APPENDIX 9.
REMEDIATION STRATEGY

Headland Park, Barangaroo

Generalised remediation strategy

Nature of the present site

The land that comprises the proposed Headland Park (the "Park") occupies the northern part of the Barangaroo site and has been substantially reclaimed from the waters of Sydney Harbour by reclamation using fill material sourced for the most part from unidentified locations. However, fill materials, probably derived from the former gasworks, which are known to have operated on the southern part of the Barangaroo site, has also been identified in the north-western part of the Park.

Almost the entire Park is covered presently by pavements and buildings.

Assessment of contamination

A comprehensive assessment of the environmental condition of fill materials, natural soil, bedrock and groundwater has been reported by Environmental Resources Management Australia (ERM 2008 "*Additional Investigation Works at Barangaroo Hickson Road, Millers Point NSW*").

Soil condition

Assessment criteria

The environmental condition of soil materials on the Park are assessed by comparison with the health-based investigation levels (referred to as "HIL-E") against which contaminant concentrations are compared for land used for open space purposes, as defined in NSW DEC (2006) "*Guidelines for the NSW Site Auditor Scheme (2nd edition)".*

The comparison of contaminant concentrations against the HIL-E levels is very conservative and relates to child users of the open space areas having exposure to the soil for 2 hours/day, 365 days/year for 70 years.

Where contaminant concentrations exceed HIL-E levels, ANZECC (1992) "*Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites*" state that theses levels are "investigation levels" and that higher levels may be acceptable based on an assessment of site-specific exposure factors. For example, on the proposed Park it is not likely that a child would have exposure to the fill materials for the duration used to derive the HIL-E levels and, in any event, when completed, the Park will be constructed and maintained so that users of the Park would have no exposure to the materials beneath the landscaped surfaces.

Environmental condition

Soil samples collected from a number of depth intervals from more than 60 bores across the Park reported for the most part no significant concentrations of contaminants, as shown in

Table 1 (attached), except at a small number of locations in the north-western part of the Park where levels of polynuclear aromatic hydrocarbons exceeding the HIL-E levels were identified.

Groundwater condition

Assessment criteria

The quality of groundwater was assessed against trigger values listed in ANZECC/ARMCANZ (2000) "*Australian and New Zealand Guidelines for Fresh and Marine Water Quality"*.

The receiving waters of Darling Harbour are classified in the guidelines as a "highly disturbed ecosystem" that are characterised by the lowest ecological values addressed by the guidelines. Although there is a requirement not to contaminate waters, the guidelines envisage that lower protection levels provided by the guidelines may be applicable to highly disturbed ecosystems.

Groundwater quality

Groundwater across the Park was shown to be subject to tidal influences.

Groundwater from the 10 monitoring wells installed within the Park was impacted by low concentrations of nickel and zinc, at levels typically encountered in groundwater in urban areas. No significant concentrations of heavy metals, petroleum hydrocarbons, polynuclear aromatic hydrocarbons, benzene, toluene, ethylbenzene and xylenes, phenols or pesticides were identified.

The results reported for groundwater indicated remediation of groundwater was not required and that leaching of contaminants from the fill materials into groundwater was not significant.

Ecologically Sustainable Development principles

Wherever possible on the Park, development works and remediation, as required, will be undertaken according to the principles of Ecologically Sustainable Development (ESD) to provide economic goals that are:

- Cost-effective.
- Protective of human health and the environment, with respect to minimisation of:
    - consumption of energy
    - emissions to air and water
    - impact to social amenity
    - long-term risk

Requirement for remedial works

The contaminated materials identified at the Park were present in fill materials at depths below sea level and beneath substantial pavements. It is considered that application of ESD principles mitigate against the excavation and transport of contaminated materials for disposal

to a landfill licensed to receive the waste, but notwithstanding these principles, it is considered that no significant environmental or human health benefit would result in remediation of the contamination "hot spots" by their excavation and removal to a landfill.

Consequently, for continued use as a Park, the most appropriate remedial option, in accordance with ESD principles and policy endorsed by NSW Department of Environment and Climate Change (DECC) set out in ANZECC/NHMRC (1992) "*Australian and New Zealand Guidelines for Assessment and Management of Contaminated Sites"*, would be for the contaminated materials to be contained beneath the existing pavements or beneath some other engineered capping system if the pavements are to be removed as part of the development of the Park.

Where development of the Park requires that the fill materials are excavated, the materials would be placed within an engineered "containment cell" that will securely contain the materials and will be constructed to ensure long-term stability and to minimise the ingress of storm water. The surface of the cell would be constructed of clean topsoil that would be suitable for landscaping purposes and would allow the surface of the cell to be used for open space purposes and for the collection of storm water for reuse within the Park .

Development works requiring removal of fill materials

Where development works on the Park require removal of fill materials, such as creation of the Northern Cove and the reestablishment of the 1836 shoreline, the following principles will be adopted:

- Wherever possible and if practical, existing concrete pavements should remain in place to minimise the ingress of storm water that could leach contaminants from the fill materials, although this risk is considered to be low based on the absence of significant impact to groundwater quality.
- Where levels of contaminants are less than HIL-E level, the fill materials may be used in any location on the Park.
- Where levels of contaminants in the fill materials allow classification as "General Solid Waste", in accordance with the procedures listed in NSW DECC (2008) "Waste Classification Guidelines", the materials can be placed within the containment cell.
- Where levels of contaminants in the fill materials allow classification as "Restricted Solid Waste", in accordance with the procedures listed in NSW DECC (2008) "Waste Classification Guidelines", the material will be disposed to a landfill licensed to accept that class of waste.
- Where levels of contaminants in the fill materials allow classification as "Hazardous Waste", in accordance with the procedures listed in NSW DECC (2008) "Waste Classification Guidelines", the material will be stabilised and disposed to a landfill licensed to accept that class of waste.

Remedial Action Plan

To address remedial measures that are proposed to be implemented across the Barangaroo site, ERM are in the process of preparing a Remedial Action Plan (RAP) "*Stage 2 Remedial Action Plan for Barangaroo, Hickson Road, Sydney*" dated September 2008.

Environmental management during development works

Development works will be undertaken in accordance with an operational Environmental Management Plan (EMP), which will be required to be developed prior to commencement of the works. Environmental values required to be monitored and protected include the quality of:

- Water within Darling Harbour.
- Air, including impacts from odours and dust.
- Social amenity, including impacts from odours, noise and vehicle movements.

Where development works require excavation of large volumes of fill materials, it is considered that impacts to air and to social amenity can be achieved using standard measures, but that stringent measures will be required to be implemented to protect the quality of water in Darling Harbour. The measures will be designed following completion of a risk assessment and may include installation of sheet-pile walls and/or silt curtains.

Occupational health and safety during development works

Development works will be undertaken in accordance with an operational Occupational Health and Safety Plan), which will be required to be developed prior to commencement of the works.

Long-term environmental management

As groundwater on the Park was not impacted so as to pose a risk to the receiving waters of Darling Harbour, no long-term management of groundwater is required.

As fill materials impacted with chemical substances will remain on the Park beneath existing pavements and within the containment cell, there is the requirement for a long-term EMP to be implemented.

The purpose of the EMP is to:

- Document the environmental condition of the final development.
- Document the responsibilities of various persons for inspection and maintenance of the Park.
- Document reporting responsibilities of various persons.
- Provide guidance for inspection and maintenance of pavements, buildings, gardens, landscaped and grassed areas and the surface of the cell to prevent exposure to the fill materials by users of the Park.
- Provide guidance for maintenance workers involved in intrusive works within the Park.
- Provide guidance for disposal of any excavated materials and for reinstating excavated areas of the Park.

The EMP will be required to be notified by the consent authority in accordance with the requirements of the s149 of the Environmental Planning and Assessment Act.

Requirements of State Environmental Planning Policy No. 55

State Environmental Planning Policy No. 55 – Remediation of Land (SEPP 55) provides a Statewide planning approach to the remediation of contaminated land by consideration of whether the land is contaminated and, if it is contaminated, whether it can be made suitable for the proposed purpose.

Sections of SEPP 55 relevant to the remedial works proposed on the Barangaroo site are considered below.

Sections 6 and 7

With respect to rezoning of land, Section 6 of SEPP 55 requires the planning authority to permit a change of use of land, unless:

- "The planning authority has assessed whether the land is contaminated, and
- If the land is contaminated, the planning authority is satisfied the land is suitable in its contaminated state (or will be suitable after remediation) for all purposes for which the land in the zone concerned is permitted to be used, and
- If the land requires remediation to be made suitable for any purpose for which land in that zone is permitted to be used, the planning authority is satisfied that the land will be so remediated before the land is used for that purpose."

With respect to determining a Development Application, Section 7 of SEPP 55 requires the consent authority not to consent to the carrying out of any development on land, unless:

- "it has considered whether the land is contaminated, and
- If the land is contaminated, it is satisfied the land is suitable in its contaminated state (or will be suitable after remediation) for the purpose for which the development is proposed to be carried out, and
- If the land requires remediation to be made suitable for the purpose for which the development is proposed, it is satisfied that the land will be remediated before the land is used for that purpose."

With respect to the requirements of Sections 6 and 7 of SEPP 55, the Barangaroo site has been subject to Stage 1 Preliminary Site Investigation and Stage 2 Detailed Site Assessment environmental assessment programs that has shown fill, natural soils and groundwater to be contaminated, particularly in the vicinity of the former gas works that operated on the site.

The Barangaroo site has been shown to be contaminated to the extent that remediation is required before the planning authority would permit a change in use of the site.

In addition, that part of the Barangaroo site occupied previously as a gas works, has been declared as an Investigation Site by NSW Environment Protection Authority in Declaration Number 15036.

An RAP has been prepared that documented measures to be implemented so that the site can be made suitable for the proposed purposes.

To ensure that the remedial works are carried out and validated so that the site will be suitable for the proposed uses, it is proposed that the RAP and the validation of the works would be certified by a site auditor accredited by NSW Environment Protection Authority under the Contaminated Land Management Act 1997.

Section 9

Consideration of Section 9 of SEPP 55 requires that the remedial works proposed on the Site be considered as Category 1 remediation works requiring consent.

The remedial works on the site will be carried out only after obtaining consent of the consent authority.

Section 17

Consideration of Section 9 of SEPP 55 requires that, *inter alia*, remediation work must "be carried out in accordance with:

(a) the contaminated land planning guidelines, and
(b) the guidelines (if any) in force under the Contaminated Land Management Act 1997, and
(c) in the case of category 1 remediation work – a plan of remediation, as approved by the consent authority, prepared in accordance with the contaminated land planning guidelines".

The assessment and remediation of identified contamination will be carried out in accordance with the requirements of "Managing Land Contamination: Planning Guidelines" "best practice" for managing land contamination so that the following key principles the planning and development control processes can be undertaken, as follows:

- "ensure that changes of land use will not increase the risk to health or the environment
- avoid inappropriate restrictions on land use
- provide information to support decision making and to inform the community".

To provide the documentation required for the "Decision Process for Land Use Changes" set out in Section 3.1 of the planning guidelines, the environmental condition of the site has been assessed through programs of Stage 1 Preliminary Site Investigations and Stage 2 Detailed Site Investigations and a Stage 3 RAP has been completed. Following completion of the remedial works, a Stage 4 Validation Report and Monitoring Report will be prepared.

In addition, a site audit will be completed by a site auditor, as described above.

The remedial works will be carried out in accordance with requirements of guidelines in force under the Contaminated Land Management Act 1997, as specified in s105 of the Act. It will be one of the responsibilities of the site auditor to ensure and to certify that the remedial works have been carried out in accordance with the requirements of Section 17.

A plan of remediation, the RAP, has been prepared that documented measures to be implemented so that the site can be made suitable for the proposed purposes.

Conclusion

Contaminated materials have been identified within the Park due to historical filling and reclamation activities, but groundwater has been shown to be only marginally impacted and to require no remediation.

In accordance with ESD principles, the contamination within the fill materials can be managed *in situ* by ensuring the fill materials are capped so that users of the Park have no exposure to the contaminants and by implementation of a long-term EMP.

Where development works on the Park require removal of fill materials, they are required to be classified. Materials that meet criteria for open space land use are able to be used in any location on the Park, materials that are classified as “General Solid Waste” can be placed into the engineered containment cell to be constructed on the Park, but materials classified as “Restricted Solid Waste” or “Hazardous Waste” are required to be disposed off-site into a landfill licensed to receive the appropriate class of waste.

The requirements of SEPP 55 will be achieved by implementation of the programs of site assessment, remediation and validation, which will be subject to endorsement by the NSW Environment Protection Authority and by a site auditor, who will ensure, firstly, that the implementation of these programs will make the Park suitable for the proposed open space land use, and, secondly, at the completion of the remedial works and validation program, that the Park is suitable for this use.