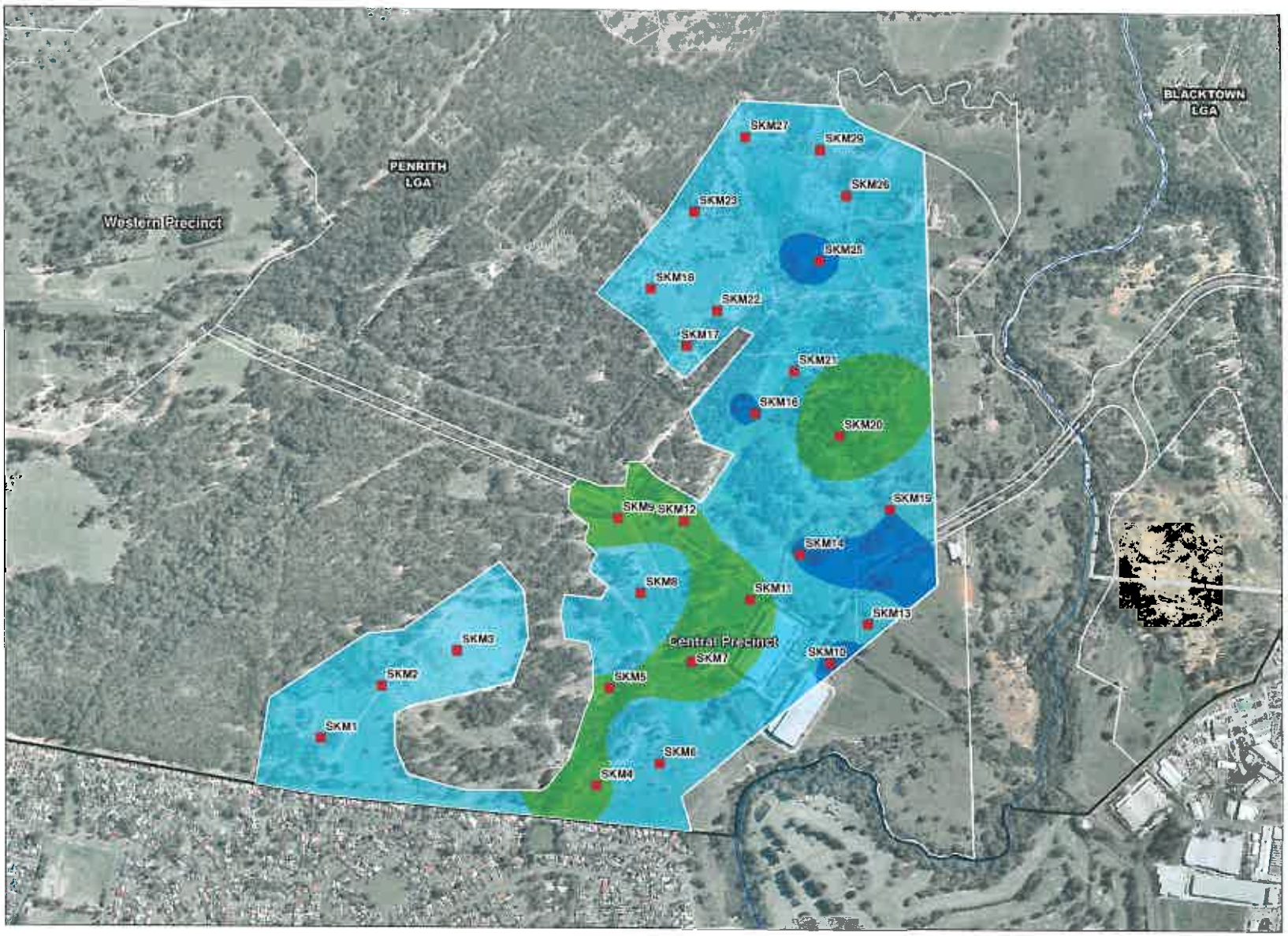
0 250 Metres

SKM

Fig 5.5 : Soil Salinity at a Depth of 0.25m (A-Horizon)

St Marys Development Project - Central Precinct

GDA 94 MGA Zone 56



Legend

- SREP 30 boundaries
- Site boundary

(Sydney Regional Environmental Plan No 30 – St Marys Structure Plan Amendment No 1. Environmental Planning and Assessment Act, 1979. 11/04/2008 NSW Department of Planning.)

- Property boundaries (LPI 2007)
- LGA boundaries (LPI 2007)
- Soil Bore Locations

Soil Salinity

Class	EC$_e$ (dS/m)
Non-Saline	<2
Slightly Saline	2-4
Moderately Saline	4-8
Very Saline	8-16
Highly Saline	>16

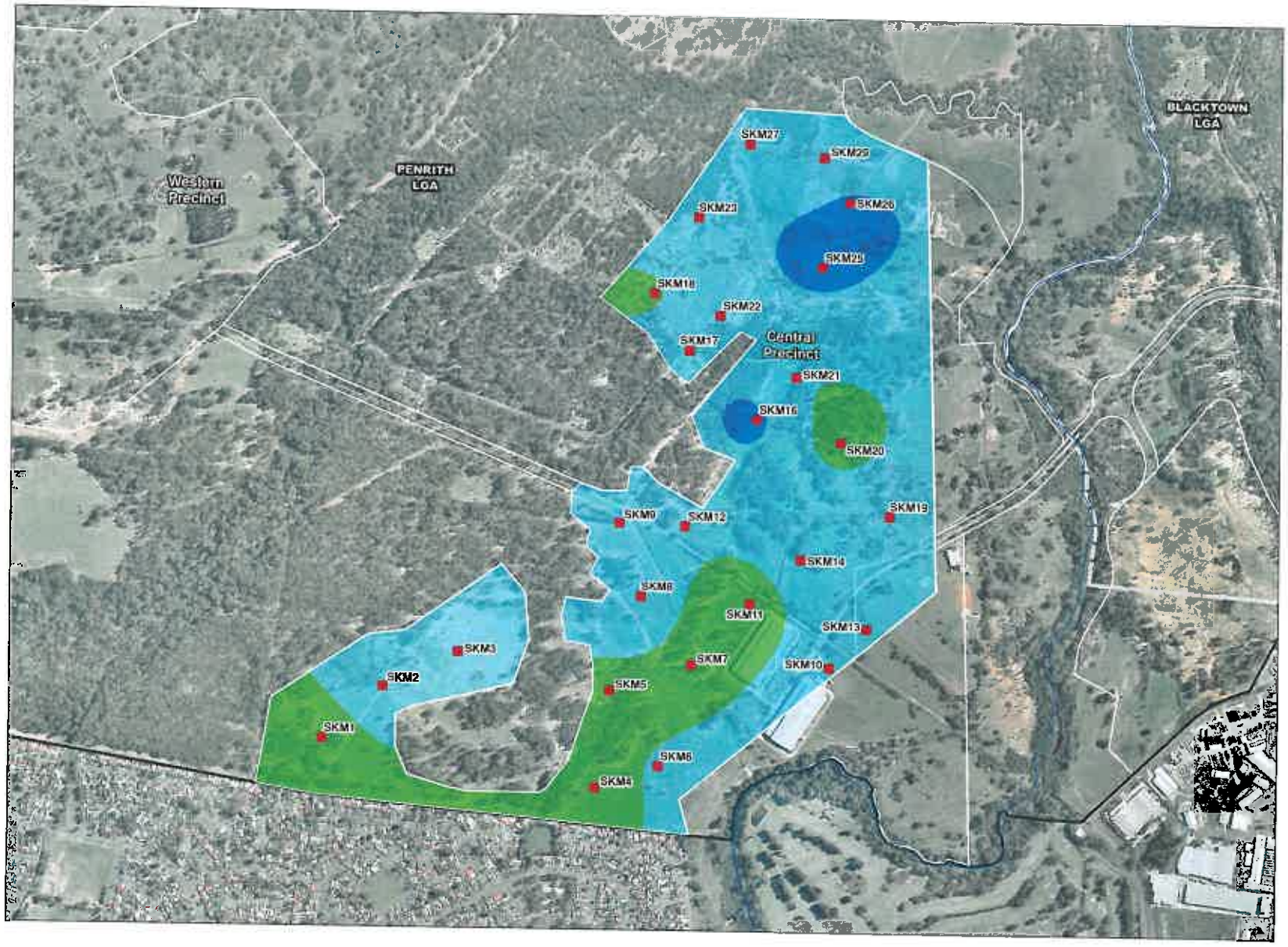
2007 Aerial Photography by AUSIMAGE

0 250 Metres

Fig 5.6 : Soil Salinity at a Depth of 0.5m (B-Horizon)

GDA 94 MGA Zone 56

St Marys Development Project - Central Precinct



Legend

- SREP 30 boundaries
- Site boundary

(Sydney Regional Environmental Plan No 30 – St Marys Structure Plan Amendment No 1. Environmental Planning and Assessment Act, 1979. 11/04/2006. NSW Department of Planning.)

- Property boundaries (LPI 2007)
- LGA boundaries (LPI 2007)
- Soil Bore Locations

Soil Salinity

Class	EC$_e$ (dS/m)
Non-Saline	<2
Slightly Saline	2-4
Moderately Saline	4-8
Very Saline	8-16
Highly Saline	>16

2007 Aerial Photography by AUSIMAGE

0 250 Metres

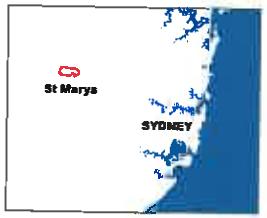
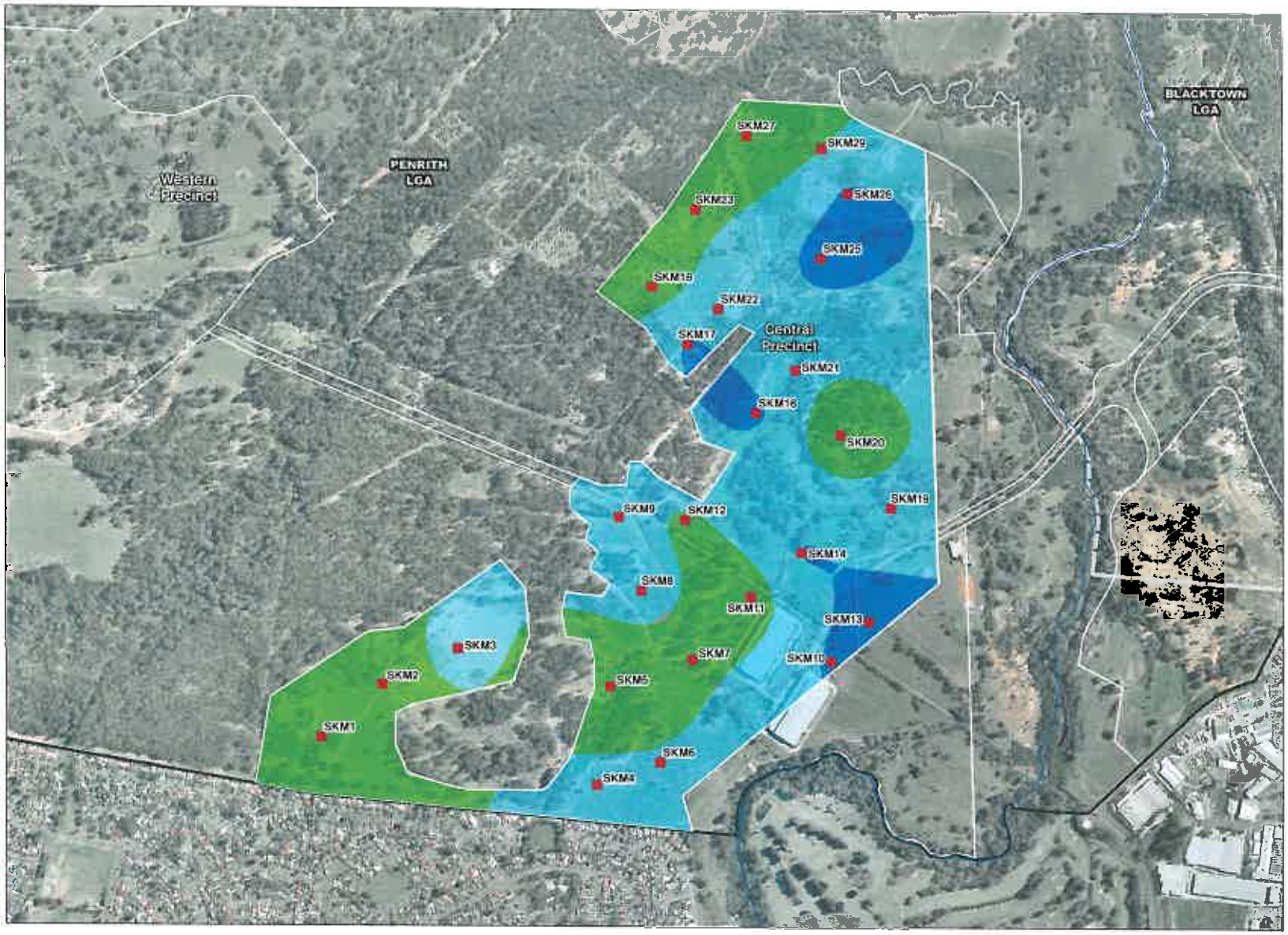


Fig 5.7 : Soil Salinity at a Depth of 1m (Lower B-Horizon)

St Marys Development Project - Central Precinct

GDA 94 MGA Zone 56



Legend

SREP 30 boundaries

Site boundary

('Sydney Regional Environmental Plan No 30 – St Marys Structure Plan Amendment No 1. Environmental Planning and Assessment Act, 1979. 11/04/2008. NSW Department of Planning.)

Property boundaries (LPI 2007)

LGA boundaries (LPI 2007)

Soil Bore Locations

Soil Salinity

Class	EC_e (dS/m)
Non-Saline	<2
Slightly Saline	2-4
Moderately Saline	4-8
Very Saline	8-16
Highly Saline	>16

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0 250
Metres

Fig 5.8 : Soil Salinity at a Depth of 3m (Weathered Shale)

St Marys Development Project - Central Precinct

GDA 94 MGA Zone 56

APPENDIX B
Table 1 – Salinity-Related Test Bore Data, Lab Tests and Assessments

TABLE 1: SALINITY-RELATED TEST BORE DATA, LAB TESTS AND ASSESSMENTS, PROJECT 45529, CENTRAL PRECINCT, ST MARYS

Test Bore	Coordinates East (m MGA94)	Coordinates North (m MGA94)	RL (m AHD)	Sample Depth (m)	pH	Soil Condition [AS2159]	Soil Aggressivity To Concrete [AS2159 pH criteria]	Soil Aggressivity To Steel [AS2159 pH criteria]	Soil Texture Group [after DLWC]	Textural Factor (M) [after DLWC]	$EC_{1:5}$ [Lab.] (µS/cm)	EC_e [M x $EC_{1:5}$] (dS/m)	Salinity Class [Richards 1954]	ECe Bulk [depths<0.8m] (dS/m)	Salinity Class [depths>0.8m] [Richards 1954]
SKM1	290742	6264539		0.25	6.9	B	Non-Aggressive	Non-Aggressive	Clay loam	9	253	2.3	Slightly Saline		
				0.50	6.8	B	Non-Aggressive	Non-Aggressive	Clay loam	9	187	1.7	Non Saline	2.8	Slightly Saline
				0.75	7.0	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	259	2.2	Slightly Saline		
				1.00	7.0	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	583	5.0	Moderately Saline		
				1.25	6.4	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	308	2.6	Slightly Saline		
				1.50	6.8	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	252	2.1	Slightly Saline		
				1.75	6.9	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	413	3.5	Slightly Saline		
				2.00	7.2	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	272	2.3	Slightly Saline	3.5	Slightly Saline
				2.25	6.4	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	332	2.8	Slightly Saline		
				2.50	6.1	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	360	3.1	Slightly Saline		
				2.75	6.5	A	Non-Aggressive	Non-Aggressive	Sand	17	390	6.6	Moderately Saline		
				3.00	6.6	A	Non-Aggressive	Non-Aggressive	Sand	17	345	5.9	Moderately Saline		
SKM2	290893	6264671		0.25	6.7	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	168	2.4	Slightly Saline		
				0.50	6.7	B	Non-Aggressive	Non-Aggressive	Clay loam	9	187	1.7	Non Saline	2.0	Slightly Saline
				1.00	5.3	B	Non-Aggressive	Non-Aggressive	Clay loam	9	306	2.8	Slightly Saline		
				1.50	4.8	B	Mild	Non-Aggressive	Clay loam	9	317	2.9	Slightly Saline	3.4	Slightly Saline
				2.00	7.5	A	Non-Aggressive	Non-Aggressive	Sand	17	272	4.6	Moderately Saline		
SKM3	291079	6264760		0.25	8.7	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	255	3.6	Slightly Saline		
				0.50	8.9	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	277	3.9	Slightly Saline	5.5	Moderately Saline
				0.75	8.8	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	296	4.1	Moderately Saline		
				1.00	8.9	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	256	3.6	Slightly Saline		
				1.25	8.6	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	277	3.9	Slightly Saline		
				1.50	8.5	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	293	4.1	Moderately Saline		
				1.75	8.7	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	269	3.8	Slightly Saline		
				2.00	8.8	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	269	3.8	Slightly Saline	3.8	Slightly Saline
				2.25	8.7	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	259	3.6	Slightly Saline		
				2.50	8.7	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	271	3.8	Slightly Saline		
				2.75	8.8	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	280	3.9	Slightly Saline		
				3.00	8.5	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	254	3.6	Slightly Saline		
SKM4	291422	6264424		0.25	7.6	B	Non-Aggressive	Non-Aggressive	Clay loam	9	512	4.6	Moderately Saline		
				0.50	7.5	B	Non-Aggressive	Non-Aggressive	Clay loam	9	492	4.4	Moderately Saline	4.4	Moderately Saline
				0.75	7.4	B	Non-Aggressive	Non-Aggressive	Clay loam	9	434	3.9	Slightly Saline		
				1.00	7.4	B	Non-Aggressive	Non-Aggressive	Clay loam	9	515	4.6	Moderately Saline		
				1.25	7.2	B	Non-Aggressive	Non-Aggressive	Clay loam	9	655	5.9	Moderately Saline		
				1.50	7.0	B	Non-Aggressive	Non-Aggressive	Clay loam	9	400	3.6	Slightly Saline		
				1.75	7.6	B	Non-Aggressive	Non-Aggressive	Clay loam	9	523	4.7	Moderately Saline		
				2.00	7.5	B	Non-Aggressive	Non-Aggressive	Clay loam	9	440	4.0	Slightly Saline	4.1	Moderately Saline
				2.25	7.6	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	364	3.1	Slightly Saline		
				2.50	7.6	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	463	3.9	Slightly Saline		
				2.75	7.7	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	493	4.2	Moderately Saline		
				3.00	8.4	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	368	3.1	Slightly Saline		
SKM5	291455	6264668		0.25	7.3	B	Non-Aggressive	Non-Aggressive	Clay loam	9	485	4.2	Moderately Saline		
				0.50	7.2	B	Non-Aggressive	Non-Aggressive	Clay loam	9	522	4.7	Moderately Saline	6.5	Moderately Saline
				0.75	7.1	B	Non-Aggressive	Non-Aggressive	Clay loam	9	513	4.6	Moderately Saline		
				1.00	7.4	B	Non-Aggressive	Non-Aggressive	Clay loam	9	521	4.7	Moderately Saline		
				1.25	7.3	B	Non-Aggressive	Non-Aggressive	Clay loam	9	533	4.8	Moderately Saline		
				1.50	7.3	B	Non-Aggressive	Non-Aggressive	Clay loam	9	991	8.9	Very Saline		
				1.75	7.2	B	Non-Aggressive	Non-Aggressive	Clay loam	9	835	7.5	Moderately Saline		
				2.00	7.7	B	Non-Aggressive	Non-Aggressive	Clay loam	9	671	6.0	Moderately Saline	6.3	Moderately Saline
				2.25	7.3	B	Non-Aggressive	Non-Aggressive	Clay loam	9	707	6.4	Moderately Saline		
				2.50	7.3	B	Non-Aggressive	Non-Aggressive	Loam	10	613	6.1	Moderately Saline		
				2.75	8.4	B	Non-Aggressive	Non-Aggressive	Loam	10	663	6.6	Moderately Saline		
				3.00	7.2	B	Non-Aggressive	Non-Aggressive	Loam	10	592	5.9	Moderately Saline		
SKM6	291579	6264480		0.25	8.2	B	Non-Aggressive	Non-Aggressive	Clay loam	9	246	2.2	Slightly Saline		
				0.50	9.3	B	Non-Aggressive	Non-Aggressive	Clay loam	9	320	2.9	Slightly Saline	2.5	Slightly Saline
				0.75	9.4	B	Non-Aggressive	Non-Aggressive	Loam	10	329	3.3	Slightly Saline		
				1.00	9.4	B	Non-Aggressive	Non-Aggressive	Loam	10	374	3.7	Slightly Saline	4.1	Moderately Saline
				1.25	7.1	B	Non-Aggressive	Non-Aggressive	Loam	10	526	5.3	Moderately Saline		
SKM7	291658	6264735		0.25	7.9	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	607	5.2	Moderately Saline		
				0.50	7.8	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	462	3.9	Slightly Saline	4.5	Moderately Saline
				1.00	8.2	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	540	4.6	Moderately Saline		
				1.50	7.9	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	438	3.7	Slightly Saline		
				2.00	8.0	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	518	4.4	Moderately Saline	4.1	Moderately Saline
				2.50	8.1	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	436	3.7	Slightly Saline		
				3.00	7.7	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	502	4.3	Moderately Saline		

Test Bore	Coordinates East (m MGA94)	North (m MGA94)	RL (m AHD)	Sample Depth (m)	pH	Soil Condition [AS2159]	Soil Aggressivity To Concrete [AS2159 pH criteria]	Soil Aggressivity To Steel [AS2159 pH criteria]	Soil Texture Group [after DLWC]	Textural Factor [M] [after DLWC]	$EC_{1:5}$ [Lab.] (µS/cm)	EC_e [M x $EC_{1:5}$] (dS/m)	Salinity Class [Richards 1954]	ECe Bulk [depths<0.8m/depths>0.8m] (dS/m)	Salinity Class [Richards 1954]
SKM8	291533	6264905		0.25	7.3	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	215	1.8	Non Saline		
				0.50	7.6	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	232	2.0	Non Saline	1.9	Non Saline
				0.75	7.3	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	228	1.9	Non Saline		
				1.00	7.4	B	Non-Aggressive	Non-Aggressive	Clay loam	9	249	2.2	Slightly Saline		
				1.25	7.4	B	Non-Aggressive	Non-Aggressive	Clay loam	9	234	2.1	Slightly Saline		
				1.50	7.4	B	Non-Aggressive	Non-Aggressive	Clay loam	9	267	2.4	Slightly Saline		
				2.00	7.3	B	Non-Aggressive	Non-Aggressive	Clay loam	9	275	2.5	Slightly Saline	2.4	Slightly Saline
				2.25	7.4	B	Non-Aggressive	Non-Aggressive	Clay loam	9	254	2.3	Slightly Saline		
				2.50	7.4	B	Non-Aggressive	Non-Aggressive	Clay loam	9	234	2.1	Slightly Saline		
				2.75	7.4	B	Non-Aggressive	Non-Aggressive	Clay loam	9	246	2.2	Slightly Saline		
				3.00	7.5	B	Non-Aggressive	Non-Aggressive	Clay loam	9	333	3.0	Slightly Saline		
SKM9	291477	6265089		0.25	9.1	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	360	5.0	Moderately Saline		
				0.50	8.6	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	302	4.2	Moderately Saline	4.7	Moderately Saline
				0.75	8.7	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	316	4.4	Moderately Saline		
				1.00	8.4	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	281	3.9	Slightly Saline		
				1.25	8.7	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	261	3.7	Slightly Saline	4.1	Moderately Saline
				1.50	8.9	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	304	4.3	Moderately Saline		
SKM10	292002	6264732		0.25	8.1	B	Non-Aggressive	Non-Aggressive	Clay loam	9	169	1.5	Non Saline		
				0.50	7.6	B	Non-Aggressive	Non-Aggressive	Clay loam	9	169	1.5	Non Saline	1.5	Non Saline
				1.00	7.5	B	Non-Aggressive	Non-Aggressive	Clay loam	9	173	1.6	Non Saline		
				1.50	7.7	B	Non-Aggressive	Non-Aggressive	Clay loam	9	177	1.6	Non Saline		
				2.00	8.0	B	Non-Aggressive	Non-Aggressive	Clay loam	9	173	1.6	Non Saline	1.6	Non Saline
				2.50	7.8	B	Non-Aggressive	Non-Aggressive	Clay loam	9	181	1.6	Non Saline		
				3.00	7.9	B	Non-Aggressive	Non-Aggressive	Clay loam	9	186	1.7	Non Saline		
SKM11	291803	6264890		0.25	7.1	B	Non-Aggressive	Non-Aggressive	Clay loam	9	615	5.5	Moderately Saline		
				0.50	7.2	B	Non-Aggressive	Non-Aggressive	Clay loam	9	617	5.6	Moderately Saline	8.4	Very Saline
				0.75	7.2	B	Non-Aggressive	Non-Aggressive	Clay loam	9	795	7.2	Moderately Saline		
				1.00	7.3	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	760	6.5	Moderately Saline		
				1.25	8.4	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	673	5.7	Moderately Saline		
				1.50	7.3	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	692	5.9	Moderately Saline		
				1.75	7.3	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	623	5.3	Moderately Saline		
				2.00	7.1	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	717	6.1	Moderately Saline	5.7	Moderately Saline
				2.25	7.2	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	640	5.4	Moderately Saline		
				2.50	7.1	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	612	5.2	Moderately Saline		
				2.75	7.2	B	Non-Aggressive	Non-Aggressive	Clay loam	9	693	6.2	Moderately Saline		
				3.00	7.2	B	Non-Aggressive	Non-Aggressive	Clay loam	9	592	5.3	Moderately Saline		
SKM12	291641	6265083		0.25	7.4	B	Non-Aggressive	Non-Aggressive	Clay loam	9	480	4.3	Moderately Saline		
				0.50	7.8	B	Non-Aggressive	Non-Aggressive	Clay loam	9	430	3.9	Slightly Saline	4.1	Moderately Saline
				1.00	7.5	B	Non-Aggressive	Non-Aggressive	Clay loam	9	378	3.4	Slightly Saline		
				1.50	7.4	B	Non-Aggressive	Non-Aggressive	Clay loam	9	321	2.9	Slightly Saline		
				2.00	7.8	B	Non-Aggressive	Non-Aggressive	Clay loam	9	539	4.9	Moderately Saline	4.1	Moderately Saline
				2.50	7.7	B	Non-Aggressive	Non-Aggressive	Clay loam	9	583	5.1	Moderately Saline		
				3.00	7.1	B	Non-Aggressive	Non-Aggressive	Clay loam	9	477	4.3	Moderately Saline		
SKM13	292095	6264830		0.25	7.1	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	166	2.3	Slightly Saline		
				0.50	7.5	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	160	2.2	Slightly Saline	2.3	Slightly Saline
				1.00	7.4	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	165	2.3	Slightly Saline		
				1.50	6.8	B	Non-Aggressive	Non-Aggressive	Clay loam	9	161	1.4	Non Saline		
				2.00	7.5	B	Non-Aggressive	Non-Aggressive	Clay loam	9	175	1.6	Non Saline	1.7	Non Saline
				2.50	7.2	B	Non-Aggressive	Non-Aggressive	Clay loam	9	176	1.6	Non Saline		
				3.00	7.3	B	Non-Aggressive	Non-Aggressive	Clay loam	9	165	1.5	Non Saline		
SKM14	291929	6265002		0.25	7.2	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	168	1.4	Non Saline		
				0.50	7.2	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	174	1.5	Non Saline	1.5	Non Saline
				0.75	7.5	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	175	1.5	Non Saline		
				1.00	7.6	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	175	1.5	Non Saline		
				1.25	8.0	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	172	1.5	Non Saline		
				1.50	7.5	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	172	1.5	Non Saline		
				1.75	7.5	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	177	1.5	Non Saline		
				2.00	7.8	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	174	1.5	Non Saline		
				2.25	7.5	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	186	1.6	Non Saline	1.6	Non Saline
				2.50	7.9	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	198	1.7	Non Saline		
				2.75	7.9	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	203	1.7	Non Saline		
				3.00	7.9	B	Non-Aggressive	Non-Aggressive	Clay loam	9	197	1.8	Non Saline		
SKM16	291817	6265351		0.25	7.3	B	Non-Aggressive	Non-Aggressive	Clay loam	9	170	1.5	Non Saline		
				0.50	7.5	B	Non-Aggressive	Non-Aggressive	Clay loam	9	170	1.5	Non Saline	1.5	Non Saline
				1.00	7.1	B	Non-Aggressive	Non-Aggressive	Clay loam	9	163	1.5	Non Saline		
				1.50	7.1	B	Non-Aggressive	Non-Aggressive	Clay loam	9	169	1.5	Non Saline		
				2.00	7.5	B	Non-Aggressive	Non-Aggressive	Clay loam	9	169	1.5	Non Saline	1.5	Non Saline
				2.50	7.5	B	Non-Aggressive	Non-Aggressive	Clay loam	9	172	1.5	Non Saline		
				3.00	6.6	B	Non-Aggressive	Non-Aggressive	Clay loam	9	173	1.6	Non Saline		

Test	Coordinates			Sample	pH	Soil	Soil Aggressivity		Soil Texture Group	Textural	$EC_{1:5}$	EC_e	Salinity Class	ECe Bulk	Salinity Class
Bore	East (m MGA94)	North (m MGA94)	RL (m AHD)	Depth (m)		Condition [AS2159]	To Concrete [AS2159 pH criteria]	To Steel [AS2159 pH criteria]	[after DLWC]	Factor [M] [after DLWC]	[Lab.] (uS/cm)	[M x $EC_{1:5}$] (dS/m)	[Richards 1954]	[depths<0.8m/depths>0.8m] (dS/m)	[Richards 1954]
SKM17	291648	6265519		0.25	7.6	B	Non-Aggressive	Non-Aggressive	Clay loam	9	282	2.5	Slightly Saline	2.4	Slightly Saline
				0.50	7.8	B	Non-Aggressive	Non-Aggressive	Clay loam	9	261	2.3	Slightly Saline		
				1.00	7.4	B	Non-Aggressive	Non-Aggressive	Clay loam	9	293	2.6	Slightly Saline		
				1.50	7.6	B	Non-Aggressive	Non-Aggressive	Clay loam	9	296	2.7	Slightly Saline		
				2.00	7.3	B	Non-Aggressive	Non-Aggressive	Clay loam	9	261	2.3	Slightly Saline	2.3	Slightly Saline
				2.50	7.2	B	Non-Aggressive	Non-Aggressive	Clay loam	9	204	1.8	Non Saline		
				3.00	6.8	B	Non-Aggressive	Non-Aggressive	Clay loam	9	199	1.8	Non Saline		
SKM18	291560	6265662		0.25	7.1	B	Non-Aggressive	Non-Aggressive	Clay loam	9	286	2.6	Slightly Saline		
				0.50	6.9	B	Non-Aggressive	Non-Aggressive	Clay loam	9	350	3.2	Slightly Saline	4.3	Moderately Saline
				0.75	7.5	B	Non-Aggressive	Non-Aggressive	Clay loam	9	376	3.4	Slightly Saline		
				1.00	6.6	B	Non-Aggressive	Non-Aggressive	Clay loam	9	480	4.3	Moderately Saline		
				1.25	6.3	B	Non-Aggressive	Non-Aggressive	Clay loam	9	460	4.1	Moderately Saline		
				1.50	6.5	B	Non-Aggressive	Non-Aggressive	Clay loam	9	399	3.6	Slightly Saline		
				1.75	6.2	B	Non-Aggressive	Non-Aggressive	Clay loam	9	473	4.3	Moderately Saline		
				2.00	7.3	B	Non-Aggressive	Non-Aggressive	Clay loam	9	294	2.6	Slightly Saline	4.6	Moderately Saline
				2.25	7.2	A	Non-Aggressive	Non-Aggressive	Sand	17	280	4.8	Moderately Saline		
				2.50	6.2	A	Non-Aggressive	Non-Aggressive	Sand	17	409	7.0	Moderately Saline		
				2.75	6.1	A	Non-Aggressive	Non-Aggressive	Sand	17	320	5.4	Moderately Saline		
				3.00	7.3	A	Non-Aggressive	Non-Aggressive	Sand	17	297	5.0	Moderately Saline		
SKM19	292150	6265114		0.25	7.5	B	Non-Aggressive	Non-Aggressive	Clay loam	9	217	2.0	Non Saline		
				0.50	7.4	B	Non-Aggressive	Non-Aggressive	Clay loam	9	234	2.1	Slightly Saline	2.9	Slightly Saline
				0.75	7.7	B	Non-Aggressive	Non-Aggressive	Clay loam	9	215	1.9	Non Saline		
				1.00	7.7	B	Non-Aggressive	Non-Aggressive	Clay loam	9	214	1.9	Non Saline		
				1.25	7.4	B	Non-Aggressive	Non-Aggressive	Clay loam	9	225	2.0	Slightly Saline		
				1.50	7.8	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	232	2.0	Non Saline		
				1.75	7.4	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	219	1.9	Non Saline		
				2.00	7.7	B	Non-Aggressive	Non-Aggressive	Clay loam	9	193	1.7	Non Saline	2.2	Slightly Saline
				2.25	7.2	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	184	2.6	Slightly Saline		
				2.50	7.2	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	176	2.5	Slightly Saline		
				2.75	7.5	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	184	2.6	Slightly Saline		
				3.00	7.4	A	Non-Aggressive	Non-Aggressive	Sand	17	184	3.1	Slightly Saline		
SKM20	292026	6265296		0.25	7.3	B	Non-Aggressive	Non-Aggressive	Clay loam	9	750	6.8	Moderately Saline		
				0.50	7.2	B	Non-Aggressive	Non-Aggressive	Clay loam	9	516	4.6	Moderately Saline	5.5	Moderately Saline
				0.75	7.5	B	Non-Aggressive	Non-Aggressive	Clay loam	9	486	4.4	Moderately Saline		
				1.00	7.6	B	Non-Aggressive	Non-Aggressive	Clay loam	9	572	5.1	Moderately Saline		
				1.25	7.4	B	Non-Aggressive	Non-Aggressive	Clay loam	9	468	4.2	Moderately Saline		
				1.50	6.1	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	601	8.4	[illegible]		
				1.75	5.8	A	Mild	Non-Aggressive	Sandy loam	14	663	9.3	[illegible]		
				2.00	7.4	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	505	7.1	Moderately Saline	6.6	Moderately Saline
				2.25	7.3	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	524	7.3	Moderately Saline		
				2.50	7.4	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	460	6.4	Moderately Saline		
				2.75	7.2	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	461	6.5	Moderately Saline		
				3.00	7.3	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	392	5.5	Moderately Saline		
SKM21	291914	6265457		0.25	7.6	B	Non-Aggressive	Non-Aggressive	Clay loam	9	383	3.4	Slightly Saline		
				0.50	7.8	B	Non-Aggressive	Non-Aggressive	Clay loam	9	444	4.0	Slightly Saline	3.7	Slightly Saline
				1.00	7.9	B	Non-Aggressive	Non-Aggressive	Clay loam	9	430	3.9	Slightly Saline		
				1.50	7.9	B	Non-Aggressive	Non-Aggressive	Clay loam	9	524	4.7	Moderately Saline		
				2.00	7.8	B	Non-Aggressive	Non-Aggressive	Clay loam	9	553	5.0	Moderately Saline	4.3	Moderately Saline
				2.50	7.5	B	Non-Aggressive	Non-Aggressive	Clay loam	9	502	4.5	Moderately Saline		
				3.00	7.9	B	Non-Aggressive	Non-Aggressive	Clay loam	9	386	3.5	Slightly Saline		
SKM22	291724	6265608		0.25	6.7	B	Non-Aggressive	Non-Aggressive	Clay loam	9	313	2.8	Slightly Saline		
				0.50	7.4	B	Non-Aggressive	Non-Aggressive	Clay loam	9	239	2.2	Slightly Saline	3.5	Slightly Saline
				0.75	6.6	B	Non-Aggressive	Non-Aggressive	Clay loam	9	288	2.6	Slightly Saline		
				1.00	6.5	B	Non-Aggressive	Non-Aggressive	Clay loam	9	300	2.7	Slightly Saline		
				1.25	6.8	B	Non-Aggressive	Non-Aggressive	Clay loam	9	253	2.3	Slightly Saline		
				1.50	6.5	B	Non-Aggressive	Non-Aggressive	Clay loam	9	242	2.2	Slightly Saline		
				1.75	6.6	B	Non-Aggressive	Non-Aggressive	Clay loam	9	212	1.9	Non Saline		
				2.00	7.0	B	Non-Aggressive	Non-Aggressive	Clay loam	9	238	2.1	Slightly Saline	2.5	Slightly Saline
				2.25	6.5	B	Non-Aggressive	Non-Aggressive	Clay loam	9	237	2.1	Slightly Saline		
				2.50	6.3	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	219	3.1	Slightly Saline		
				2.75	6.4	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	232	3.2	Slightly Saline		
				3.00	6.8	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	217	3.0	Slightly Saline		
SKM23	291868	6265854		0.25	6.8	B	Non-Aggressive	Non-Aggressive	Clay loam	9	277	2.5	Slightly Saline		
				0.50	7.2	B	Non-Aggressive	Non-Aggressive	Clay loam	9	249	2.2	Slightly Saline	3.3	Slightly Saline
				0.75	6.8	B	Non-Aggressive	Non-Aggressive	Clay loam	9	248	2.2	Slightly Saline		
				1.00	6.3	B	Non-Aggressive	Non-Aggressive	Clay loam	9	265	2.4	Slightly Saline		
				1.25	6.8	B	Non-Aggressive	Non-Aggressive	Clay loam	9	262	2.4	Slightly Saline		
				1.50	7.4	B	Non-Aggressive	Non-Aggressive	Clay loam	9	234	2.1	Slightly Saline		
				1.75	6.8	B	Non-Aggressive	Non-Aggressive	Clay loam	9	266	2.4	Slightly Saline		
				2.00	6.2	B	Non-Aggressive	Non-Aggressive	Clay loam	9	276	2.5	Slightly Saline	3.3	Slightly Saline
				2.25	6.1	B	Non-Aggressive	Non-Aggressive	Sandy loam	14	296	4.1	Moderately Saline		
				2.50	5.9	A	Mild	Non-Aggressive	Sandy loam	14	313	4.4	Moderately Saline		
				2.75	6.4	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	333	4.7	Moderately Saline		
				3.00	6.2	A	Non-Aggressive	Non-Aggressive	Sandy loam	14	315	4.4	Moderately Saline		

Test Bore	Coordinates East (m MGA94)	Coordinates North (m MGA94)	RL (m AHD)	Sample Depth (m)	pH	Soil Condition (AS2159)	Soil Aggressivity To Concrete (AS2159 pH criteria)	Soil Aggressivity To Steel (AS2159 pH criteria)	Soil Texture Group (after DLWC)	Textural Factor [M] (after DLWC)	$EC_{1:5}$ (Lab.) (µS/cm)	EC_e [M x $EC_{1:5}$] (dS/m)	Salinity Class (Richards 1954)	ECe Bulk (depths<0.8m) (dS/m)	Salinity Class (depths>0.8m) (Richards 1954)
CKM25	291978	6265734		0.25	6.9	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	166	1.4	Non Saline		
				0.50	7.3	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	166	1.4	Non Saline	1.4	Non Saline
				0.75	7.4	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	167	1.4	Non Saline		
				1.00	6.7	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	168	1.4	Non Saline		
				1.25	7.3	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	165	1.4	Non Saline		
				1.50	6.9	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	163	1.4	Non Saline		
				1.75	6.7	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	164	1.4	Non Saline		
				2.00	7.2	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	167	1.4	Non Saline	1.4	Non Saline
				2.25	7.2	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	166	1.4	Non Saline		
				2.50	7.0	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	164	1.4	Non Saline		
				2.75	6.5	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	170	1.4	Non Saline		
				3.00	7.5	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	169	1.4	Non Saline		
SKM26	292044	6265896		0.25	7.0	B	Non-Aggressive	Non-Aggressive	Clay loam	9	354	3.2	Slightly Saline		
				0.50	7.3	B	Non-Aggressive	Non-Aggressive	Clay loam	9	211	1.9	Non Saline	2.5	Slightly Saline
				1.00	7.7	B	Non-Aggressive	Non-Aggressive	Clay loam	9	201	1.8	Non Saline		
				1.50	7.4	B	Non-Aggressive	Non-Aggressive	Clay loam	9	210	1.9	Non Saline		
				2.00	7.0	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	186	1.6	Non Saline	1.7	Non Saline
				2.50	7.5	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	184	1.6	Non Saline		
				3.00	6.9	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	202	1.7	Non Saline		
SKM27	291795	6266039		0.25	7.0	B	Non-Aggressive	Non-Aggressive	Clay loam	9	287	2.6	Slightly Saline		
				0.50	7.5	B	Non-Aggressive	Non-Aggressive	Clay loam	9	228	2.0	Slightly Saline	2.5	Slightly Saline
				0.75	7.2	B	Non-Aggressive	Non-Aggressive	Clay loam	9	299	2.7	Slightly Saline		
				1.00	7.4	B	Non-Aggressive	Non-Aggressive	Clay loam	9	319	2.9	Slightly Saline		
				1.25	7.0	B	Non-Aggressive	Non-Aggressive	Clay loam	9	369	3.3	Slightly Saline		
				1.50	7.0	B	Non-Aggressive	Non-Aggressive	Clay loam	9	440	4.0	Slightly Saline		
				1.75	7.0	B	Non-Aggressive	Non-Aggressive	Clay loam	9	397	3.6	Slightly Saline		
				2.00	7.0	B	Non-Aggressive	Non-Aggressive	Clay loam	9	381	3.4	Slightly Saline	4.7	Moderately Saline
				2.25	6.7	A	Non-Aggressive	Non-Aggressive	Sand	17	331	5.6	Moderately Saline		
				2.50	7.1	A	Non-Aggressive	Non-Aggressive	Sand	17	362	6.2	Moderately Saline		
				2.75	6.6	A	Non-Aggressive	Non-Aggressive	Sand	17	365	6.2	Moderately Saline		
				3.00	6.6	A	Non-Aggressive	Non-Aggressive	Sand	17	376	6.4	Moderately Saline		
SKM29	291980	6266008		0.25	7.0	B	Non-Aggressive	Non-Aggressive	Clay loam	9	274	2.5	Slightly Saline		
				0.50	7.3	B	Non-Aggressive	Non-Aggressive	Clay loam	9	272	2.4	Slightly Saline	2.4	Slightly Saline
				0.75	6.2	B	Non-Aggressive	Non-Aggressive	Clay loam	9	269	2.4	Slightly Saline		
				1.00	5.5	B	Non-Aggressive	Non-Aggressive	Clay loam	9	325	2.9	Slightly Saline		
				1.25	5.7	B	Non-Aggressive	Non-Aggressive	Clay loam	9	291	2.6	Slightly Saline		
				1.50	5.7	B	Non-Aggressive	Non-Aggressive	Clay loam	9	440	4.0	Slightly Saline		
				1.75	5.8	B	Non-Aggressive	Non-Aggressive	Clay loam	9	383	3.4	Slightly Saline		
				2.00	6.1	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	396	3.4	Slightly Saline	4.5	Moderately Saline
				2.25	6.5	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	972	8.3	Very Saline		
				2.50	7.1	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	741	6.3	Moderately Saline		
				2.75	7.0	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	708	6.0	Moderately Saline		
				3.00	7.1	B	Non-Aggressive	Non-Aggressive	Light clay	8.5	473	4.0	Moderately Saline		

SKM

Table 5-4 Salinity, Erosion and Sediment Management Strategy Overview

OBJECTIVE	BENEFIT	CONTROL	DETAILS	MONITORING METHOD	MANAGEMENT METHOD
SALINITY CONTROL MINIMISE GROUNDWATER RECHARGE	PREVENT RISING GROUNDWATER TABLE LEVEL AND DEVELOPMENT OF SALINE SOIL PROBLEMS	MINIMISE IMPORTATION AND USE OF POTABLE WATER ONTO THE SITE	• REUSE STORMWATER FOR IRRIGATION OF OPEN AREAS • MINIMISE POTABLE WATER DEMAND	INSTALL MONITORING BORE NETWORK	• MONITOR GROUNDWATER TABLE LEVELS • PERFORM REGULAR, RANDOM INSPECTIONS OF HOUSE SITES, AND VEGETATION AND GENERAL INFRASTRUCTURE AREAS
		REDUCE IRRIGATION REQUIREMENTS	• ADOPT SMALL GARDEN/LAWN AREAS • ESTABLISH LOW WATER REQUIREMENT PLANTS • USE MULCH COVER • USE LOW FLOW WATERING FACILITIES		
		AVOID USE OF INFILTRATION PITS TO DISPERSE SURFACE WATER	• DESIGN STORMWATER SYSTEM TO NEGATE NEED FOR HOME SITE STORMWATER STORAGE DISPOSAL • CONNECT ALL DOWNPIPES DIRECTLY TO STORMWATER		
		PREVENT LEAKAGE FROM WETLAND AND DRAINAGE FACILITIES	• LINE ALL PERMANENT STORMWATER RETENTION STRUCTURES AND WETLANDS		
SALINITY CONTROL ENCOURAGE USE OF GROUNDWATER AS A RESOURCE	MAINTAIN OR LOWER GROUNDWATER TABLE LEVEL	ENCOURAGE TREE PLANTING AND RETENTION, ESPECIALLY IN AREAS OF HIGHER RECHARGE	• USE/RETAIN NATIVE, DEEP-ROOTED, LARGE GROWING SPECIES		