

APPENDIX 26

Preliminary Environmental and Construction Management Plan

Preliminary Environmental & Construction Management Plan

Main Works – Headland Park Barangaroo

Barangaroo Delivery Authority

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1. Introduction

The Director General's Requirements from the NSW Department of Planning for Early Works (MP10_0047) and Main Works (MP10_0048) for Barangaroo Headland Park and Northern Cove require an Environmental and Construction Management Plan (ECMP) to be submitted with the Environmental Assessment for each project.

Item 14 of the Director General's Requirements states that the ECMP is to include:

- Community consultation, notification and complaints handling.
- Impacts of construction on adjoining development and proposed measures to mitigate construction impacts.
- Noise and vibration impacts on and off site.
- Air quality impacts on the neighbourhood.
- Odour impacts.
- Visual impacts, with particular regard to the Temporary Cruise Passenger Terminal.
- Water quality management for the site.
- Waste and chemical management.

This document is a Preliminary Environmental and Construction Management Plan (PECMP) for the Main Works, which has been prepared to respond to the Director General's Requirements. A separate PECMP was prepared for the Early Works Environmental Assessment.

The structure of this PECMP is:

- Main Works Overview (Section 3).
- Environmental Management Approach (Section 4).
- Organisation and Communications (Section 5).
- Construction Impacts & Environmental Controls (Section 6).
- Monitoring and Review (Section 7).
- Risk Management (Section 8).

The PECMP describes construction methodologies and the mitigation measures proposed to protect the environment. It is based on the level of detail available at this stage in the project. Construction activities and mitigation measures to protect the environment will be developed in further detail during the detailed design, contract works specification and construction methods development phases of the works.

The Main Works are planned to commence from mid-2011 and be completed in 2014. A portion of the Headland Park is targeted to be open in late 2013.

2. Abbreviations

The following acronyms are used throughout the Preliminary Environmental Construction Management Plan:

AS	Australian Standard
DECCW	Department of Environment Climate Change and Water
CEMP	Construction Environmental Management Plan
DOP	Department of Planning
ECMP	Environmental and Construction Management Plan
ESCP	Erosion and Sediment Control
ESD	Ecologically Sustainable Development
EMS	Environmental Management System
ENM	Excavated Natural Material
HVAC	Heating, Ventilation and Air Conditioning
ISO	International Standard Organisation
MSDS	Material Safety Data Sheet
NCR	Non Conformance Report
NSW	New South Wales
NZS	New Zealand Standard
PECMP	Preliminary Environmental and Construction Management Plan
RAP	Remediation Action Plan
SPC	Sydney Ports Corporation
SPS	Sewer Pump Station
VENM	Virgin Excavated Natural Material
WRAPP	Waste Reduction and Purchasing Policy

3. Main Works Overview

The following sections describe the scope and nature of the Main Works:

- Section 3.1 – details activities to be undertaken as Main Works.
- Section 3.2 – provides staging and sequencing details;
- Section 3.3 – describes construction methodologies; and
- Section 3.4 – describes the associated construction schedule and hours of work.

3.1 Main Works Activities

The development proposal comprises the redevelopment of the northern part (Stage 3) of the Barangaroo site for a new 'Headland Park' and the creation of a new 'Northern Cove'. The proposal includes all works required to construct the final landforms. In addition, the proposal include construction of a car park with approximately 300 spaces, and a space for a future cultural use within the Headland (below finished ground level). The future cultural use facility will be subject to a separate project application.

Main Works include:

- Land formation utilising fill from Stage 1, ranging from the 150,000m³ identified in the Early Works application to approximately 230,000m³ (additional 80,000m³) along with excavated material from Stage 3 (120,000m³) to build the headland up to finished levels for a nominal one metre topsoil layer (total fill of 350,000m³).
- Construction of structural earth retaining walls utilising sandstone based materials.
- Creation of a naturalistic shoreline and northern cove through excavation/dredging, formation of retaining walls using boulders.
- General landscaping and planting.
- Construction of a network of pedestrian pathways connecting the foreshore walkway and surrounding areas.
- Construction of a shoreline promenade (dual use pedestrian path and cycleway).
- Jetty / viewing platform extending into the Northern Cove from the southern shoreline.
- Construction of a car park with up to 300 spaces within the headland with vehicular access from Towns Place and pedestrian access from various locations within Headland Park.
- Location and adaptive reuse of the former Sydney Water Sewage Pumping Station for the purposes of an amenities building.
- Construction of a space for a future use (cultural facility) comprising initially 75,000m³ and ultimately up to 100,000m³.
- Installation of relevant services and infrastructure;
- Construction of the services and piping/pumping infrastructure associated with the air conditioning system (cooling water inlet/ outlet) for the future cultural facility and car park; and
- Site remediation for limited contamination of fill material previously identified at the Headland Park site.

Indicative drawings showing the proposed Main Works for the Headland Park and Northern Cove at certain snapshots in time are provided at Appendix A.

The proposed works comprise five main 'packages' of works as follows:

- Excavation, filling and land formation.
- Public domain and civil works.
- Building architecture.

- Landscape architecture.
- Waterfront & maritime design and engineering.

Each of the above categories is expanded in further detail below.

3.1.1 Excavation, filling and land formation

This package of works involves the creation of the final landform, through excavation of the shoreline and Northern Cove and filling to form the Headland Park.

The main area of excavation relates to the creation of a naturalistic shoreline and the Northern Cove with excavation proposed to a level two metres below sea level (RL -2m). Other minor landside excavation is also envisaged. In total it is estimated that up to 80,000m³ of excavation would be undertaken as part of the proposed Main Works, along with up to the 60,000m³ of sandstone extraction detailed in the Early Works Project Application. There would be man-made objects and materials that needing to be disposed off-site.

The proposed filling for the Main Works is in addition to the receipt and placement of up to 150,000m³ of fill from Stage 1, as provided for in the Early Works Project Application. Fill created on site through excavation of the shoreline and Northern Cove will be used to form the final landform. Any further fill to be placed on site required would likely come from Stage 1 basement excavations. In total there is approximately 350,000m³ of fill to be placed, including topsoil used for planted and turfed areas. The landform contours in the vicinity of the south western face where a slope of 1:1.5 is shown may be modified to accommodate the actual fill materials available from Stage 1 and excavated from the site. In the event that insufficient materials of the required engineering quality are available, then up to 35,000m³ of fill may need to be sourced from elsewhere.

As part of the shoreline works, the existing heritage listed sandstone seawall on the western side of Barangaroo would be stabilised and partially dismantled. Retrieved sandstone blocks would be reused on site and incorporated in the Headland Park works.

Temporary retaining walls and infrastructure works would be removed as part of the proposed works.

3.1.2 Public domain and civil works

Public domain and civil works proposed for Headland Park and Northern Cove include:

- Creation of a new access road connecting from Towns Place to the proposed underground car park within the Headland Park.
- Construction of the proposed car park and public connections.
- Construction of a series of pedestrian pathways connecting the Headland Park to Merriman Street, Argyle Place and Hickson Road in the south.
- Construction of a public jetty on the southern shore of the Northern Cove.
- Installation of drainage infrastructure and utility services.
- Construction of the services and piping/pumping infrastructure associated with the air conditioning system (cooling water inlet/outlet) for the future cultural facility and car park.
- Erection of lighting.
- Installation of security surveillance systems (CCTV).

The domain is to be open at all times as a public space. There are no permanent fences or gates.

During major public events temporary fencing for protection of the sensitive landscaped areas and crowd control will be utilised.

3.1.3 Building architecture

Architectural works included in the Main Works include:

- Construction of a space within Headland Park for a future cultural use. The concept development is in two stages with the first stage comprising the allocation of a 75,000m³ space. A second stage will mature the landform contour design and may allow the space to increase to up to 100,000m³.
- Installation of the relocated Sydney Water Sewage Pumping Station (SPS14) superstructure on the northern shore of Barangaroo for adaptive reuse as an amenities block.
- Public amenities to cater for every day patronage.

3.1.4 Landscape architecture

The proposed landscape works comprise the new shoreline, park and Northern Cove and include:

- Areas of typical Sydney Harbour steep headland vegetation established with a mix of young and semi mature stock consisting of ground covers, shrubs and trees.
- Open spaces on the higher ground area well irrigated for heavy use with fringe areas of natural grasses and low levels of irrigation.

The vegetation will take 10 to 15 years to develop to reach an appearance of maturity.

These areas will include new paving and pathways, seating, lighting and security cameras. The works include ESD initiatives including irrigation supply from stormwater capture, filtration and re-use strategies.

3.1.5 Waterfront & maritime design and engineering

The concept design for the Headland Park is to create a headland similar to other major headlands in Sydney Harbour such as Lady Macquarie's Hair or Ball's Head. At the shoreline these parks are typified by horizontal rock platforms and pools stepping down into the harbour with underwater slopes and cliffs dropping to the harbour floor. The concept design replicates this form, with rock quarried on the site used to form the platforms. The existing quay line formed by concrete caissons is to be cut down and the fill material behind excavated to form the new harbour floor. The harbour floor and submerged embankment will be protected by rock armour. Further details are provided below.

Above Low Water

For visible sections of the shoreline it is important to be able to achieve a naturalistic structure. A moderate slope (approximately 1 in 3 to 1 in 4) with large flat rocks forming steps and rock pools is appropriate. The large sandstone rocks will be sourced from site as part of the quarrying activities.

Under the concept design the rocks that form the edge are bedded on a gravel bed of approximately one metre, and then further bedded by forcing down with an excavator bucket.

Below Low Water

On the western and northern sides of the site, the proposed shoreline is close or above the existing caissons. These caissons retain the fill behind them, under the existing hardstand area and cannot be removed. It is proposed to retain as much of the existing caisson structures as possible.

The proposed methodology is to remove sand fill within the front row of caisson compartments down to 0.8m below the design finished levels, place 0.8m of concrete over existing sand fill, pumped into place by tremie methods. This will lock the existing caisson structure together at that level. The caisson wall will then be demolished down to the design level. The top of the caissons are not structural so that local deterioration of the concrete and reinforcement will not be an issue.

The back row of caisson compartments will be excavated to one metre below the design level and filled with one metre of rock armour over geotextile fabric.

Embankment and New Harbour Floor

For the section below low water an embankment with rock ballast (armour, rip rap) facing solution is proposed.

3.2 Main Works Staging and Sequencing

The Main Works phase of the Headland Park and Northern Cove requires sequencing of construction to complete the works in the most efficient and effective way, thereby maximising value for money to government. The project will generally be delivered from north to south, working adjacent Sydney Harbour and progressing toward Darling Harbour and Wharf 5. Table 3.1 below provides further detail.

The temporary Passenger Cruise Terminal is currently located at Wharf 5 and is required to be decommissioned prior to commencement of the Northern Cove excavation.

Further details associated with construction staging and sequencing are provided in Appendix A.

Table 3.1 Main Works Staging and Sequencing

Key Stages	Sequencing of Key Activities
Main Works from Mid- 2011	1. After completion of Early Works, continue receipt of approved fill from Stage 1 until no longer required (nominally 80,000m ³ for Main Works) and retaining wall construction.
	2. Commence new shoreline construction and relocation of the public walking and cycling from Towns Place to a point adjacent Gate No 4 on Hickson Road.
	3. Commence Northern Cove excavation.
	4. Stage 1 Fill placed in the Sandstone extraction pit.
Buildings and Landscaping from April 2012	5. Carpark and structures.
	6. Hard and soft landscaping.
	7. Excavate Northern Cove and construct new shoreline.
	8. Construct public wharf facility in the Northern Cove.
	9. Heavy soft and hard landscape maintenance.
Establishment Period 2014 to 2017	10. Decreasing degree of maintenance as Hard and Soft landscape elements 'settle-in'.

3.3 Construction Methodology

The naturalistic foreshore requires a significant quantity of sandstone and the majority will be extracted from a site extraction pit. The extraction process is 'business as usual' in the Sydney CBD environment.

The sandstone extraction pit will be at least 12m in depth with a 3.5m wide ramp on a 1:10 grade to allow rubber tyred front end loaders and trucks to access. The exaction will be very similar to a CBD building site basement with weathered material ripped by dozer until refusal and then cut with saws into blocks. The edges of the pit face and the removal of the sawn blocks will require heavy excavator mounted hydraulic rock breakers.

The formation of the 'naturalistic' look and finish of the created shoreline in the intertidal zone will require methods that are not 'business as usual'. The use of the milling heads on excavators and high pressure water cutting will produce sandstone materials which will be left in place to contribute to the new 'naturalistic' shoreline.

Set out below are likely plant and equipment that will be applied by the contractors during the various stages of the project.

3.3.1 Plant and Equipment

Construction methods and equipment likely to be used in each stage is set out in Table 3.2 below.

Table 3.2 Main Works Plant and Equipment

Key Stages	Sequencing of Key Activities
Main Works from Mid 2011	Fill materials will be spread and compacted in nominal 500mm layers by dozers (D6 to D9), graders and self propelled 'sheepsfoot' roller compactors. Placement of fill materials requires separation of materials, with higher quality sandy

	<p>materials required for structural retaining walls. Front end loaders, trucks and graders will move materials around to the designated storage or use area.</p> <p>Excavation behind the caisson walls will be by hydraulic excavator. Portions of the caisson structure facing the sea will be 'cut-down' to at least RL-2m, being 1m below the lowest tide level. An excavator mounted hydraulic rock breaker and 'nibbler' are the likely plant types to be used to remove the underwater concrete caisson components. A hydraulic jaw cutter will remove steel with divers likely required to assist in the process. Concrete saws, excavator mounted, will cut above the water line.</p> <p>An exclusion zone for public watercraft, and a silt curtain with floating boom is required to isolate construction activity, some of which may occur from a floating barge.</p> <p>The new shoreline construction will require large cranes 150 to 250 tonne capacity to place sandstone elements ranging in size 5 to 50 tonnes in place from approximately RL-2 to RL 5 along the perimeter of Headland Park. Concrete trucks will deliver to a distribution pumping point to get mass concrete to the required location along the perimeter edge.</p> <p>Excavated materials from behind the caisson walls will likely be loaded onto all-terrain trucks to transport to an area to drain and 'dry' prior to placement in the landform.</p> <p>Fill will be transported from Stage 1 and placed in the sandstone extraction pit. The fill will be placed in layers around structural columns built to support the carpark and a space for future use. An excavator and self propelled roller compactor will place the material with small items of plant working against the pit wall and concrete columns.</p>
Buildings and Landscaping from April 2012	<p>The carpark and space for future use structures will be built from a mixture of off-site manufactured pre-cast beams and elements, and on site cast in-situ concrete.</p> <p>Hard landscaping will involve mainly smaller plant to form pathways and features. At nominated locations larger elements of sandstone will be incorporated in to the topsoil layers along with advanced growth trees. A 150 to 200 tonne crawler crane with long reach will be required to place these features.</p> <p>Lighting and hydraulic services will be delivered through a range of small plant.</p> <p>The public wharf facility at the Northern Cove will likely be delivered from the landside using off-site pre-fabricated elements and modules. The piles will either be incorporated into the cove during the excavation phase or driven from a barge following completion of the cove.</p> <p>Topsoils will be prepared on site and placed via trucks, front end loaders and graders to get to the final contours. Irrigation systems will be installed with the topsoil placement and activated to commence growth of first plantings and turf where laid.</p>
Establishment Period 2014 to 2017	<p>During the initial maintenance period as Hard and Soft landscape elements 'settle-in' it is expected that localised areas will need heavy maintenance and level adjustments as the land form upper layers 'settle' . Typically small excavator and truck with hand held equipment would be used. Installation of new art elements would require small mobile cranes.</p>

3.4 Construction Schedule / Hours of Work

3.4.1 Construction Schedule

Key Main Works activities including approximate start and finish dates are detailed in Appendix B 'Main Works Construction Schedule'.

3.4.2 Hours of Work

Work is proposed to be undertaken during the following hours:

- 7am to 6pm Monday to Fridays. These hours are within the DECCW recommended construction times (Section 2.2 of the Interim Construction Noise Guideline - ICNG).
- 8am to 3pm Saturdays. Since most of the work carried out prior to the excavation of sandstone involves earthworks activities, moving fill and stockpiling; noise levels from these activities are less intensive. Loud activities such as saw cutting or excavator mounted hammers would not be permitted within the 1pm to 3pm work window.
- No works or deliveries would take on Sundays and public holidays.

Certain exceptions to these hours apply for inaudible works, the delivery of oversize loads or certain materials as required for safety reasons and for emergency response. Furthermore, certain construction activities may be allowed to work outside the hours above on a planned basis with the written approval of the Director General or as provided for under separate legislation.

Dewatering plant would need to operate 24 hours per day to clear groundwater inflow into excavations.

4. Environmental Management Approach

4.1 Purpose and objectives

The purpose of this PECMP is to set out environmental management strategies to be used to manage and mitigate environmental impacts from construction of Headland Park Main Works at Barangaroo.

It has been developed to demonstrate the Authority's commitment to management of the environment, and to minimise impacts on the surrounding community.

The PECMP will be developed into a detailed Construction Environmental Management Plan (CEMP), when detailed design and constructability information is available and the Minister's Conditions of Approval are provided. The Authority, through its construction contractor, will further develop the CEMP.

The key objectives of this PECMP are to:

- Guide the environmental outcomes during the design and construction of the Main Works.
- Set out the processes and procedures by which the Authority will:
 - Meet the environmental and sustainability requirements of the Department of Planning and other relevant statutory authorities as set out in the Environmental Assessment documents.
 - Meet the requirement of environmental guidelines such as the Guidelines for the Preparation of Environmental Management Plans (issued by the former Department of Infrastructure Planning & Natural Resources).
 - Recognise the future need to ensure compliance with the Minister's Conditions of Approval and any other licences, approvals, permits.
 - Conform to the requirements of AS/NZS ISO 14001:2004.
- Ensure that the design and construction phase minimises potential impacts on the environment and community.

The CEMP will be implemented as appropriate by all staff and subcontractors during the construction phases of the Main Works.

4.2 Environmental Reports and Management Plans

Environmental reports and management plans have been prepared to document the Authority's general approach to those areas identified in the environmental assessment and the Director General's Requirements as being key issues. They outline management safeguards, mitigation measures, responsibilities and monitoring requirements to be implemented to prevent or minimise potential impacts on particular aspects of the environment, heritage or the community.

In addition to meeting project and delivery objectives set out in the Environmental Assessment documents, in particular the Statement of Commitments and the Minister's Conditions of Approval, the Authority is committed to achieving high sustainability targets through construction and operation phases.

Specialist management plans forming part of this PECMP are listed in Table 4.1 below.

Table 4.1 List of Environmental Documents and Management Plans

Issue	Location	Further information
Noise and Vibration	Section 6.1	Acoustic Logic report: <i>Barangaroo Headland Park Preliminary Main Works Noise And Vibration Management Plan</i> , dated 19 October 2010.
Air Quality & Odour	Section 6.2	JBS Environmental report <i>Air Quality and Health Assessment Main Works – Headland Park</i> , dated 7 October 2010.
Water Quality	Section 6.4	WSP Environment and Energy report <i>Soil and Water Report</i> , dated 14 October 2010.

Waste and Chemical Management	Section 6.5	JBS Environmental report <i>Waste Management Plan – Main Works</i> , dated 1 October 2010.
Traffic Management	Section 6.7	Halcrow report <i>Barangaroo Headland Park Main Works Construction Traffic Management Plan and Impact Assessment</i> , dated 16 October 2010.
Heritage	Section 6.8	Conybear Morrison reports <i>Heritage Impact Statement</i> , dated 6 October 2010, and <i>Sewage Pumping Station SPS0014 Conservation Management Plan</i> , dated 13 October 2010. Austral Archaeology report <i>Research Design & Archaeological Excavation Methodology</i> , dated October 2010.
Sustainability	Section 6.9	Built Ecology report <i>Headland Park Main Works Package ESD Report</i> dated 19 October 2010.

The successful implementation of environmental management strategies and controls will require clear and accurate workplace level instructions and guidance to construction supervisors and personnel under their control.

The undertaking of certain high risk activities may also be controlled by the use of hold and/or witness points. These points require the approval of a designated person with a level of authority or expertise appropriate to the activity / risk involved.

This will be further developed in the construction contractor’s CEMP.

4.3 Monitoring

The construction contractor will be required to monitor the impact of their activities on the business and residential communities in the proximity of the site, and users of Barangaroo. Issues that may be pertinent on a day to day basis to these stakeholders include, but are not limited to, the following:

- Noise and vibration.
- Air quality, odour and dust.
- Water quality.
- Traffic movement and traffic safety (including vehicles, pedestrians and cyclists).

The construction contractor will be required to consider each impact on a case by case basis and provide a detailed plan of how these impacts are going to be managed and communicated.

5. Organisation and Communications

The construction contractor, on behalf of the Authority, will be responsible for implementing the environmental management principles developed for the construction phase of the project. It is envisaged that the construction contractor would manage these obligations generally in accordance with the approach set out below.

5.1 Structure and Responsibilities

The construction contractor is responsible for the preparation of the CEMP, through the relevant contractors, as well as for obtaining the approval of the Director General of the Department of Planning.

The construction contractor will establish a compliance auditing plan to cover each subcontractor's CEMP and will subsequently report to the environmental and heritage regulatory authorities.

For the management of the Remedial Action Plan (RAP) the project requires an independent Site Auditor. The Site Auditor will report to the construction contractor for day to day activities. However the Site Auditor will separately and independently report to regulatory authorities as required by the Director General's Approval Conditions. The Site Auditor will provide the necessary information to the client team and construction contractor representatives to communicate to all project participants the relevant requirements of the RAP. The construction contractor will seek the endorsement of the Site Auditor prior to submission to the Director General.

5.2 Internal Communications

A number of activities could be undertaken to maximise the effectiveness of project communications for environmental management. These include

- Conduct toolbox talks and daily pre-start meetings
- Induct personnel on RAP and environmental requirements
- Issue incident alerts and bulletins
- Conduct subcontractor pre-commencement meeting
- Establish environmental review group
- Environmental guidance and communication tools

5.3 Notification & complaints handling

Activities that are likely to be required will include:

- General communications about the staging of the construction
- Specific communications to properties that will be impacted. This communication will commence at least eight weeks prior to any impact and people will be notified in writing at least two weeks prior to the commencement of any impacting activity.
- This will allow for planning for mitigation measures or accommodating impacted individuals or property owners requirements where possible.
- A widely advertised phone number will need to be answered during each and every hour that construction is in operation.

The construction contractor will need to keep and update records of all contacts with stakeholders and will need to report on issues raised in particular complaints, any comments related to noise, dust, traffic etc and also lack of information about construction activities and impacts.

The construction contractor will work in close cooperation with the Authority's communications staff to ensure that communication is closely coordinated with other communications activities and that there is a coordinated response to any concerns raised by individuals, groups or property owners.

6. Construction Impacts & Environmental Controls

As described in Section 1, the Director General's Requirements identified a number of environmental issues to be addressed in the PECMP.

Sections 6.1 – 6.5 address the specific issues identified by the Department of Planning (noise and vibration, air quality and odour, visual impacts, water quality and waste and chemical measures). The remaining Sections 6.6 – 6.9 address other relevant issues.

All sections consider the impacts of construction on adjoining development and propose measures to mitigate construction impacts.

6.1 Construction noise and vibration

Overview

The Noise and Vibration Management Plan as prepared by Acoustic Logic Consultancy outlines the development of controls and safeguards that will be applied to all activities on the site by the construction contractor. The objective of these controls is to ensure that all work is carried out in a highly controlled and predictable manner that will minimise emissions and protect the amenity of the sensitive receivers surrounding the site.

Likely noise and vibration emissions from likely processes and activities have been assessed. The assessment identified the activities likely to exceed noise and/or vibration goals. The noise and vibration management plan will be used to manage impacts from all activities, with particular reference to those activities that might generate emissions greater than the noise goals.

The controls and safeguards implemented will be reviewed at a number of stages during the excavation period in response to revised methods and equipment, or monitoring and evaluation of actual impacts. This management plan outlines the procedures that would be adopted by the construction contractor during the detailed planning and execution phases.

Process

Construction noise and ground vibration will be managed in accordance with the requirements of DECCW, the Minister's Conditions of Approval including the Environmental Assessment and Statement of Commitments, the general requirements of the *Protection of the Environment Operations Act 1997*, and the following guidelines:

- Interim Construction Noise Guidelines (DECC, July 2009).
- NSW Industrial Noise Policy (EPA 2000).
- Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration ANZECC, 1990).

A Construction Noise and Vibration Management Plan prepared by the construction contractor will be appended to the final CEMP.

Managing Environmental Impacts of Noise and Vibration

The following measures will typically be employed to minimise the impacts of airborne noise and vibration from construction activities:

- The use of safe alternatives to tonal reversing beepers will be considered.
- Community consultation and mitigation measures will be set out in the Construction Noise and Vibration Management Plan.
- The Authority will seek to negotiate agreements with sensitive receivers affected by significant noise and vibration impacts to the satisfaction of the receiver and the DECCW to enable works to proceed.
- Baseline-monitoring assessments will be undertaken at sensitive receiver locations prior to commencing construction.

- Monitoring of noise levels will be performed within 24 hours of receiving a complaint, to verify if they are related to the Main Works and to identify any measures to eliminate or reduce the impact if related to the Main Works.
- If possible, work activities will be spread over different times so that impacts will not occur at the same time every day. A break in activities will be allowed for wherever possible. Vehicle parking will be designated so it does not cause local resident disturbance.
- Liaise closely with the local community to keep people informed as a means of preventing unexpected issues arising.
- The details of noise measurements and the results of any corrective actions or complaints received will be included in monthly reports.
- Monitoring equipment will be kept correctly calibrated.
- To reduce noise from plant, vehicles and equipment, the following will be undertaken:
 - investigate whether the noise can be eliminated by using a different method or equipment/machine, e.g. smaller machine;
 - keep equipment well maintained;
 - monitor equipment sound power levels;
 - limit the revving of engines on mobile or stationary machines and shut down any equipment not in use;
 - limit the use of horns, bells, hooters or other audible signals on mobile equipment to the maximum practical extent;
 - locate fixed plant and equipment (including material stockpiles and vehicle parking areas) as far as practical from residences; and
 - avoid yelling and loitering near residential buildings during night works, if any. Use two-ways to communicate and try circular or loop loading methods to avoid reversing.

Further Details

For further details of Noise and Vibration including impact assessment, controls and mitigation methods refer to Acoustic Logic report *Barangaroo Headland Park Main Works Noise And Vibration Assessment* dated 19 October 2010.

6.2 Air quality & odour

Overview

Air quality and odour impacts from construction activities such as earthworks and sandstone extraction can impact human and environmental wellbeing. Accordingly, management controls are required to minimise and control the effects of air pollution generated from site activities on adjacent receptors, the travelling public and workers. Compliance with relevant DECCW and National Environment Protection Council (NEPC) published and endorsed air quality assessment criteria is required.

Potential Sources of Air Emissions

A range of potential sources of air emissions exist within the scope of Main Works. These include:

- Particulate emissions during soil excavation works proposed on the Headland Park Site to facilitate the excavation of the proposed Northern Cove and the alternations to the Park shoreline;
- Particulate emissions during screening of sandstone as proposed on the Headland Park Site to generate engineered fill materials for use in the Park construction; and
- Particulate, chemical and odour emissions associated with the receipt, handling and stockpiling of potentially environmentally impacted soils from the southern part of the Headland Park Site and excavated soils from the Headland Park Site.

Air Modelling

Each of the activities above has been assessed using air modelling, assuming worse case conditions for air emissions and the absence of environmental controls. The results of air modelling have been used to identify activities where air emission controls are required. It has been found:

- Excavation of soils within the Headland Park shoreline adjustment and excavation of Northern Cove may cause levels of particulates at the nearest potential receptors to the Headland Park Site to exceed DECCW criteria;
- Handling of soils received as fill material on the Headland Park Site may cause levels of particulates at the nearest potential receptors to the Headland Park Site to exceed DECCW criteria; and
- Handling of tar impacted soils received as fill material on the Headland Park Site may cause coal tar odours to be recognised at the nearest potential receptors to the Headland Park Site.

Air Emission Controls

A range of air controls have been selected on the basis of the modelling results. The effectiveness of proposed air controls has been assessed by additional modelling and comparison to published guidelines. Levels of potential particulate emissions have been found to be comparable to existing background levels of constituents.

The following air emission controls are to be implemented during the Main Works phase:

- Regular (at least hourly) application of water sprays / mists to disturbed areas;
- Reduced excavation / material handling activities during periods of non-favourable meteorological conditions;
- Minimisation the quantities of exposed coal tar impacted materials on the Headland Park Site at all times by the rapid identification and management of malodorous soils when received at the Headland Park Site. Stockpile surfaces of these soils require to be minimised to the extent possible by covering. Readily available non malodorous soils, odour suppressant and/or 'hydro-mulch' should be used to cover the malodorous soils as soon as possible subsequent to receipt;
- Install an odour suppression system at the Headland Park Site works boundary, and operate as necessary throughout the duration of the works;

Monitoring and Corrective Action

Air monitoring is required throughout the duration of earthworks, including:

- Continual visual assessment of dust emissions during all facets of demolition and earthworks. No visible dust should be observed at any stage at site boundaries;
- Periodic particulate monitoring at site boundaries undertaken using realtime aerosol monitor;
- Continuous odour monitoring by use of photo-ionisation detector and field scientist observations supported by field olfactometer measurements;
- Respirable fibres monitoring at discrete locations during the works at any stage where potential asbestos containing materials are identified in materials being received on the Headland Park Site, or present in soils being excavated on the Headland Park Site; and
- Dust deposition gauges maintained at two discrete locations at the site boundaries for the duration of the earthworks.

Where significant nuisance to sensitive receptors occurs or performance criteria limits are exceeded, the following actions will be taken:

- Cease work at the location or modify to correct the problem.
- Stand down any machinery found with excessive (prolonged and visible) emission levels, until appropriately repaired or newer equipment supplied with more effective mufflers / emission systems.

- Consider remedial measures such as dust suppressants, wetting agents, water carts, or alternative haul and travel route to reduce or eliminate the problem.
- Implement more frequent monitoring of the criteria until levels are in compliance.

Further Details

For further details associated with air quality assessment and management including impact assessment, health risk assessment, controls and mitigation methods refer to JBS Environmental report titled *Air Quality and Health Assessment Main Works – Headland Park*.

6.3 Visual impacts

Overview

The Authority recognises that visual impacts, in particular with regard to the Temporary Cruise Passenger Terminal as an issue to be managed during the Main Works phase of Headland Park. It is also acknowledged that the Main Works phase involves a range of activities to be undertaken over a relatively short duration.

Controls and Strategies

The following key controls will apply to mitigate potential visual impacts associated with the Main Works:

- Erection of a professional painted perimeter hoardings/screening, emblazoned with appropriate project details and information about the Headland Park project, around the perimeter of the work site at the earliest opportunity in the Main Works program. Illegal bill posters, graffiti and the like will be managed to prevent occurrence and to ensure timely removal.
- Ensure areas in Barangaroo which are to remain open to the public that are adjacent to the Main Works boundary are kept clean and tidy.
- Erect information displays at key public access areas into the site and at public areas adjacent to the site (such as Clyne Reserve, Munn Reserve, Hungry Mile (Hickson Road) or Towns Place) with views into the site to describe and illustrate the proposed Main Works and their relationship to other construction activities in the Barangaroo precinct.
- Manage construction activities to minimise visual impacts, i.e., minimise dust, vehicular movements along public roads, construction workforce parking, minimising pedestrian and vehicular conflict.

6.4 Water quality

Overview

The management of water quality including surface water, groundwater and erosion and sedimentation are environmental issues requiring careful and considered management during the construction phase of the Main Works to minimise the risk of sediment entering Sydney Harbour.

Principles

The following principles will apply to all areas and stages during construction of Headland Park.

Minimise Site Disturbance

The site is to be broken down into stages to segregate disturbed areas of the site.

Control of Clean Water

All clean water running through the site will be diverted around the site, or through the site without contamination. This will be achieved through a number of measures including temporary culverts, diversion banks, and/or sediment fences.

Erosion Control

Prevention of erosion of the construction site is considered to be an important approach for the prevention of pollution. Construction activities are to be undertaken so as to minimise the amount of disturbed area, implement erosion control measures and stabilise soil in disturbed areas quickly. Erosion

control is a proactive strategy which will minimise the degree of sedimentation from the site and thereby lessen the chance of off-site pollution.

Sediment Control

Runoff resulting from the construction area will be managed to ensure the highest possible water quality standard can be achieved prior to its exit from the site, within design requirements. Construction basins may need to be designed to form the basis of sediment control. Sizing of construction sediment basins should be increased from an Average Recurrence Interval of 85 to 90% to reduce the risk of sediment runoff into Sydney Harbour during construction activities.

Although essential, it is important to note that sediment basins are considered secondary to minimising ground and surface water pollution resulting from construction activities.

The main aim is to trap sediment rather than rely on a basin/s at the end of the 'treatment train'.

Soil Stabilisation

Soil on the site will be stabilised following completion and / or suspension of construction activities. Following 20 working days of inactivity, all lands (drainage lines, batters, stockpiles) are to be protected.

Permanent rehabilitation of sites will take place as soon as practicable following completion of works in accordance with an approved landscape plan.

Monitoring and Evaluation

The installation and maintenance of all soil and water management works on the site are to be continually monitored to ensure correct implementation and modification of erosion and sediment control plans if and when necessary. Daily monitoring of measures will be undertaken by internal environment and construction staff. Regular inspections, monitoring and updating of plans will be undertaken by a qualified soil conservationist. The frequency of inspections and monitoring by the soil conservationist will be weekly for the initial six months of construction, and reducing as construction progresses.

Soil and Water Management Plan

A Soil & Water Management Plan will be prepared prior to construction which:

- identifies erosion, sedimentation and water quality issues potentially arising in order to minimise the adverse impacts of construction activities on local waterways and adjacent land;
- calculates volumes of water generated on site from design storms and groundwater;
- details the types, locations, specifications and capacity of measures to manage soil and water quality during construction, based on Blue Book criteria;
- details sediment basin sizing and management protocols to ensure TSS in discharge does not exceed 50mg/L (or turbidity equivalent);
- details contingency plans in the case that runoff water exceeds the capacity of on-site measures to adequately treat to required standards;
- details dewatering methods;
- includes a Stockpile Management Plan that defines stockpile locations, management, maximum heights;
- includes progressive ESCP's developed throughout the construction program and provided to construction staff prior to the commencement of works to which they relate. Progressive ESCPs will describe site-specific devices and controls to be employed for various sections/stages of construction.

Site Specific Erosion and Sediment Control Plans

The control measures and practices outlined will be translated into site specific Erosion and Sediment Control Plans (ESCPs) for sub-catchments on the subject site.

These plans will be amended and revised as required in response to changes to construction program, scope of work or change in work methods.

ESCPs will include specific details on the location of features such as:

- Sediment traps;

- Diversion banks;
- Sediment fences;
- Mulch bund/bio bunds;
- Earth bunds;
- Clean water flow paths; and
- Other specific controls as required.

Discharge of Water from Sedimentation Basins

Any discharges from sedimentation basins will be the subject to regulatory requirements and will be managed and monitored to meet the requirements of any water quality or discharge criteria specified in the licence. Discharges will need to comply with the criteria outlined in the Water Management Protocol.

Hold and Witness Point

A hold point applies to the commencement of any work on site requiring the installation of erosion and sediment controls.

An ESCP must be submitted to the Authority to consider prior to release of the Hold Point. Additionally the sediment and erosion controls in the ESCP must be inspected and confirmed in place prior to any works capable of producing sediment laden run-off commencing on the site.

Groundwater quality

Description

This section details how construction activities will be managed and monitored to minimise impacts on ground water.

Process

The Plan needs to include:

- identification of potentially affected ground water resources, identification of licensed bores or other water affected by the Main Works;
- measures to identify impacts on water table, flow regimes and quality;
- groundwater inflow control, handling, treatment and disposal methods;
- detailed monitoring plan to identify monitoring methods, locations, frequency, duration; and
- analysis requirements.

Any specific requirements related to groundwater management will be included in the relevant documentation for communication to construction personnel.

Further Details

For further details associated with water management refer to WSP Environment and Energy report *Soil and Water Report* dated 14 October 2010.

6.5 Waste management

This section addresses waste and hazardous waste management during construction. Planned waste management controls are summarised below.

Construction waste management

Overview

The aim of waste management, including resource use management, is to promote the efficient use of energy and water, reduction of waste and recycling of materials.

Process

Waste Management Planning and Records

A Waste Re-use and Recycling Management Plan will be prepared as part of the Construction Environmental Management Plan. It will reference:

- 'Waste Classification Guidelines'; and
- NSW Government's 'Waste Reduction and Purchasing Policy" (WRAPP).

The Waste Reuse and Recycling Management Plan will:

- identify the waste streams that will be generated during the works;
- detail for each waste stream:
 - the waste classification (refer Waste Classification Guidelines);
 - how and where the waste is to be reused, recycled or disposed of;
 - receptacles to be used for storage; and
 - how and by whom the waste will be transported between generation, storage and point of reuse, recycling or disposal.
- include the methods for monitoring the implementation of the Waste Reuse and Recycling Management Plan;
- identify the need for section 143 Notices;
- identify any exemptions under the Protection of the Environment Operations Act 1997 (POEO Act);
- comply with the requirements of the POEO Act for all waste types;
- identify licenced waste facilities that are to receive waste from the project.

A Waste Management Register will be maintained to record the type, amount and location of waste reused, recycled and disposed. The register will include:

- type of waste and its classification;
- quantity;
- how, when and where the waste was recycled, reused or disposed of; and
- the name of any transporter and / or disposal site used.

Waste information that is reportable to the NSW Government under the WRAPP will be reported for the preceding financial year and at completion.

Hold Point

Any waste transported to a place that is not a licensed waste facility must be accompanied by a completed section 143 Notice received from the landowner.

Materials with Recycled Content

The following materials are considered potentially recyclable and will be further addressed in the Waste Reuse and Recycling Management Plan:

- Soil.
- Road pavement materials.
- Oils.
- Vegetation and tyres.
- Plastics, paper, cardboard.
- Toner cartridges.

- Batteries.

Hazardous materials management

Description

A hazardous material is one that poses a hazard to human health or the environment when improperly handled, stored or disposed of. The hazard may arise from acute or chronic toxicity or carcinogenicity of the substance or its corrosive or flammable nature.

Process

Identifying Hazardous Materials

Hazardous materials that may be encountered during construction work can be broadly identified and categorised as solid, liquid or gaseous:

- Solid hazardous materials are normally associated with activities involving hazardous spoil, construction materials and explosives.
- Liquid hazardous materials comprise flammable and combustible liquids and toxic chemicals including pesticides, insecticides and liquefied gases, acids, solvents, lime and degreasing agents.
- Gaseous materials which may be hazardous are flammable gases, toxic gases and gaseous emissions from construction works.

Details related to a substance's physical properties, flammability, toxicity, special precautions, transport and storage are detailed in a Material Safety Data Sheet (MSDS).

Managing Hazardous Materials

Bunding and spill management must be undertaken in accordance with:

- Relevant legislation and Australian Standards.
- DECCW's 'Bunding and Spill Management Guidelines'.
- WorkCover requirements and guidelines.
- A current MSDS will be made available for any hazardous substance or dangerous good stored and handled at the premises:
 - Copies of most current versions of MSDSs will be available at the work site and readily accessible to all persons working on the premises and to the emergency services authority.
 - The MSDS sheet should be provided by the supplier of the substance. If it is not, it will be obtained from ChemWatch.
 - The MSDS will be checked as the most current version, as sometimes a revision is available via the producers and not the supplier or ChemWatch.
 - A selection of MSDSs will be reviewed by the workplace Safety and Health Committee.
- All licenses, permits and approvals will be retained on site as required by the statutory obligations, for each type of hazardous material.
- Controls detailed in the MSDS will be recorded in the Safety Health and Environmental and Safe Work Method Statement relating to the activity that involves the use of the substance.
- A Hazardous Substance Register will be maintained for all hazardous substances used on the site:
 - A hard file copy will be kept at the substance storage area and a copy kept with all first aid equipment and facilities.
 - The Hazardous Substances Register will be reviewed annually to ensure MSDSs are current.
 - Containers will be labelled and an MSDS made available at the location.
- Prior to bringing any hazardous material on to site, the licensing requirements to store the material will be determined from the:
 - Australian Standard for storage and handling of Hazardous Substances (AS1940-2004).

- Australian Dangerous Goods Code.
- MSDS.
- Significant quantities of chemicals may trigger the requirements for permits under relevant State legislation.
- A risk assessment will be performed on the use and disposal of the material, and the appropriate controls implemented.
- Quantities of hazardous substances stored on site will be kept to a minimum.

Transporting Dangerous Goods

All waste materials moving to and from site will be tracked using dockets and receipts. Only licensed transporters will be used to move and dispose of waste materials.

When transferring dangerous goods measures will be taken to control spills, overflows and leaks, minimise static electricity and control vapour generation. If significant quantities are being transported, local authorities will be notified in case of an emergency situation or spill during transit.

Storing Hazardous Substances

- All containers of hazardous chemicals including oil and fuel, will be stored in a bunded area so the capacity of the spillage containment compound is as follows:

Volume	Capacity
0-10,000	Volume of largest package plus 25%
10,001 – 100,000 L	Volume of largest package plus 10%
Over 100,000 L	Volume of largest package plus 5%
Or alternatively: 100% of largest container, or 10% of all containers in area with an additional 10% allowance	

- Where possible, the bunded area will be covered to prevent rain and water filling the area, resulting in additional treatment requirements during disposal and management of the storage areas.
- The storage area will be clearly signposted.
- Where the storage area is part of a building, ventilation will be provided at floor and ceiling levels, of an adequate size to allow circulation of air, as per AS1940.
- Storage areas will be kept locked at all times and secured against unauthorised access and potential theft.
- Where different substances are stored in the same room, the MSDS will be consulted prior to storage to verify compatibility of substances. A bunded floor liner may also be required to prevent seepage and spillage. Non-compatible dangerous goods will be stored separately so that loss of containment will not cause a dangerous situation.
- Where practical, fuels and chemicals will not be stored or handled in the vicinity of natural or built waterways or water storage areas. All storage areas will be a minimum distance of 20 metres of natural or built drainage lines, flood prone areas or on slopes steeper than 1:10.
- All storage tanks containing hazardous substances will have the contents and volume clearly identified, be numbered if in a cluster, and have the appropriate Hazchem signs displayed to legislative requirements and AS 1319.
- Storage areas will be protected against damage from impact with vehicles, mobile plant etc.
- In each area of the premises where dangerous goods are stored or handled, provision will be made for spill containment that will:
 - contain the spill of dangerous goods
 - enable spilled or leaked dangerous goods and any solid or liquid effluent arising from the incident to be cleaned up and disposed of or otherwise treated.

- Appropriate workforce training will be provided for spill management and the use of spill response kits and supplies.
- Incident reporting procedures will be followed in the event of a spill.
- Where sources of ionising radiation have been identified, they will be handled in accordance with the requirements of the relevant State radiation safety act and radiation safety regulations.

Disposing of Hazardous Waste

All unused or excess chemicals and materials will be removed and disposed of in accordance with the MSDS and waste disposal guidelines. Disposal of containers as well as any unused contents will be tracked via the waste disposal processes outlined in the process for Waste management.

Fuel Cell and Oil, Grease, Fuel and Chemical Management

Guidelines for the management of fuel cells and oil, grease, fuel and chemicals are available as knowledge resource documents.

Further Details

For further details associated with Waste Management refer to the JBS Environmental report *Preliminary Waste Management Plan – Main Works*.

6.6 Stockpiling

This section details how stockpiling of sandstone and fill will be managed and monitored to minimise impacts on air quality and surface water runoff.

Overview

Only material suitable for Headland Park filling will be brought to the construction site and stockpiled for any length of time.

Separate stockpile locations and runoff treatment facilities would be established on the construction site, and clearly labelled both on the ground and in the Erosion and Sediment Control Plans, to manage any:

- Acid sulfate soils;
- Excavated contaminated materials; and
- Non-contaminated fill material.

Runoff treatment facilities would be as described in Section 6.4 of this PECMP, and the WSP Environment and Energy report *Soil & Water Report* dated 14 October 2010.

Process

The construction contractor will identify stockpiling areas prior to commencement of construction to protect receiving waters from potential runoff. Temporary stockpile areas will be located:

- close to the intended use;
- at least 15 metres and where possible up to 50 metres from waterways and drainage lines;
- on relatively flat ground;
- upstream of sediment basins; and
- so that material is easily accessible and may be retrieved at any time.

Compliance with these requirements may be difficult in some locations due to site constraints. In these cases stockpile locations and management of stockpiles will be assessed on a case-by-case basis on their merits so as to minimise and manage risks.

Erosion and Sediment Control Plans (ESCPs) prepared for specific areas will contain details on the locations and control measures for stockpiling.

Prior to stockpiling material, temporary sediment control fences must be installed on the downhill side of stockpiles, and diversion drains on the uphill side of stockpile sites. The construction contractor must construct temporary sediment ponds to capture any turbid runoff from these sites.

Stockpiled spoil not planned for reuse in less than 30 days would be grassed within 10 days of establishment using a hydro-mulch of sterile crop cover or another appropriate technique (eg covering, crusting agent etc).

A Soil & Water Management Plan will be prepared prior to construction which:

- identifies erosion, sedimentation and water quality issues potentially arising from the Project in order to minimise the adverse impacts of construction activities on local waterways and adjacent land;
- details the types, locations, specifications and capacity of measures to manage soil and water quality during construction;
- details contingency plans in the case that runoff water exceeds the capacity of on-site measures to adequately treat to required standards;
- includes a Stockpile Management Plan that defines stockpile locations, management, maximum heights;
- includes progressive ESCP's developed throughout the construction program and provided to construction staff prior to the commencement of works to which they relate. Progressive ESCPs will describe site-specific devices and controls to be employed for various sections/stages of construction.

6.7 Traffic Management

Overview

Effective traffic and transport management is necessary to ensure that the internal and external movements of vehicles and people (including pedestrians and cyclists) are appropriately managed in order to achieve objectives.

Traffic Management Plans will be used to define the traffic management measures to be adopted by the construction contractor for the proposed works on the site. These measures are to be implemented to:

- provide a safe environment for all surrounding residents, visitors, road users and workers onsite;
- provide protection to workers, visitors and the general public from traffic and environmental hazards that may arise as a result of the construction activity;
- minimise the disruption, congestion and delays to all road users;
- ensure network performance is maintained at an acceptable level throughout the term of the work;
- eliminate or mitigate risks of damage or degradation to the environment through sound construction management practices.

To achieve these objectives, the construction contractor will:

- ensure that the road capacity is sufficient to accommodate construction vehicle traffic volumes and disruptions are minimised;
- ensure that appropriate warning and information signs are installed;
- ensure that all needs of road users, motorists, pedestrians, cyclists, public transport passengers and people with disabilities are accommodated;
- provide for work activities to be undertaken sequentially to reduce the adverse impacts of the work;
- provide for safe procedures to enable personnel to enter and leave the work area in a safe manner;
- identify potential environmental risks from standard construction activities and define sound construction practices to be adopted to eliminate or mitigate these risks.

Key Traffic Management Controls

Key traffic management controls associated with the Main Works are detailed below:

Vehicular Traffic Management

- Construction traffic shall utilise the existing Gates entries from Hungry Mile (Hickson Road), Towns Place and from within the overall site opposite Gate 5
- All construction traffic is to be co-ordinated with the construction contractor prior to arrival on site
- All vehicles are to be directed by the construction contractor to the nominated work areas
- All vehicles prior to leaving site will be checked for cleanliness and washed down, if required
- Construction vehicles are not permitted on site without approval from the construction contractor
- All demolition material shall be covered prior to leaving site
- Transportation of hazardous materials will be carried out in accordance with statutory requirements
- The maintenance and cleaning of vehicles and construction plant will not be carried out in areas from where oil or washing may be discharged into a watercourse, street gutter or stormwater drainage system.
- A truck wheel cleaning facility will be maintained for the effective cleaning of wheels prior to trucks leaving site
- Fuelling of vehicles, earthmoving plants and mobile equipment will not be carried out without an operator or driver being in attendance at all times
- To restrict traffic and noise impacts, trucks transporting materials from the site will be confined to the main road system and avoid local roads as far as is practicable
- All demolition materials / spoil shall be loaded within the site
- All deliveries will be co-ordinated with the construction contractor prior to arrival on site
- All loads are to be covered, securely fastened and reliably stacked on vehicles
- All hazardous materials to be transported and stored in accordance with all statutory requirements
- Only trade construction vehicles will be allowed on site

Pedestrian & Cyclist Management

- Way finding signage will be provided within the vicinity of the site where pedestrian and cyclist access is permitted and immediately surrounding the site to direct pedestrians
- All pedestrians and cyclists have the right of way, especially within the site
- Pedestrian and cyclist thoroughfares around exterior of site to be maintained and clearly marked.
- No private car parking will be available within the site
- Visitors will be advised to park in the surrounding public car parks
- The construction area will be suitably segregated from the public and adjoining pedestrian areas
- Access to, from and around the site via defined access routes detailed in the induction process

Further Details

For further details associated with Traffic Management including vehicle, pedestrian and cyclist access arrangements and requirements, impact assessments, traffic control plans, monitoring and assessment arrangements, refer to the Halcrow report *Barangaroo Headland Park Main Works Construction Traffic Management Plan and Impact Assessment*, dated 16 October 2010.

6.8 Heritage and Archaeology

Overview

The key heritage and archaeology items to be addressed during the Main Works construction are:

- Sandstone Seawall
- Moores Wharf Building (north of site)
- Sewage Pumping Station SPS014
- Dalgetys Bond Store
- Munn Street Reserve

Key measures associated with managing potential heritage and archaeological issues and impacts during construction of the Main Works are detailed below:

- Proposed works should minimise damage and disturbance to significant original fabric of heritage items.
- Prepare a Conservation Management Plan for heritage items proposed to be affected by the works to guide the future management and maintenance of the item.
- Prepare construction works method statements for all heritage items in the vicinity of works that could be affected by construction works, including vibration. This would include restricting vehicular access to the Hungry Mile (Hickson Road) for all heavy vehicles.
- A structural audit of all heritage items in proximity to the works should be completed before the commencement of construction works.
- An archaeological excavation be undertaken in accordance with the methodology and recommendations (relating to testing methodology, site interpretation, research questions) contained in the Research Design Report. This will be undertaken following the early works but prior to excavation of the Northern Cove and Moore's Wharf inlet.

Process for Discovery of Items of Heritage or Archaeological Significance

Under the Heritage Act a heritage item includes any deposit, object or material which relates to the settlement of NSW (not aboriginal) which is more than 50 years old. If any heritage item is discovered during operations or construction, the following steps will be undertaken:

1. Work will cease and care taken to minimise further disturbance.
2. The Foreman will be notified immediately, who will then report the find to the construction contractor.
3. Relevant authorities including the Heritage Office and Council will also be notified immediately.
4. The area will not be disturbed until a complete assessment is undertaken by a heritage expert, an inspection undertaken and direction to proceed provided.
5. After archaeological works are undertaken, a copy of the final excavation report(s) shall be prepared and lodged with the Heritage Branch, Department of Planning, to the State Library of NSW and also to the Local Studies Library in the City of Sydney.
6. The proponent shall also be required to nominate a repository for the relics salvaged from any historical archaeological excavations.

Further Details

For further details associated with the Heritage and Archaeological Significance of Headland Park and Northern Cove including impact assessments, refer to Conybeare Morrison reports *Heritage Impact Statement*, dated 6 October 2010, and *Sewage Pumping Station SPS0014 Conservation Management Plan*, dated 13 October 2010; and Austral Archaeology report *Research Design & Archaeological Excavation Methodology*, dated October 2010.

6.9 Sustainability

Overview

A key objective for the Headland Park is the achievement of sustainable outcomes, in both design and construction. Accordingly a number of Ecologically Sustainable Development (ESD) principles are to be incorporated into the Main Works at Headland Park.

Controls and Mitigations

The following initiatives will be addressed during the Main Works construction to address sustainability objectives:

- A 1250kL water harvesting tank to be installed to enable future provision of non-potable/irrigation demand on site. Where possible the water harvesting tank should be utilised during construction to minimise potable water use.
- 100% biodiesel construction equipment to be used where possible. Alternatively 20% bio-fuels should be used where possible.
- Pollution control measures to be on construction equipment.
- Waste management plans to be developed to reduce waste from construction of the main works. Plans are to provide for greater than 90% diversion of construction waste (by mass) from landfill, by the implementation of a waste management plan and monthly reporting during construction.
- Treatment of stormwater during main works to prevent pollution into the harbour.
- Re-use of materials where possible.
- Re-use of FCS certified timber where possible.
- Incorporation of 100% Green Power.
- Ensure appropriate construction worker conditions.

Further Details

For further details associated with Sustainability refer to Built Ecology report *Headland Park Main Works Package ESD Report* dated 19 October 2010.

7. Monitoring and Review

7.1 Compliance management

7.1.1 *Conduct internal environmental audits*

Description

This section describes the process for environmental audits which are part of the ISO 14001 continual improvement process used to identify opportunities and ascertain whether systems, processes and products comply with specified, agreed and / or statutory requirements.

Process

Auditing Approach

Internal environmental audits will be performed to ensure compliance with:

- Statutory requirements
- Minister's Conditions of Approval
- Requirements of the EMS
- Requirements of ISO 14001.

They will also identify opportunities for continual improvement of the management of environmental aspects.

Develop Audit Schedule

Audit timing and frequency will be planned to suit the status, importance and risk of the activities and areas to be audited. The audit schedule will be based on the significance of risks and results of previous audits and the procurement schedule.

Risks and opportunities will also be fully assessed at an early stage so as to minimise impacts. When proceeding to the construction stage, audits will focus on the review of onsite construction activities. At project completion, the focus will be on proper close-out of outstanding environmental compliance requirements and the proper handover of relevant documentation to the Authority for operational purposes.

Maintain and Update Audit Schedule

The Audit Schedule will be updated and maintained throughout the construction phase of the project. .

Environmental audit reports will be retained and forwarded to the management team.

Supplier corrective actions will be reviewed and, if necessary, the audit schedule amended to include more frequent audits of the Supplier.

7.1.2 *Perform environmental condition monitoring*

Description

Environmental condition monitoring including, but not limited to, noise and vibration, air and water quality will be undertaken for the duration of the construction period (including any baseline environmental condition monitoring prior to construction commencing).

Process

Environmental condition monitoring will be undertaken in accordance with an Environmental Monitoring Program (the Program) to be developed as part of the final Construction Environmental Management Plan.

The Program draws together all of the monitoring programs as set out in the:

- Minister's Conditions of Approval and Statement of Commitments
- Other regulatory instruments
- The Construction Environmental Management Plan.

The Program will be a working document and will be amended and updated to reflect changes to reporting requirements and outcomes of management reviews.

Environmental monitoring will be managed as follows:

- A dedicated resource will be responsible for managing the Program including equipment hire, training and specialist consultants as required;
- Monitoring will be undertaken in accordance with DECCW approved methods, Australian Standards or in the absence of either of these, industry acceptable procedures;
- Frequency of monitoring will be as stipulated in the Ecological Monitoring Program, relevant management plan, other regulatory requirement, Australian Standard etc;
- All monitoring results will be formally recorded as required by ISO 14001;
- Monitoring results exceeding the relevant limit/target will be managed as per the non-compliance and corrective action process;
- The Authority will be immediately advised of any non-conformances from monitoring; and
- Monitoring results will be reported in the Quarterly Environmental Report.

7.1.3 Environmental site inspections

Description

Site inspections are used to identify workplace safety and environmental hazards and deficiencies and assess safety and environmental compliance against regulatory requirements and best practice processes and initiatives. Site inspections will cover all aspects of works.

Process

Daily Inspections

- All Employees are to conduct a daily visual site inspection of their work area and report any hazards to the Foreman.
- Every Foreman will conduct visual site inspections of their work areas every shift / day to ensure that any potential hazards and deficiencies are identified, assessed and controlled as required. The inspections will include safety and health issues, environmental issues, working practices and housekeeping.
- Inspections will be recorded in a Daily Site Report / Diary.
- Any hazards identified during the inspection will be managed and recorded as described in the process "Identify hazards and improvements".

Weekly Inspections

Site weekly inspections will be managed as follows:

- Site weekly inspections will be performed.
- The Weekly Site Inspection Checklist will be completed as a record of the inspection.
- Any hazards and deficiencies identified during the inspection will be managed and recorded.

The Safety and Health Committee will have access to the inspection report.

Monthly Inspections

The construction contractor will perform a monthly inspection which includes work practices, compliance with safety and health documentation, environmental compliance, and emergency response. Findings will be recorded on the Monthly Site Inspection Checklist.

Authority or Regulatory Body Inspections

The Authority, the Authority's Representative and regulatory authorities such as WorkCover, DECCW, may inspect the work area from time to time.

Inspections of Construction Contractor Activities

In addition to the system audit / surveillance carried out on the subcontractor's activities, the Foreman will carry out inspections of all works in progress. Each subcontractor will be required to participate in audits and inspections of their activities.

Where applicable, the inspections will include the monitoring of the use of subcontractor safety and environmental checklists to ensure the subcontractor understands the importance of completing them correctly and in a timely manner. If subcontractor work on the site is being performed contrary to the subcontractor's plan and / or applicable legislative requirements, action will be taken immediately. This should include a direction to stop work if deemed unsafe.

7.1.4 Environmental compliance tracking and reporting

Description

Reporting of environmental compliance data to the construction contractor's senior management and the Authority will be an automated process designed specifically to meet the requirements of a Compliance Tracking Program, other permits and approvals and any requirements of the Contract.

Process

Environmental Compliance Tracking Program

The Compliance Tracking Program to be implemented will include:

- Periodic review of compliance with the Minister's Conditions of Approval, Statements of Commitments and other environmental documents and reporting to the Director-General as required.
- Provisions for notification of the Director-General prior to the commencement of construction and operation and of environmental incidents.
- A program of independent environmental audits.
- Mechanisms for reporting and recording incidents and actions.
- Procedures for rectifying non-compliances with the environmental assessment documents.

The reporting of environmental compliance performance will be managed as follows:

- The construction contractor will update the compliance status of the environmental compliance database, following inspections, audits, incidents, non compliance reports so that contemporary compliance status reports can be produced at any given time.
- The construction contractor will provide details to the Authority's management team in accordance with requirements as determined.

7.1.5 Managing non-compliances

Description

This process describes how non-compliances identified through daily work activities, environmental site inspections, tracking/reporting and audit activities are managed to ensure any necessary corrective and preventative actions are implemented.

Process

Any member of staff may identify an environmental non-compliance. Any environmental non-compliance must be immediately reported to the construction contractor. The non-compliance is treated as a Non Compliance (NCR) and recorded as a non compliance in the Compliance Tracking Program by the construction contractor.

Investigate Cause of Non Compliance

The construction contractor or party receiving the NCR will investigate the circumstances and the root cause of the NCR and respond with details of what caused the non-conformance and update the NCR form with relevant information.

Agree Correction Action (Remedial Action) and Propose Corrective Action

The construction contractor or party receiving the NCR will update NCR section "Proposed Remedial Action" with proposed action(s) to rectify the non-conformance detailed in the NCR and record how the non-conformance will be dealt with.

The construction contractor or party receiving the NCR will update the NCR section "Proposed Corrective Action to Prevent Recurrence" with details of actions that they propose to take to prevent the non-conformity recurring.

The NCR shall be sent back to the Environment Manager for approval / rejection of proposed Correction Action and to update the Compliance Tracking Program as required.

Implement Correction Action (Remedial Action)

On receipt of acceptance of the proposed Correction Action and / or the disposition of the NCR, the construction contractor will implement the Correction Action and confirm to the person who raised the NCR that the Correction Action has been completed.

Implement Corrective Action

Where Corrective Action(s) have been identified, the construction contractor will implement the Corrective Action and confirm to the person who raised the NCR that the Corrective Action has been completed by changing the Incite status to "Action Completed".

7.2 Environmental Incidents

7.2.1 Report environment incidents

Description

Environmental incidents will be managed as detailed below.

Classification of Incidents and Process

Minor environmental incident: an incident that has an impact or is likely to have an impact on the environment but can be readily handled by work crews, with limited or no adverse impacts on the environment, stakeholders, community or the well being of staff.

This level of incident is typically resolved as part of the normal operations of the work group or by pre-arranged response protocols and is reported at the local level, to the construction contractor and entered into a Safety Health & Environment (SH&E) Incident Management System as soon as possible following an incident.

Major environmental incident: an incident of magnitude that requires considerable levels of resourcing support (or potential to develop to such a magnitude) and has, or is likely to have, significant impact (within the meaning of the POEO Act) on the environment, stakeholders or community. This includes incidents that:

- Require notification to other authorities (e.g. DECCW, Department of Planning, City of Sydney Council etc).
- Involve a high level of work to clean up.
- Have widespread actual or potential adverse impact on the environment or community health.
- Have potential to have an adverse impact on the well being of staff or the public.

This level of incident must be reported immediately to the construction contractor who will report the incident to the Authority's representative and the Environmental Representative, as well as government authorities following consultation with the Authority and others, where necessary.

Details of major environmental incidents will also be entered into a SH&E Incident Management System as soon as possible following the incident and also reported to the construction contractors' business unit offices.

7.2.2 Emergency planning and response

Environmental incidents and emergency situations will be managed in accordance with an Emergency Response Plan. The Emergency Response Plan includes a list of key incident and emergency response personnel.

8. Risk Management

8.1 Overview

The management of risk (includes threats and opportunities) will be conducted in accordance ISO 31000 Guidelines for Risk Management, and will comply with the Authority’s Headland Park Risk Management Plan.

8.2 Definitions

Risk	“The effect of uncertainty on objectives” (Draft ISO 31000)
Hazard	“A source of potential harm” (HB205 2004)
Risk Management	“The culture, processes and structures that are directed towards realising potential opportunities whilst managing adverse effects” (AS/NZS 4360:2004)
Risk Assessment	The formalised process of identifying risks and evaluating their potential consequence(s) and their likelihood of occurrence together with strategies as appropriate for prevention, mitigation and contingent actions.

For further information on definitions refer to ISO 31000.

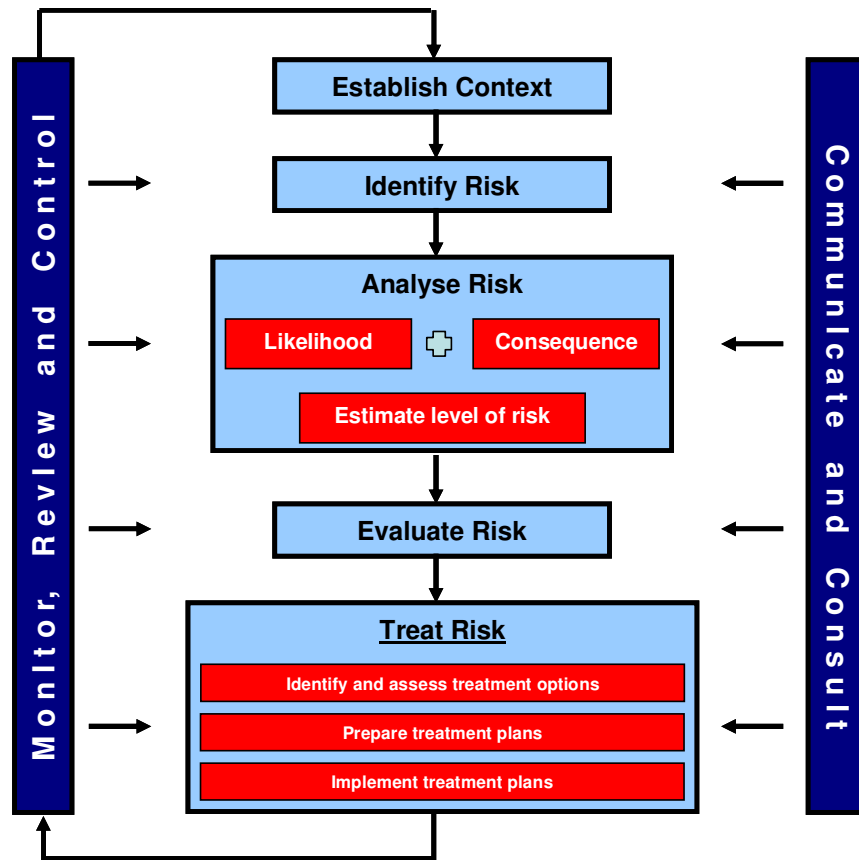
8.3 Risk Management Process

8.3.1 General

The International Standard for Risk Management (ISO 31000) provides a generic guide for managing risk. The risk management process depicted in Figure 8.1 below details the main elements of the risk management process as follows:

- Establishing the context; which involves formulating the external, internal and risk management context in which the activity will take place.
- Risk identification; where the aim is to identify and classify a list of the events that might impact on the success of the activity.
- Risk analysis; which estimates the likelihood that things may go wrong and the potential consequences, and generates a risk score for each risk identified.
- Risk evaluation; which determines the risks that should be accorded the highest priority for risk treatment. The types of risk treatment are also considered, and recommendations made where effective risk reduction can be achieved.
- Communicate and consult; where stakeholders are informed as appropriate on the activity at each stage of the risk management process.
- Monitoring and review; which ensures that the project risk management process is not static, but continues through the life of the project, or for an organisation provides a mechanism for continuous improvement.

Figure 8.1 Risk Management Process



8.4 Key risks and controls

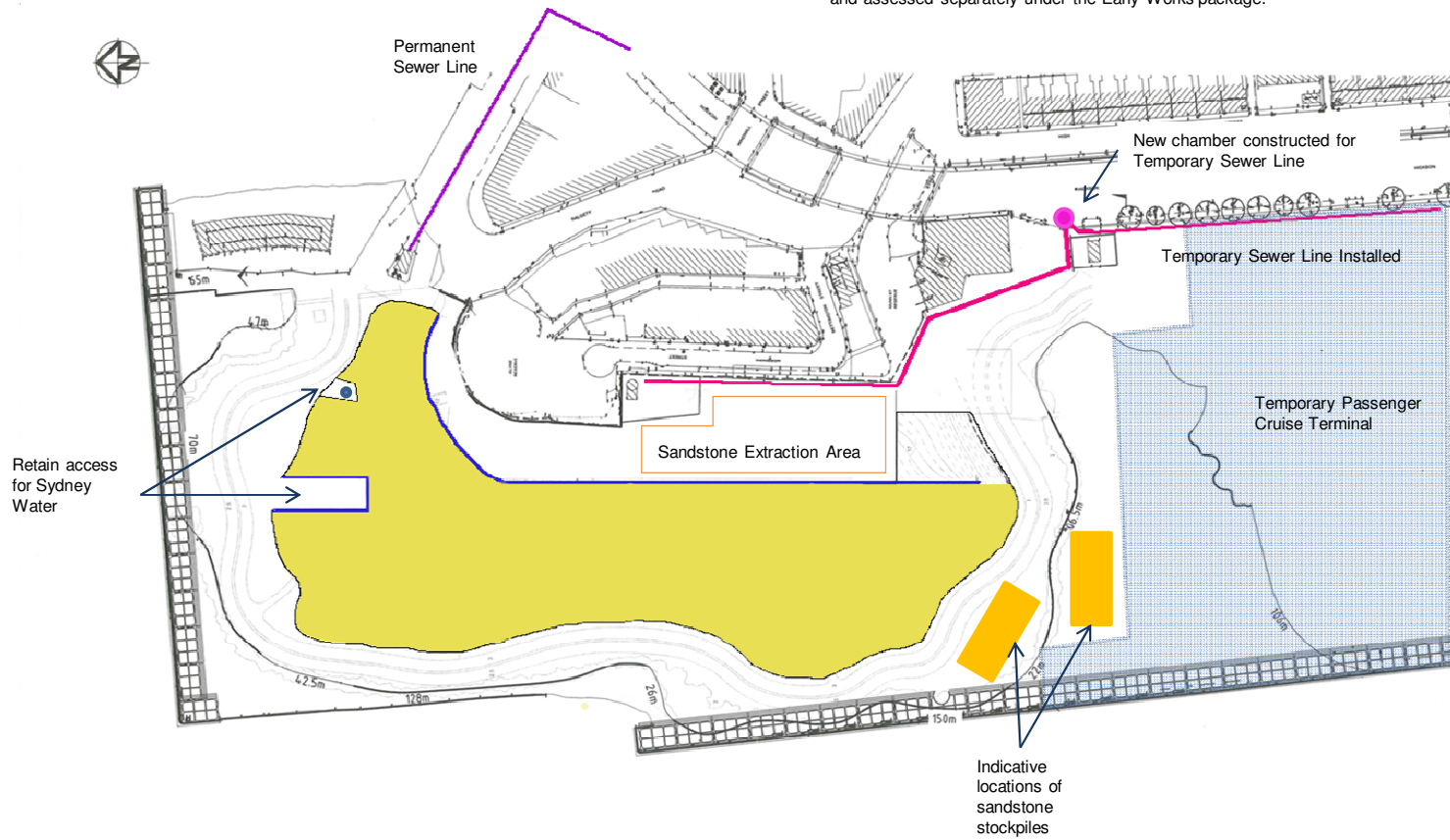
For details of the various environmental and associated risks including the corresponding controls and treatments, refer to the individual management plans and reports as listed in Table 4.1.

Appendix A - Construction Staging Sketches

JUNE 2011

January-June 2011 - Key Activities:

- Receive fill material and continue headland fill from Early Works: █
- Note that sandstone extraction, works to sewer lines and SPS14, and placement of the first 150,000m³ of fill are covered and assessed separately under the Early Works package.



CLIENT	BARANGAROO DELIVERY AUTHORITY	DATE	12 Oct 10	TITLE	
DESIGN	AG	DESIGN	AG		
PROJECT	BARANGAROO HEADLAND PARK – MAIN WORKS	APPD	SS		
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		REV	0		

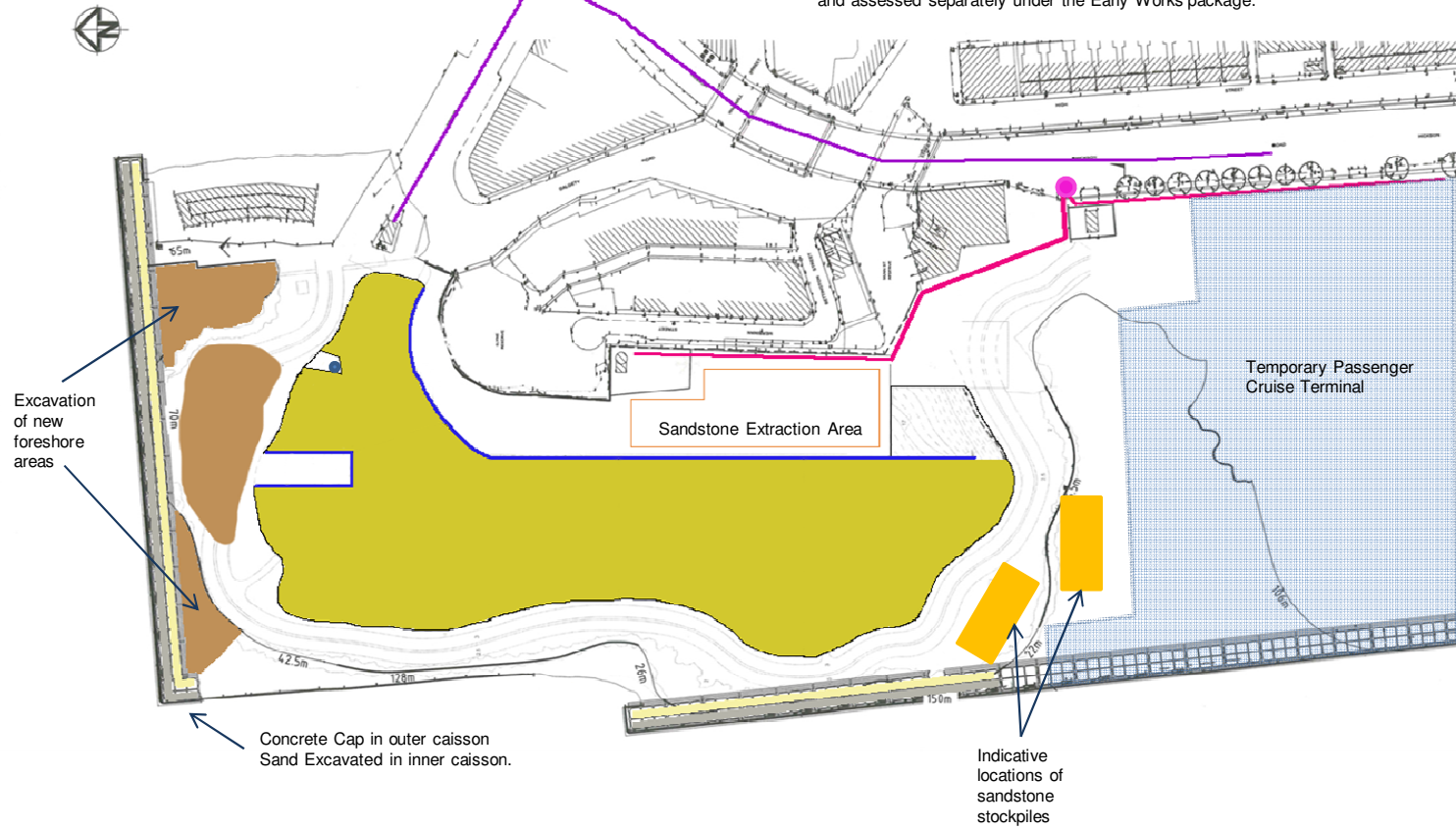
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DECEMBER 2011

July-December 2011 - Key Activities:

- Receive fill material and continue headland fill:
- Excavate sand in caisson walls at northern end of site.
- Excavate foreshore recession areas at north end of site.
- Note that sandstone extraction, works to sewer lines and SPS14, and placement of the first 150,000m³ of fill are covered and assessed separately under the Early Works package.



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JUNE 2012

January-June 2012 - Key Activities:

- Receive fill material and continue headland fill: █
- Backfill of sandstone excavation pit complete.
- Car park piles and pile caps poured.
- Excavate foreshore recession areas at northern end of site
- Commence sandstone lining at northern end of site.
- Note that sandstone extraction, works to sewer lines and SPS14, and placement of the first 150,000m³ of fill are covered and assessed separately under the Early Works package.



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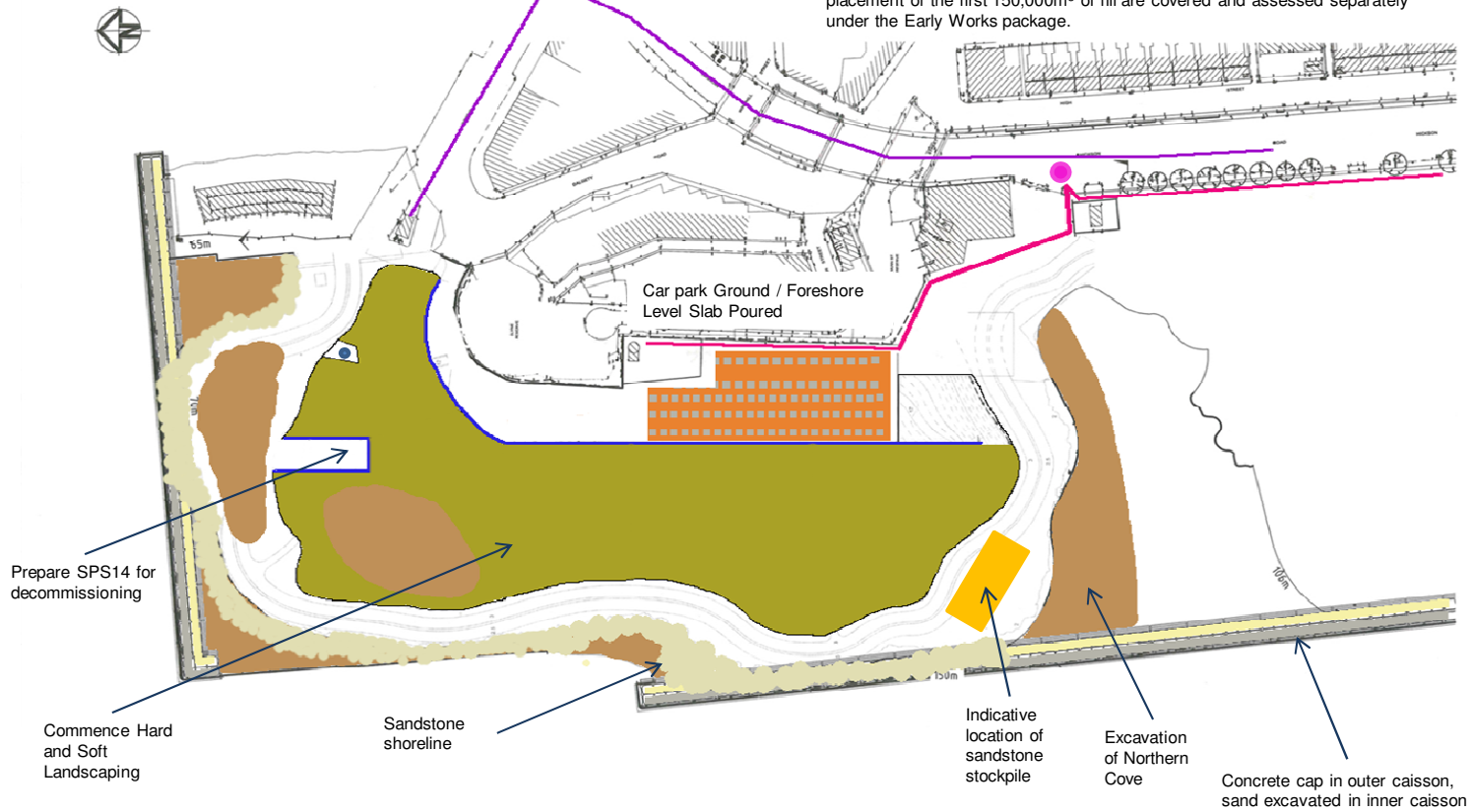
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DECEMBER 2012

June-December 2012 - Key Activities:

- Receive fill material and continue headland fill: █
- Temporary cruise terminal demolished.
- Car park structural construction to ground level.
- Sandstone shoreline completed at northern end of site.
- Excavation of Northern Cove.
- Note that sandstone extraction, works to sewer lines and SPS14, and placement of the first 150,000m³ of fill are covered and assessed separately under the Early Works package.



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JUNE 2013 – 2014 Completion

January-July 2014 - Key Activities:

- Bore remaining sewer mains to SPS1129.
- Commence Car Park Fit out.
- Commence structural works for future space.
- Commence sandstone lining and stone seawall in the Northern Cove.
- Commence board walk along the foreshore.
- Commence installation of services and drainage on the headland.
- Note that sandstone extraction, works to sewer lines and SPS14, and placement of the first 150,000m³ of fill are covered and assessed separately under the Early Works package.



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