

SALINITY MANAGEMENT PLAN



Geotechnical Engineering

Engineering Geology

Hydrogeology

Contaminated Site Assessment

Construction Materials Testing

Environmental Monitoring

PROSPECT WATER THEME PARK

Prepared for

Prospect Aquatic Investments

Prepared by

RCA AUSTRALIA

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SALINITY POTENTIAL IN WESTERN SYDNEY

RCA ref 7600-902/0
Client ref TBA

20 January 2011

Prospect Aquatic Investments
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Attention: Mr Matthew Fisk

SALINITY MANAGEMENT PLAN
PROPOSED WATER THEME PARK – PROSPECT NSW

1 INTRODUCTION

RCA Australia (RCA) has been engaged by Prospect Aquatic Investments (PAI) to prepare a Salinity Management Plan for the proposed Water Theme Park at Prospect.

This Salinity Management Plan has addressed all the issues relating to saline soil and groundwater at the proposed site development. This report provides an assessment of the proposed site's saline conditions based on a review of salinity reports of Western Sydney and fieldwork data. From this, recommendations have been provided on how to properly manage existing saline conditions on site during and after the proposed development works and to mitigate the impact of salinity on the development.

Documents reviewed in the preparation of this management plan include:

- NSW Salinity Strategy – *Salinity Targets Supplementary Paper* (2000).
- NSW Salinity Strategy – *Salinity Actions* (2000).
- Salinity Management Guidelines (2007).
- Western Sydney Guidelines – *Guidelines to accompany maps of salinity potential in Western Sydney* (2002).
- Salinity Potential Map in Western Sydney (2002).

2 OBJECTIVES

Salinity management controls for during and after site development are to be implemented as a preventative measure in dealing with saline soil and groundwater issues. The aims of these guidelines are to:

- reduce sedimentation loss during and after construction;
- limit the impacts of salinity on the environment;
- maximise re-use of on site materials;
- reduce the impact of salinity on groundwater;
- limit the removal of naturally resistant saline vegetation;
- reduce water collecting in low lying areas.

3 SALINITY RISK MAP

A review of the Department of Natural Resources Map of Salinity Potential in Western Sydney (2002) as shown in **Drawing 1, Appendix A** indicated that the site is located in an area of Moderate Salinity potential. Saline areas may occur in this zone, which have not yet been identified or may occur if risk factors change adversely. Surrounding creek lines were classified as having High Salinity Potential due to its high relative wetness index predisposing this area as a salinity risk.

4 SITE DESIGN

Fieldwork was undertaken at Prospect Water Theme Park on 12 November 2010. The subsurface conditions encountered in the boreholes comprise the following:

- TOPSOIL - Present in all bores except one, at depths ranging from 0.1m to 0.3m.
- FILL - Present in three bores where only fill material was found except one bore in which siltstone was found at 1.9m. Depths varied from 0.1m to 2m.
- SILTY CLAY - Present in majority of bore holes to depths ranging 0.1m to 2m.
- SILTY SANDY CLAY - Present in one bore at a depth of 1.5m to 1.8m.
- SILTSTONE - Present in several bore holes to depths starting at 1.3m to 1.8m and extending to 2m.

The electrical conductivity was measured on site to assess the salinity levels of the subsurface soils. The EC values were then compared against critical EC levels for environmental protection:

- 280-800 EC for sensitive crops;
- 70-320 EC for allowable range of drinking water in Sydney;
- 1500 EC for protection of aquatic communities (however, there is no simple threshold below which impacts are negligible or above which impacts are significant).

The average EC value on site was 486 EC. Based on the environmentally critical EC levels above, the average EC levels show that the soils have low to moderate salinity potential.

Permeability testing was conducted on a confined aquifer within the bedrock layer as no groundwater was present above this depth. As such, the permeability testing results have been classified as insignificant as the groundwater at these depths would not have a high impact on the site's salinity potential. However, groundwater management should still be taken into consideration when dealing with salinity on site so as to not increase the groundwater level and salt concentrations in the groundwater.

Based on the soil types and the electrical conductivity of the site it was determined that salinity management guidelines should be implemented during and after development so that salinity levels are kept within an acceptable range. These salinity management guidelines are outlined in Section 5.

5 SALINITY MANAGEMENT GUIDELINES

Guidelines for saline soils and groundwater have been proposed for Western Sydney due to naturally occurring saline soils in the area and the increased expansion of Western Sydney. The development of Western Sydney has disturbed the soil profile, altered hydrological processes and, in some areas, led to concentrations of salts on soil surfaces, in building materials, and waterways.

The soil and groundwater guidelines present practical recommendations about how to manage and mitigate existing saline conditions. The application of the Salinity Management Plan will differ depending on the type of land use that is proposed for the site. The soil and groundwater management guidelines form part of the Salinity Management Plan and are presented in Section 5.1 and 5.2. The salinity management guidelines should be followed in conjunction with the Water Cycle Management Plan on site [Ref 6]. For more information on the Water Cycle Management Plan on the site refer to the report by Brown consulting (NSW) Pty Ltd.

5.1 SOIL MANAGEMENT

The soil management guidelines have been proposed in accordance with the NSW Salinity Strategy (2000). These soil guidelines have been proposed based on the geology, hydrogeology, topography, recharge rates, vegetation type and proposed development of the site. We suggest the following soil management guidelines as part of the Salinity Management Plan:

- On site topsoil materials to depths of approximately 0.5m are considered non-saline.
- Salinity levels generally increase with depth, with subsurface salinity levels presenting moderately saline conditions from 1.0 metre below ground level.
- The underlying saline soils that may be exposed during site works should be capped with non-saline imported fill or non-saline topsoil.
- Any imported fill must have its salinity levels tested and must not exceed a level of two deci-siemens per centimetre. Soils exceeding this level must not be imported on to the site.

- Place cut materials in the original in-situ order, or if this is not possible, bury the most saline soil underneath less saline soil.
- Avoid excavation intersecting the groundwater, where possible.
- Filling areas are to be graded, revegetated and adequate surface drainage infrastructure installed as soon as practical to avoid excessive infiltration, minimise salt leaching and soil erosion.
- Exposure and disturbance of subsoil material must be reduced by minimising cut and fill.
- Fill material must have satisfactory permeability properties to ensure sufficient drainage.

5.2 GROUNDWATER MANAGEMENT

As part of the salinity management plan groundwater has been identified as a key area of concern for the proposed works at the site. RCA suggest the following guidelines to manage salinity levels in the groundwater within and around the site:

- Avoid over-watering of the proposed site.
- Groundwater extraction does not occur on the site.
- Plant native vegetation that utilises rainfall efficiently and minimise lawn areas on land not required for recreational uses. Landscape with native trees, shrubs and grasses that require little irrigation.
- Appropriate design, construction and maintenance of water supply, sewage and stormwater pipes to avoid leaking.
- Natural drainage patterns should be maintained as far as practical.
- Ensure an appropriate ratio of hard (impermeable) and permeable surfaces to avoid rainwater runoff infiltrating the ground in large volumes at any given location.
- Direct runoff from paved areas into lined stormwater drains rather than along grassed channels as necessary.
- Avoid or minimise the use of onsite stormwater detention.
- Ensure chlorine from pools have adequate drainage to make sure no chlorine infiltrates into the surrounding permeable areas on the site.

5.3 SITE DEVELOPMENT

The following guidelines have been proposed to prevent damage to the site development during and after construction:

- In the case of all building materials the manufacturer's advice must be complied with regarding durability and correct use.
- Sulfate resistant materials should be used for underground surfaces and roads or paving where possible.
- The addition of salts in the materials, fill or water used during construction must be limited.

- A waterproof seal must be used on roads to minimise evaporation and the concentration of salt.
- Design and construction is to be carried out in accordance with relevant Australian Standards, Building Codes and current 'Industry Best Practice' in regard to urban salinity.
- Concrete of suitable strength and reinforcement cover is to be used for drainage structures and wherever contact with water and increased soil moisture is expected.
- Allow for sufficient corrosion of steel or install the appropriate protective systems.

6 LIMITATIONS

This report has been prepared for Prospect Aquatic Investments in accordance with an agreement with RCA dated 20 January 2011. The services performed by RCA have been conducted in a manner consistent with that generally exercised by members of its profession and consulting practice.

This report has been prepared for the sole use of Prospect Aquatic Investments. The report may not contain sufficient information for purposes of other uses or for parties other than Prospect Aquatic Investments. This report shall only be presented in full and may not be used to support objectives other than those stated in the report without written permission from RCA.

The information in this report is considered accurate at the date of issue with regard to the current conditions of the site. Conditions can vary across any site that cannot be explicitly defined by investigation.

Environmental conditions including contaminant concentrations can change in a limited period of time. This should be considered if the report is used following a significant period of time after the date of issue.

Yours faithfully

RCA AUSTRALIA



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REFERENCES

- [1] NSW Government Department of Planning Appendix C- Salinity Management Guidelines, 2007.
- [2] Department of Infrastructure, Planning and Natural Resources - *Salinity Map Potential in Western Sydney*, 2002.
- [3] Department of Infrastructure, Planning and Natural Resources; Western Sydney Guidelines - *Guidelines to accompany Map of Salinity Potential in Western Sydney*, August 2002.
- [4] NSW Department of Land and Water Conservation; NSW Salinity Strategy – *Salinity Targets Supplementary Paper*, October 2000.
- [5] NSW Department of Land and Water Conservation; NSW Salinity Strategy – *Salinity Actions*, August 2000.
- [6] Brown Consulting; *Water Cycle Management Plan – Wet ‘n’ Wild Sydney*, report No. X10212-01 November 2010.

Appendix A

Salinity Potential in Western Sydney

SALINITY POTENTIAL IN WESTERN SYDNEY 2002



LEGEND

RIVER or CREEK
MOTORWAY or HIGHWAY
MAIN ROAD
WATERBODY, LAKE or SWAMP
LOCAL GOVERNMENT AREA CAMDEN

[illegible][illegible]