Your reference *SSD 6617*
Our reference: EF13/5222 – DOC15/373526-02
Our contact: Bob Marr

Mr Cameron Sargent
Team Leader - Key Site Assessments
Department of Planning & Environment
23-33 Bridge St
SYDNEY NSW 2001

Attn: Michele Nettlefold

Dear Mr Sargent

The Environment Protection Authority (EPA) refers to your letter dated 21 September 2015 seeking comments on a development application for part of Hickson Road including land within the EPA declaration area – Barangaroo (SSD 6617). EPA refers also to the appended Environmental Impact Statement titled *Hickson Road Remediation Works (SSD 6617) Environmental Impact Statement Hickson Road, Barangaroo Remediation of Hickson Road - Part of EPA Remediation Site 21122 (and appendices)* prepared by JBA Urban Planning Consultants Pty Ltd for Lend Lease - (Millers Point) Pty Ltd and dated August 2015.

EPA has reviewed the EIS supplied and offers comments under the following broad headings:

- Air emissions;
- Chemical risk (contamination and air);
- Noise;
- Waste and contamination; and
- Water management.

Note: Comments under the heading "*Chemical risk*" provide an additional risk perspective to the broader comments provided under the heading "*Air emissions*".

Detailed comments and some recommended approval conditions are appended in the document titled "Attachment A". You will note that the EPA has identified some areas where more information is required. EPA would appreciate an opportunity to review the outstanding information prior to finalising its recommended consent conditions.

As you will be aware activities at the Barangaroo site are regulated by conditions attached to Environment Protection Licence number 13336 and many of the short-term environmental or amenity impacts associated with this project can be readily regulated by the EPL. Nonetheless, the proponent will need to ensure that all mitigation measures outlined in the Environmental Assessment, and required in P&E,s final Approval will need to be carefully implemented to ensure compliance with the EPL (as varied) and other relevant environmental legislation. The Licensee will need to apply to the EPA to vary EPL number 13336 to permit these works.

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If you have any queries regarding these matters please contact Bob Marr on 9995 6825.

Yours sincerely

23/11/2015

STUART CLARK
Acting Unit Head Sydney Industry
Environment Protection Authority

ATTACHMENT A – EPA detailed comments on DA and EIS
Remediation of part of Hickson Road – Barangaroo – SSD 6617

EPA has reviewed the EIS supplied and offers the following detailed comments under the headings:

1. Air emissions;
2. Chemical risk (contamination and air);
3. Noise;
4. Waste and contamination; and
5. Surface and groundwater management.

Note: Comments under the heading "*Chemical risk*" above provide an additional risk perspective to the broader comments provided under the heading "*Air emissions*"

1. Air

The EPA has reviewed the Air Quality Impact Assessment (AQIA) (AECOM report dated 14th August 2015) prepared for the proposed remediation of the Hickson Road portion of the EPA declared area (the Assessment). The Assessment considers two scenarios, those being:

- Scenario 1: In-situ remediation (chemical oxidation). This is the preferred option for the proposal;
- Scenario 2: Ex-situ remediation (excavate, off-site disposal and backfill).

The assessment considers emissions from the proposal concurrently with other works, including other remediation activities (Block4/Block5). Comments on the AQIA relate to the two options proposed:

Scenario 1: In-situ (preferred) option:

- Emission rates for the preferred option have been developed based on soil concentration data, however no supporting information or data has been included for this approach, including if it provides a reasonable indication of VOC speciation from the proposed remediation method. Additionally, the assessment proposes a maximum emission concentration of 20 mg/m^3 for VOC's for licensing purposes, however the assessment has not provided predicted impacts at the limit proposed;
- Table 24 provides mass emission rate estimates for the Soil Vapour Recovery Unit for comparison against the POEO (Clean Air) Regulation limits. The limits in the Regulation are concentration limits not mass emission limits. This table should be revised. Additionally the table outlines a concentration of 20,000 mg/m^3, whereas the Clean Air Regulation stipulates a concentration of 20 mg/m^3;
- The preferred option does not include sources that contribute to particle or combustion pollutants hence the predicted exceedances for Scenario 1 could be attributed to other projects on the Barangaroo site, which do not fall within this proposal.

Scenario 2: Ex-situ option:

- The assessment outlines that "*to the extent practicable, a commitment to undertake ex-situ within temporary enclosures fitted with emission controls*". The assessment has not presented potential impacts without these controls. A commitment to conduct ex-situ remediation within an emissions control structure is paramount;
- The assessment outlines the potential use of diesel generators. However no emission performance of generators are included and no demonstration of compliance against *Protection of the Environment Operations (Clean Air) Regulation* has been included;

- The assessment predicts the following exceedances for Scenario 2:
    - Cumulative NO_2 concentration of 390 ug/m^3 (1 hour);
    - Cumulative PM_{10} concentration of 92 ug/m^3(24 hour).
- The AQIA provides a summary of additional exceedances (Appendix F), however Section 6.1 of the assessment gives the indication that the additional exceedances provided do not account for the contribution from Stage 1C. The AQIA must present an analysis of additional exceedances, including a breakdown and analysis of sources contributing to additional exceedances for concurrent stages that are likely to occur in unison and contribute to cumulative impacts.
- Based on the predicted concentrations, where proposed sources significantly contributing to cumulative impacts, further investigation of mitigation measures must be conducted.

Recommendations

EPA advice:

- EPL conditions and limits would need to be established upon final design stage, and prior to construction and implementation;
- The project would need to be supported by a detailed air quality management and monitoring program. This would include continuous emission monitoring of emission controls systems;
- The project would need to be designed to minimise fugitive emissions. If the ex-situ option is required, the ventilation system design must be adequate to maintain negative pressure with the remediation enclosure. Given the proximity to receptors a relatively high ventilation rate maybe required.
- The design of the in-situ option would need to consider the outcomes of the remediation trials conducted or to be conducted on the site.

EPA recommends:

Prior to project approval, the AQIA be revised with consideration to the following:

1. **For the preferred in-situ option:**
    - **The provision of additional information or data to support the speciation of in-stack VOC's for the preferred remediation option;**
    - **Providing a clear demonstration of compliance with the Clean Air Regulation emission limits; and**
    - **The provision of predicted impacts at the proposed emission limits**

2. **For the ex-situ option:**
    - **Further analysis of predicted exceedances must be conducted, including an analysis of source contributions where concurrent activities are likely to occur and contribute to predicted impacts;**
    - **Where sources identified in the additional analysis are found to significantly contribute to the predicted cumulative impacts, and are associated with the proposal, further investigation into mitigation options must be conducted; and**
    - **Where there is potential for activities to be undertaken outside of an emissions control enclosure, due to technical constraints, the assessment must include a scenario that evaluates the impacts from external activities.**

2. Chemicals and risk

EPA has reviewed the relevant sections of EIS documents with respect to Project contamination and air risks, including the:

- *Air Quality Impact Assessment Report, Remediation Development Application, Barangaroo Hickson Road, EPA Declaration Area No 21122, Millers Pt, NSW* (AECOM, 14 August 2015) (the AQIA);
- *Health Impact Assessment, Remediation Development Application, SSD 6617-2014, Barangaroo Hickson Road, EPA Declaration Area No 21122* (AECOM, 11 March 2015) (the HIA);
- *Preliminary Hazard Analysis, Remediation Works Development Application SSD 6617 2014 Barangaroo, Hickson Road, Millers Point, NSW* (AECOM, 19 February 2015) (the Preliminary Hazard Analysis);
- *Preliminary Work Plan for In situ Chemical Oxidation Hickson Road Declaration Area, Barangaroo NSW* (AECOM, 11 November 2014) (the ISCO PWP); and
- *Barangaroo, Hickson Road Remediation DA (SSD 6617), Preliminary Methodology for Off-site Transport and Treatment of Hazardous Waste, Hickson Road, Millers Point* (AECOM, 1 April 2015) (the Preliminary Methodology for OSTT).

Note: EPA has <u>not</u> undertaken a detailed review of the AQIA assessment methodology, calculations, or results.

In summary, additional information is required to demonstrate:

- Hickson Road Remediation Works can be undertaken in a way that will not result in any adverse offsite impacts; and
- all Project risks have been appropriately and robustly assessed.

Details of the issues identified are provided below.

1. Offsite treatment, transport and disposal of excavated material have the potential to be significant sources of emissions and require appropriate assessment.

a. <u>Background</u>

The Hickson Road EIS assesses impacts associated with two remediation strategies:

- the preferred in-situ chemical oxidation/product extraction remediation method; and
- an alternative remediation method which involves selective excavation.

The preferred in-situ chemical oxidation/product extraction remediation will likely involve only limited excavation, and therefore only a limited amount of waste material that may require offsite transport, treatment and/or disposal.

The alternative selective excavation remediation method will involve the excavation of a significant amount (approximately 16,000 m^3) of material, which will require offsite transport, treatment and/or disposal.

Excavated contaminated material has the potential to contain significant amounts of potentially toxic chemicals, including those identified at the site (NSW EPA Declaration area Number 21122; Area Number 3221)) as chemical of potential concern (COPC) for the Project as follows:

- polycyclic aromatic hydrocarbons (PAHs);
- benzene, toluene, ethylbenzene and xylene (BTEX);
- total petroleum hydrocarbons (TPH);
- ammonia;
- heavy metals;
- phenol;
- cyanide; and
- asbestos.

In addition to the potential toxicity associated with the above COPC, excavated material has the potential to be highly odorous due to the large range and high concentrations of volatile organic compounds (VOCs) typically present in coal tar. Contaminated material excavated from Hickson Road are not proposed to be treated (chemically stabilised) on-site, although some limited on-site pre-treatment may be undertaken to make the material transportable (HIA Section 4.2.7).

Much of the waste to be transported offsite is therefore likely to consist of soil containing blended raw inherently odorous gasworks waste and tar. Without the design and implementation of appropriate processes and emission controls, the offsite transport, treatment, and disposal offsite of gasworks contaminated material consequently have significant potential to result in adverse offsite impacts from the toxic and be highly odorous emissions generated from the gasworks material while these activities are undertaken.

b. Relevant Project Secretary's Environmental Assessment Requirements (SEARs)

To address the above and other related issues, the Project Secretary's Environmental Assessment Requirements (SEARs) require the Project EIS to address specific matters including those concerning offsite transport, treatment and disposal of materials generated from the Project. For example, the Project Secretary's Environmental Assessment Requirements (SEARs) require the Project EIS to:

i. assess the impacts on health (including extraction of sediments, offsite transport and treatment as well as disposal of sediments), during and following remediation, including details of human exposure scenarios and demonstration that the project will not have unacceptable acute or chronic health effects (SEARs Key Issue 6 (KI#6));
ii. provide detailed justification for an ex-situ remediation strategy (KI#3);
iii. provide details of the treatment process and the environmental controls of the proposal (KI#4);
iv. provide details of waste management including:
    - any waste processing related to the proposal, including, treatment both on- and offsite;
    - the method for disposing of all wastes or recovered materials;
    - the emissions arising from the handling, storage, processing and reprocessing of waste; and
    - the proposed controls for managing the environmental impacts of these activities (KI#4).
v. provide details of spoil disposal, including the proposed strategies for the … handling, stockpiling, … disposal of spoil (KI#4); and
vi. to include in the Project Air Quality Impact Assessment (AQIA), appropriate coverage of all aspects of the remediation, including the … treatment of contaminated material (KI#8).

c. Assessment of impacts from offsite transport

Contaminated material will be transported offsite for disposal to landfill, or treatment then disposal to landfill, where necessary.

The Project EIS includes detailed consideration of aspects associated with offsite material transport. In particular the Project EIS includes details of particular measures that will be deployed in order to appropriately manage potential emissions and prevent any adverse offsite impacts from material transported from the Hickson Road site to (but not including at, or from, or between) the treatment or disposal site. (Also see item below).

d. Assessment of impacts from offsite treatment and disposal

Despite the SEAR's requirement for the Project to assess impacts associated with offsite treatment and disposal, the EIS does not include any detailed consideration, or assessment, of the potential risks associated with these activities.

Rather the EIS refers to the Project (and legal) requirement that any waste treatment or disposal must be lawfully conducted under appropriate approvals and at appropriately licenced facilities.

i. *Offsite Treatment:*

The EIS states hazardous classified material would be transported offsite to a licenced treatment facility for treatment prior to disposal at an appropriately licenced landfill in accordance with the VMP/Block 4 Remedial Action Plan (the VMP/Block 4 RAP) (HIA Section 4.2.7, and the Preliminary Methodology for OSTT Section 2.1).

The EIS states the offsite treatment facility must meet requirements such as:

- the facility must have or obtain an Environment Protection Licence which permits the treatment of Hazardous Waste; and
- the facility must obtain and immobilisation approval from the NSW EPA for the materials to be received and treated from Barangaroo.

A general immobilisation approval (GIA) exists for tar contamination associated with former gas works based on stabilisation using cement, however the GIA is limited to tar impacted materials with concentrations which are likely to be exceeded by the tar impacted material expected to be encountered at the site (RAP, Section 10.3.3). Ex situ stabilisation trials have been conducted on contaminated material obtained from the site (*Ex situ Stabilisation Trials DECC Declaration Area, Barangaroo* (EPS, 14 March 2012) (Stabilisation Trails report). The trials show that the treatment of contaminated materials using various treatment parameters generally do not consistently reduce contaminant levels significantly below those of the untreated material (Stabilisation Trials Report, Table 2).

The HIA states that because any emissions associated with the treatment process would be managed in accordance with that site's Environment Protection Licence, associated health risks with these activities are expected to be low and consequently this potential emission source was not considered further in the assessment.

In addition, the contingencies that are considered in the EIS (VMP/Block 4 RAP, Section 23.7) if immobilisation of the waste is unsuccessful are:

- refine the treatment process – based on surfactant enhanced ex-situ chemical oxidation (S-ECSO); and/or
- implement the alternative ex situ stabilisation treatment.

The S-ECSO process has not been proposed as a means of immobilising the Hickson Road waste, rather the proposed means of immobilisation is using the proposed stabilisation method. Consequently if this method fails it is unclear what contingency plans will be available to manage the waste material.

ii. *Offsite Disposal:*

The EIS states:

- following treatment of hazardous waste materials all treated materials must be disposed to an EPA licenced landfill that can receive the relevant waste type; and
- treated material would be disposed in accordance with the VMP/Block 4 RAP (HIA Section 4.2.7, and Preliminary Methodology for OSTT Section 2.1).

Despite these assurances, offsite activities have the potential to be significant emission sources and consequently represent a significant risk with respect to adverse air impacts where emissions are not effectively managed.

In addition, the EIS states that depending on the quantities of material to be disposed of to landfill, this may "present difficulties with existing landfill licence conditions" (VMP/Block 4 RAP Table T19).

The EIS does not appear to consider any contingencies to manage the Hickson Road waste if the material is not suitable for landfill disposal.

EPA recommends that the proponent:

- **provides EPA additional information and clarification demonstrating the potential air impacts associated with offsite ex-situ treatment, in particular potential emissions generated during the treatment and disposal of contaminated materials, have been adequately considered and assessed; and**
- **demonstrates contingencies are in place, for example to store contaminated material in excavation enclosures, in the event the treatment and/or disposal of highly contaminated materials from Hickson Road is not, or cannot, be undertaken in an environmentally acceptable manger.**

2. Potential emissions from liquid waste transport should be considered.

The preferred in-situ remediation method includes management of extracted fluids including by tankering offsite. However the EIS does not consider:

- potential air impacts associated with this activity; or
- relevant management strategies or emission controls to mitigate potential emissons.

EPA recommends that the proponent further considers the potential environmental impacts associated with the transport of liquid waste offsite.

3. Odour suppressant foam is proposed

Odour suppressant foam is proposed to be used to minimise odour and dust emissions during transport, and during retention wall works (AQIA Section 6.3). Rusmar AC-645 is given as an example of a dust suppressant foam that may be used for emissions mitigation. However the AQIA (Appendix A) of does not contain the Rusmar product guides as stated in the AQIA text. Consequently it is not possible to further assess the suitability of the Rusmar product for its intended use at the Project.

EPA recommends that the proponent revises the Project AQIA to include the Rusmar product guides in AQIA Appendix 1.

4. Remediation works outside the excavation enclosure/s involving contaminated material represent a potential significant risk with respect to adverse air impacts.

a) <u>Background</u>

Works associated with the preferred in-situ chemical oxidation/product extraction remediation method will not occur within a negative pressure enclosure unless significant excavation of odorous material is required - which is not currently proposed (AQIA, Section 3.8.2).

For the alternative selective excavation remediation method, remediation excavation activities are proposed to be conducted, to the extent practicable, within temporary emission control structures (excavation enclosures) that are maintained under negative pressure and are fitted with filtration systems to remove contaminants from the exhaust air stream. Where the excavation enclosures and their associated filtration systems are properly designed and operated, emissions from excavation works insider the enclosure should not result in any adverse offsite air impacts.

However works associated with the construction of retaining walls/piling /trenching and other activities will not be conducted under an emission control structure due to the height of the plant required to undertake these works. These works, though minor in comparison to the excavation

works proposed in the alternative remediation method, are likely to encounter and produce highly contaminated spoil containing free coal tar (separate phase gasworks waste and tar (SPGWT), and confirmed impacted material (CIM)) and other chemical of potential concern (COPC). Consequently these activities have the potential to be high risk with respect to causing potential adverse offsite air impacts, if adequate controls are not effectively implemented.

b) Preliminary air quality and odour control plan for the Hickson Road perimeter retention wall (the PRW OCP)

The proposed minimum management controls for the retaining wall construction are provided the in Preliminary (perimeter retention wall) Air Quality and Odour Control Plan (the PRW OCP) (AQIA, Section 3.3.5). The Plan provides a description of emission controls and process design to be implemented to ensure emissions generated outside the excavation enclosure/s (e.g. during construction of retaining walls and piling, during spoil creation and management, and associated with trucks and their movement of contaminated material) are minimised. Prior to works commencing detailed design of controls based on "selected contractor methodology" and will be provided to EPA for review and comment.

c) PRW OCP requires additional detail

As stated in the EIS, the final PRW OCP and/or the Project AQMP will need to include additional details to the information provided to manage emissions generated outside emission enclosures. In addition, the PRW OCP/AQMP must include details of other elements that are necessary to ensure robust air quality management, such as key performance indicators, monitoring methods and response mechanisms for each emission control and contingency measures where controls are ineffective.

e. The AQMP/PRW/Odour Control Plan must consider all potential emission sources.

Of works conducted outside an excavation enclosure, the construction of the retaining walls is likely to have the greatest potential for offsite air impacts due to the amount of spoil generated.

Perimeter retention walls at 36 Hickson Road are required for groundwater control and/or soil retention to facilitate the preferred in-situ remediation works and alternate ex-situ remediation works (App HH, Section 7.2). Additional temporary retention walls may be needed within Hickson road to facilitate excavation in controlled stages for the ex-situ method.

However other works that will be conducted outside excavation enclosures also have the potential to bring contaminated soil to the surface, and therefore the potential to result in air emissions. These include:

- drilling/well installation;
- other piling;
- trenching;
- concrete cutting; and
- soil boring.

The odour control strategy for the Hickson Road remediation must consider and address all potential significant odour sources. However if the *Air Quality and Odour Plan for the Hickson Road Perimeter Retention Wall* only includes perimeter retention wall related plant and activities, then all other Project works and sources must be considered in other Project air quality and odour management plans. Consequently details of processes and controls to mitigate emissions from all potentially significant activities with respect to air emission generation must be included in the relevant AQMP/PRW Odour Control Plan or other Project plan.

f. The odour control plan is not provided with the *Preliminary Methodology for Offsite Transport and Treatment of Hazardous Waste* (the Preliminary Methodology for OSTT) (EIS Appendix KK).

The construction of perimeter retaining walls, odour control would be implemented according to the Preliminary Hickson Road Perimeter Retention Wall Odour Control Plan (eg. HIA Sections 4.1.3 and 4.2.3, Preliminary Methodology for OSTT Section 3.6, and EIS Section 7.8.6).

The odour control plan is stated as having been prepared and provided at Attachment 1 in the Preliminary Methodology for OST, however the plan it is not included with this document.

While Table 2 of the Project AQIA describes the preliminary air quality and odour control plan for the Hickson Road Perimeter Retention Wall (see above), it is unclear if this is the same plan as that referred to in the Preliminary Methodology for OSTT. Where these are different it is not possible to undertake a comprehensive review of the proposed methods to control odour for the Project.

EPA recommends that the proponent clarifies if the Preliminary Hickson Road Perimeter Retention Wall Odour Control Plan referenced in the EIS, HIA and Preliminary Methodology for OSTT is the same as the plan in Table 2 of the AQIA.

g. The timing of retention wall construction should be clarified and the Project should consider potential ways to utilise where possible air quality management options that may be available due to other Barangaroo remediation Projects.

The EIS lacks clarity with respect to the timing of the construction of the retention walls and other works. Consideration of the timing of all relevant Project works, and Block 4 and Block 5 remediation works may allow the implementation of a more robust management strategy for air emission control. For example, if excavation enclosures are operational, any external works that generate spoil should include, where possible, consideration of moving significantly contaminated material within an enclosure as a means of mitigating the risk of offsite air impacts.

EPA recommends that the proponent clarifies the timing of construction activities and considers potential synergies that may exist (and be utilised) between the Hickson Road, Block 4, and Block 5 (and other future) Barangaroo remediation projects.

h. Project air quality management (and related) plans should consider other means to prevent or mitigate air emissions where possible

The aim of the proposed primary control to minimise the quantity of free tar exposure during works to minimise odour/air emissions, for example by having one open excavation at a time, is robust (AQIA Table 2).

A number of secondary controls are also proposed (AQIA, Table 2) however the odour control strategy should also where possible aim to:

- minimise the time any tar contaminated material is exposed;
- minimise or avoid double handling of materials; and
- minimise or avoid stockpiling of materials.

EPA notes that the EIS should consider conducting backfilling of excavated areas within the excavation enclosure where possible, as this would be an effective means of controlling dust emissions generated during tipping and handling activities.

EPA recommends that:

- **the AQMP must consider and include potential emissions from all works that are not addressed in the Hickson Road PRW – Preliminary Odour Control Plan.**
- **The proponent incorporates and implements best practice emission controls and process design, including consideration of movement of contaminated material immediately into an enclosure (where possible) and other contingency measures,**

to ensure emissions generated outside the excavation enclosure/s are minimised to the maximum extent practicable.

- **the Conditions of Approval include a requirement for the proponent to develop and implement a comprehensive air quality and odour management plan for the Project.**

5. The proposed environmental control measures outlined in the *Preliminary Methodology for Offsite Transport and Treatment of Hazardous Waste* (Preliminary Methodology for OSTT) are generally robust however further consideration of potential mitigation measures will be required when the relevant Project details and management plans are developed and finalised.

The proposed environmental control measures for offsite disposal and treatment of contaminated soil are presented in the Preliminary Methodology for OSTT. The proposed controls for the management of odorous materials during excavation and transport from the Project site are generally robust.

The Preliminary Methodology for OSTT states that:

- prior to loading and transport offsite excavated materials may require preparation such as:
  - mixing of saturated material with fly ash, lime or cement;
  - drainage and drying of saturated excavated materials; and
  - screening or manual separation of materials (Section 3.5.)
- material unsuitable for offsite transport will be subject to further preparation with the excavation enclosure (Section 3.5).

However these controls do not apply to contaminated soil generated prior to the installation of an emission enclosure. Consequently other management controls such as those outlined in Section 3.4 of the Preliminary Methodology for OSTT will be required. However due to the proximity of the Hickson Road remediation works to offsite receptors, and the potentially highly odorous nature of generated contaminated soil, these controls will need to be carefully and stringently applied to ensure emissions will not cause any adverse offsite impacts.

EPA recommends that the proponent further considers strategies and measures to manage contaminated materials generated outside excavation enclosures, and includes these in the relevant Project management Plan - such as the Hickson Road Perimeter Retention Wall (PRW) - Preliminary Odour Control Plan, and/or Project Air Quality Management Plan.

6. The *Preliminary Methodology for Offsite Transport and Treatment of Hazardous Waste* does not consider mitigation of air emissions during or following delivery of contaminated materials at treatment or disposal facilities.

It is unclear if the use of liners to facilitate tipping, reduce leakage and residual contamination have been considered for implementation in trucks, in particular for potentially sticky, highly contaminated and/or sloppy materials that may require transport offsite.

EPA recommends that ehe proponent considers strategies and measures to assist in the management of potential emissions during and following tipping of contaminated material at offsite treatment and disposal facilities.

7. Appropriate management strategies and control measures must be designed and implemented to capture any asbestos emissions generated within the emission enclosure/s.

Asbestos containing materials are considered to be likely within fill materials within the Declaration Area (HIA Section 5.2, Table 3). Consequently the EIS states that asbestos needs to be considered throughout the remediation project (HIA Section 5.2).

The EIS states:

- that asbestos risks will be managed by implementing the management tools in the VMP/Block 4 RAP and through the preparation and implementation of an Asbestos Management Plan (AMP) (HIA Section 5.2); and
- the AMP to be prepared for the works should include monitoring works (AQIA Section 3.6).

In addition the EIS states that the odour control structures proposed to be used for the excavation of contaminated materials were not designed to capture asbestos fibres. Consequently:

- the generation of asbestos fibres cannot be permitted within the excavation enclosure; and
- the site AMP must be designed so that asbestos fibres are not generated during works including within the excavation enclosures.

EPA recommends that the proponent:

- **clarifies that appropriate best practice emission controls and management practices will be implemented to ensure asbestos emissions are prevented or appropriately controlled.**

EPA recommends that a recommended Conditions of Approval include the requirement for the proponent to develop and implement a comprehensive asbestos management plan for the Project. The plan must include measures that will ensure any asbestos encountered inside the Project emission enclosure is managed in a way that prevents the generation of airborne asbestos fibres.

8. Additional information and clarification is required to demonstrate potential receptors located within the Barangaroo site have been adequately considered.

The EIS notes that some of the buildings in Stage 1 of the Barangaroo Project may be occupied at the time Hickson Road remedation works commence.

The Project AQIA states it has modelled receptors located at the buildings in Stage 1a. However it is unclear where these receptors are located, as the detailed information on receptor locations (AQIA Appendix E) does not include receptor numbers, and AQIA Figure 4 does not include these receptor locations (as stated in Section 5.6).

In addition, the receptors identified in AQIA Appendix E as R8 North and South, R9 North and South, and C5 West, Central and East, have been modelled at a base elevation of 6 metres at ground level. However it is unclear if potential elevated receptors have been considered.

EPA recommends that the proponent clarifies the locations of the additional receptors assessed in the AQIA, and to demonstrate all potential sensitive receptors have been adequately considered in assessment of air impacts.

9. Clarification is required regarding the management of soil generated outside enclosures.

The HIA appears to lack clarity with respect to the management of soil generated during in-situ remediation works, or during works conducted outside an excavation enclosure for the alternative selective excavation remediation method.

The HIA states:

- tarping/mulching/gravel armouring are the proposed controls for external stockpiles (non-contaminated material only) (HIA Section 4.4.1);
- external stockpiles will be wetted down (HIA Section 8.0, Table 4); and

- stockpiles from drilling and other soil movement activities will be wetted down (HIA Section 8.2.1).

However the exposure pathway analysis also states that all contaminated material will be stored within the odour control structures (HIA Section 8.0, Table 4)..

In addition the assessment of air impacts refers to:

- stockpiles regarding the management of odour from perimeter retention wall construction;
- covering stockpiles with tarps, non-odorous material or foaming agents, or placing materials into sealed drums (AQIA Section 3.8.2); and
- stockpiles associated with sediment controls. (AQIA Section 3.3.1).

EPA recommends the proponent clarifies how material generated outside enclosures will be managed for each relevant activity.

10. Additional information and details of the final Project design and Project operation elements are required to ensure Project air impacts have been adequately assessed and appropriate mitigation methods and management strategies will be implemented.

a) Details of Project design are incomplete

The EA does not provide details of the final Project design, or details of plant and processes that will be used to control emissions. However with respect to emissions control structures and filtration systems the EA states:

- the final design and detailing of emissions control structures and filtration systems will be subject to further design development;
- prior to commencing works, detailed design of controls will be prepared based on selected contractor methodology, and provided to EPA for review and comment;
- the input information used to assess air impacts were based on information available from the proponent at the time of preparation of the EIS;
- it is noted they may change to reflect the detailed design of the remediation activities; and
- if major changes are proposed to pollutant emitting activities during the remediation works, further modelling may be required to assess the effects of those changes on local air quality.

The AQIA and HIA state (Section 6.3 and Section 4.2.5 respectively) that prior to commencement of the relevant stage of works where excavation enclosures will be used, a detailed design plan of the structures, the air discharge point and emission control system, will be submitted to the EPA for review and comment. The detailed design plan will include the following information:

- performance specifications, including particle and VOC control efficiency for the proposed technology;
- proposed monitoring to confirm the performance of the proposed VOC control technology; and
- the proposed methodology to detect carbon bed breakthrough.

The EIS also states that detailed design will be provided for significant project plant and works such as the:

- excavation enclosures (HIA Section 4.2.5; AQIA Section 6.3);
- excavation enclosure filtration systems (HIA Section 4.6; AQIA Section 3.3.3)
- SISCO works including the number of soil vapour points and groundwater injection or monitoring wells; (HIA, Section 4.1.2);
- chemical storage, deliveries and use within the compound area (HIA Section 4.1.4);
- location of injection and extraction for in-situ remediation (HIA Section 4.1.5); and

- controls for retention wall construction (AQIA, Section 3.3.5);

Consequently the Project plans will require revision to consider and include the final design of all relevant Project element.

b) The design of emission control systems to be used at the excavation enclosures requires clarification.

The terminology used to describe the proposed filtration systems and to differentiate filter units with the filtration system lack clarity. For example the EIS states:

- the excavation enclosures were assumed to be service by 2 filtration units (AQIA Section 5.5);
- "The temporary EE would be service by a number of filtration systems and fresh air fans. … In accordance with previous assessments, the system is expected to be designed to achieve two to three complete air exchanges per hour within the structures, which will require the use of many filtration units. The systems would primarily consist of appropriately sized granular activated carbon (GAC) filters with particulate prefilters. Multiple GAC filters (minimum of two) would be required to prevent fugitive emissions during filter exchanges." (AQIA Section 3.3.3); and
- a minimum of two GAC filters will be installed in series for each emission stack in the excavation enclosures as per the modelling assumptions. The GACs chosen will be suitable for the contaminants being treated. (AQIA, Section 6.3);

Despite the apparent lack of clarity it appears that the design of the emission control systems for each excavation enclosure will be appropriate and be of a design that will allow a filtration unit to be serviced without potentially compromising the filtration operations required to maintain the excavation enclosures for example under negative pressure.

c) Likely staging of Barangaroo development proposals have been incorporated in the EIS

The EIS includes consideration of indicative staging for the Hickson Road proposal and an evaluation of works associated with other Barangaroo development proposals that will be conducted at the same time as the Hickson Road remediation works (AQIA Section 3.9). Based on the staging information currently available, the worst case concurrent activities associated with each of the potential remediation options for Hickson Road considered in the assessment of air impacts were determined to be:

- Remediation of eastern side of Hickson Road (in-situ or ex-situ);
- Block 4 remediation;
- Block 5 remediation;
- Construction of the C1 building; and
- Stage 1C remediation and earthworks.

The air quality impact assessment for the Stage 1B Basement works, which are proposed to overlap with Hickson Road works, is not finalised, and consequently Stage 1B Basement works have not been modelled as a concurrent activity in the cumulative impact assessment of the Hickson Road Remediation (AQIA Section 3.9).

However an assessment of cumulative impacts including the Stage 1B basement works will be included in the AQIA for the Stage 1B Basement development application.

EPA recommends that the proponent provides when available:

- **details of all proposed mitigation methods, management strategies and contingencies to ensure the effective control of Project air emissions;**
- **details of the final design of each Project element with respect to controlling air emissions;**

- **additional information and clarification to demonstrate any revised Project design is sufficient to effectively control air emissions and prevent offsite impacts; and**
- **further assessments of Project impacts if needed,**

EPA recommends the DP&E note that further assessment of impacts may be required if the Project design plans change significantly during their development or implementation.

11. The soil vapour extraction (SVE) system must be appropriately designed and operated to ensure emissions generated during ISCO works are appropriately captured and controlled.

The EIS states that injection and extraction would be undertaken in required areas in accordance with the AECOM Remedial Action Plan, Preliminary ISCO Workplan, and future detailed contractor design (HIA Section 4.1.5).

The soil vapour extraction/recovery system that will be implemented as a part of the in-situ remediation works must be appropriately and robustly designed and operated to ensure emissions from the estimated approximately 30 vapour points (subject to selected contractor design) (HIA, Section 4.1) are adequately captured and controlled. The SVE system will be designed as a contingency measure to minimise the risk of soil vapour impacts (*ISCO PWP*, Section 7.2.5).

Details of the SVE system and associated emission control system are not available and will be based on further detailed design. In addition, the installation of the SVE is not included in the in-situ remediation works summary in the assessment of Project air impacts (AQIA Section 3.1) or (clearly in) health impacts (HIA Section 4.1).

EPA recommends that the proponent provides details of the SVE and associated emission control system for EPA review and comment, when available, and prior to project commencement.

12. To ensure Project emissions are effectively controlled, the proponent proposes to expand the existing air quality monitoring program and management plan

Real time monitoring, reactive management and other management strategies have been successfully implemented by the proponent to effectively manage air emissions for the current Blocks 1-3 excavation works.

The proponent proposes to modify and expand the existing air quality monitoring and management plans (including reactive management plan) to incorporate the proposed Hickson Road remediation activities to ensure Project emissions are adequately controlled.

The HIA recommends to confirm concentrations of COPC are acceptable, a monitoring program should be developed to assess the routine concentrations of COPC at locations representative of each significant exposure group. The results of the monitoring program should be used to manage the intensity, location and duration of the works being undertaken. The monitoring should be incorporated into the Air Quality Monitoring Plan included in the Project AQIA (HIA Section 10.0).

However the Air Quality Monitoring Plan in the Project AQIA does not include all the details of all relevant air or other monitoring – for example such as asbestos monitoring or soil vapour monitoring which will be, or are, included in the Project Asbestos Management Plan and ISCO PWP.

EPA recommends the proponent clarifies that a comprehensive monitoring strategy, consistent with the monitoring requirements outlined in the HIA, will be implemented, and documented in Project work plans.

EPA recommends that a Condition of Approval includes the requirement for the proponent to develop and implement a comprehensive air quality and odour management plan for the Project that must include:

- **a. the implementation of best available control technology and best environmental practice to ensure emissions are being reduced to the maximum extent achievable for all air pollutant generating activities;**
- **b. an ambient air monitoring program and reactive management strategy, including real-time meteorological monitoring, continuous particulate and VOC monitoring for management purposes, fit for purpose odour monitoring, and the implementation of appropriate triggers to further develop the reactive management strategy for air pollution mitigation;**
- **c. details of all proposed air quality emission control measures including:**
  - **timeframe for implementation of all identified emission controls;**
  - **key performance indicator(s) for emission controls;**
  - **monitoring method(s) including location, frequency and duration;**
  - **response mechanisms;**
  - **responsibilities for demonstrating and reporting achievement of key performance indicator(s);**
  - **record keeping and complaints response register; and**
  - **compliance reporting.**

13. Additional information and clarification is required to address issues identified in the AQIA.

a. Odour calculations

Odour emission rates for Block 4 and Block 5 were estimated based on a half of the odour control structure areas actively emitting odour at any one time. This assumption was based on "discussion with the proponent" (AQIA Section 5.5.1), however no further information is provided to justify the assumption is appropriate and conservative with respect to assessment of air impacts. In addition, the AQIA does not clarify if this assumption was also applied to emissions from the Hickson Road excavation enclosure.

EPA recommends the proponent provides clarification regarding the appropriateness of the assumptions used to calculate odour emission rates for enclosed excavation works at Block 4, Block 5 and Hickson Road.

b. The comparison of soil vapour recovery unit emissions against POEO limits lacks clarity

The concentrations in AQIA Table 24 are incorrect, most likely due to a transcription error.

The unit emission rates for soil vapour recovery in Table 24 are based on an emission concentration of 20 mg/m3 (as n-propane equivalent) which is equal to the relevant emission standard prescribed in the Protection of the Environment Operations (Clean Air) Regulation 2010 (CAR). However contrary to what is stated in the AQIA, Table 24 does not compare actual or estimated emission concentrations from the soil vapour recovery unit stack against the relevant CAR emission standard.

EPA recommends that the proponent corrects the error in AQIA Table 24 and clarify that soil vapour recovery unit emissions will meet the limits specified in the Protection of the Environment Operations (Clean Air) Regulation 2010.

14. The Block 4 odour control structure (OCS) stack emission rates appear to be inconsistent with those previously used.

The Block 4 OCS emission rates for PM_{10}, TSP and combustion VOC (only) appear to be different to and lower than the equivalent emission rates used in the Block 4 remediation AQIA (AECOM, 18 February 2014) (the Block 4 AQIA) (see table below). No justification has been provided why the values have changed from those used in the Block 4 AQIA.

	Block 4 excavation OCS stack emission rates before filtration.	
	From Hickson Road AQIA	From Block 4 AQIA
Pollutant	Table 25	Table 12
PM10 (g/s)	0.9	1.45
TSP (g/s)	2.96	4.80
Combustion VOC (g/s)	0.2	5.6

The emission rates used in the Block 4 AQIA are also those used to (recently) model Block 4 emissions as a part of the cumulative air impact assessment conducted for Stage 1C remediation and earthworks.

EPA recommends that the proponent provides clarification that the total emission rates used to model the OCS stack emissions for Block 4 PM_{10}, TSP and combustion VOCs are correct.

15. The Project air impacts modelled in the assessment of Stage 1C basement are not provided.

The Hickson Road AQIA (Section 5.5.6) refers to the air dispersion modelling undertaken for Stage 1C remediation and earthworks for information on Stage 1C emission estimations. However the emission estimates used are not provided in the Hickson Road AQIA, so it is not possible to verify the cumulative concentrations that are presented in AQIA Table 32.

EPA recommends the proponent provides additional information to demonstrate the predicted impacts modelled for Stage 1C works have been appropriately included in the Hickson Road AQIA.

16. Predicted 1-hour average NO_2 and 24-hour average PM10 concentrations exceed the Project assessment criteria.

17. Project work descriptions require clarification.

The AQIA does not clarify if the alternative ex-situ remediation proposal includes an option to pump and tanker offsite highly contaminated liquid waste, similar to the preferred in-situ remediation method option. However the HIA (Section 4.2.6) states that where required highly contaminated liquid waste would be pumped by licenced liquid waste contractors (vacuum truck) and disposed of offsite.

The Block 5 remediation proposal also provides the option of pumping highly contaminated liquid waste by liquid waste contractors (vacuum truck) and disposed of offsite.

EPA recommends the proponent clarifies that contaminated liquid waste, where required, may be pumped and tankered offsite for disposal.

18. Clarification of the odour mitigation capture efficiency analysis is required.

The AQIA refers to a sensitivity analysis on odour emissions from the filters on the excavation enclosure stacks conducted as part of the AQIA submitted for the Block 4 Remediation and

Landforming works. Model runs were performed for odour reduction efficiencies at the excavation enclosure stacks of 99%, 95% and 90% - down from the 99.8% assumed in the Block 4 AQIA. All reduction efficiencies considered resulted in odour concentrations below the 2 OU criterion at all assessed sensitive receptor locations.

However it is unclear if a reduced odour reduction efficiency, of for example 90%, would ensure predicted 99th percentile odour concentrations remain below the project criteria, when cumulative odour impacts from concurrent remediation projects are considered.

With respect to the Block 4 odour mitigation capture efficiency sensitivity analysis:

- the predicted Scenario 1 and Scenario 2 99th percentile odour concentration is 0.02 OU. This is based on an odour reduction efficiency of 99.8% applied at the Block 4 excavation tent emissions (Block 4 AQIA, Table 25);
- reducing the estimated odour reduction efficiency from 99.8% to 90% results in an increase in predicted 99th percentile odour concentration from Block 4 excavation tent emissions from 0.02 OU and 1.17 OU (Block 4 AQIA, Table 25) – or by nearly 60 times; and
- Block 4 odour emission rates are approximately double those of Block 5, and approximately triple those of Hickson Road. Consequently Block 4 emissions are likely to contribute more significantly to total odour impacts.

Despite the sensitivity analysis not clearly demonstrating that lower capture efficiencies are protective of offsite odour impacts, it may be possible to confirm the capture efficiency of the filters on the excavation enclosure stacks through for example performance testing. The performance testing can be undertaken to ensure and demonstrate the desired capture efficiency is attained, and consequently that the assessment assumptions and outputs are correct.

EPA recommends that the proponent:

- **provides additional information on the odour mitigation capture efficiency analysis to clarify reduced capture efficiencies will not result in potential adverse offsite impacts; and/or**
- **conducts performance testing on the excavation enclosures filters to demonstrate they provide an adequate level of capture efficiency for odour – consistent with the 99.8% assumed in the Project AQIA; and**
- **conducts additional performance testing on the excavation enclosures to, where possible, demonstrate and ensure the assumed filter efficiencies for NOx, PM_{10}, TSP and VOCs (in addition to odour) are the same as those used in the Hickson Road and other Barangaroo AQIAs.**

19. The Project air quality monitoring program requires amendment.

The AQIA includes some details of the proposed air quality monitoring program to be undertaken for the Project. The AQIA states the plan will include “an ambient monitoring program and reactive management strategy, including real-time meteorological monitoring, particulate and VOC monitoring for management purposes…” (AQIA, Section 6.5). However the proposed ambient monitoring agenda for Hickson Road remediation works which includes details of relevant monitoring (AQIA, Table 37) does not include continuous VOC monitoring.

EPA recommends that the proponent revises the ambient monitoring agenda to include details of continuous VOC monitoring.

20. There appears to be a discrepancy regarding stack source characteristics.

The Hickson Road excavation enclosure stack is 11 metres high (AQIA, Table 12), which is 3 metres lower than the Block 4 (Table 14) and Block 5 (Table 16) stacks. It is unclear why this apparent discrepancy exists.

EPA recommends the ambient monitoring agenda be revised to include details of continuous VOC monitoring.

21. Inhalation of soil and groundwater derived vapours not clearly considered in the Project HIA.

The ISCO PWP notes the potential risks of impacts from soil vapours including to users and inhabitants of buildings on the eastern side of Hickson Road, including the Bond Building and the basement water treatment system (ISCO PWP, Section 9.5).

To prevent the possibility of vapours generated by the injections entering the building or the sub-surface parking garage at 38 Hickson Road, soil vapour monitoring and extraction points will be installed in the adjacent footpath (ISCO PWP, Section 9.5).

However despite the HIA including inhalation of soil and groundwater derived vapours as potentially and complete pathways respectively (HIA, Section 8.0), vapour intrusion risk from groundwater does not appear to be considered in the HIA (for example in the conclusions regarding site derived risks to local receptors).

EPA recommends the assessment of health impacts considers potential risks associated with vapour intrusion from all sources.

22. It is unclear if all relevant possible or potential hazardous or emergency scenarios have been identified and considered in the EIS.

Exposure to only certain hazards that result from potential sources that do not occur during normal operations, such as leaks in pipes are considered in the Project Health Impact Assessment, Preliminary Work Plan for In-situ Chemical Oxidation, and in the Preliminary Hazard Analysis.

However there are other potential hazardous or emergency scenarios, such as emergency extraction procedures, procedures to deal with a fire within an excavation enclosure or potentially explosive (non-tank/vessel) atmospheres, do not appear to have been considered in the Project EIS. These scenarios may have the potential to result in offsite impacts and consequently they should be considered and planned for where possible.

The Construction Framework Environmental Management Plan – Barangaroo South Stage 1B (Lend lease, 7 August 2015) (the CFEMP) refers to a number of relevant plans to manage potential emergency scenarios such as the Incident & Emergency Management Plan, Public Pollution Incident Response Management Plan, and Project EHS Plan, however these have not been included with the Project EIS so it is not possible to confirm all potential emergency scenarios that may result in significant offsite impacts to the environmental or human health have been identified and considered in the context of Hickson Road remediation works.

In addition the Project HIA, ISCO PWP and Project Preliminary Hazard Analysis (AECOM, 19 February 2015) (the PHA) consider and address only certain potential scenarios.

<u>HIA and ISCO PWP</u>

The HIA states (Section 6.0) that the Work Plan to be developed for the in-site treatment works would contain procedures designed to minimise the risk for exposure from events such as leaks I pipes and/or emergency extraction procedures. The HIA also states that these events would

be short in duration and result in limited exposure to pollutants, and consequently these exposure sources were not included in the assessment of health impacts.

The ISCO PWP includes monitoring and contingency plans for spills in the containment berm, injection line, or well head, and for day-lighting in the injection well heads. However the ISCO PWP does not appear to contain procedures for emergency extraction procedures.

Elsewhere the HIA states that spillages would be managed in accordance with an Emergency Response and Contingency Plan to be prepared by the proponent as required by Section 13.1.13 of the VMP/Block 4 RAP (AECOM, 2013).

PHA
The PHA states it only assesses risks associated with works that involve the use of dangerous goods.

The scenarios evaluated for in-situ remediation which may occur and result in offsite impacts were the storage of ISCO chemicals (for soil remediation) and diesel storage and delivery to power the WTP generators, and the delivery of chemicals and disposal of waste via truck. Despite

Incidents that may result in a hazard and risk of offsite impacts as a result of ex-situ remediation activities were identified in the PHA despite the ex-situ remediation not requiring dangerous goods. However the PHA states that as ex-situ remediation works will generate contaminated water that will require treatment, the incidents identified for the storage of oxidant and sodium hydroxide apply to the ex-situ remediation.

The incidents identified and carried forward to consequence analysis were:

- surfactant drum damage and full contents release, ignition and pool fire;
- surfactant drum damage, leak, ignition and pool fire (stabilisation);
- surfactant drum damage, leak, ignition and bund fire; and
- diesel tank leak, ignition and bund fire.

EPA recommends additional information is provided to clarify that hazardous and emergency scenarios with the potential to result in offsite impacts have where possible been appropriately identified and considered in the Project EIS.

23. Additional information and clarification is required to address minor issues identified in the EIS.

EPA notes the following minor issues:

a. AQIA Section 3.7: link error in text under Table 4.
b. AQIA Section 3.9: Remediation and earthworks associated with Stage 1C is listed twice.
c. AQIA Section 5.4.3: Table 16 label should be above the table – not at the bottom of the previous page.
d. HHERA_VMP Section 5.3.2: Referencing error.

EPA recommends that the proponent notes the issues above.

3. Noise

The proposed works are to take place close to residences and other sensitive land uses.
The Noise Impact Assessment (NIA) predicts noise and vibration levels up to and above EPA's amenity trigger levels. Besides restriction of works to standard construction hours, unless appropriately justified, all feasible and reasonable mitigation measures need to be implemented in these circumstances. The NIA outlines such measures and refers to management plans

where more detail is provided. EPA acknowledges that this approach is in accordance with guidance in the Interim Construction Noise Guideline (ICNG).

Consent conditions relating to noise control should reflect those as for previous Barangaroo projects, but with particularly close adherence to Noise and Vibration Management Plans to ensure that impacts are minimised. Careful noise management is critical because of the closeness of these proposed works to sensitive receiver locations, the relatively high levels resulting, and because there will also be noise from other nearby construction/remediation projects occurring at the same time.

4. Waste and contamination

The 'ex-situ' remediation option is not clear and appears to be conflicting. The EIS (page 37) indicates that contaminated material will be treated offsite at a licensed facility, followed by disposal to a lawful facility. The EPA supports this option. However, the EIS (page 63) appears to indicate that material treated offsite will be 'reused onsite where possible'. The regulatory mechanism that facilitates this is the resource recovery order and resource recovery exemption framework. It is EPA's position that hazardous waste treatment by stabilisation or solidification followed by reuse for land application is not considered to be eligible for a resource recovery order and exemption given the contamination is not removed or destroyed, and will require ongoing monitoring.

Similarly, AECOM 2015 (page 10, section 2.2) indicates that material requiring offsite treatment (including Hazardous Waste, and 'highly contaminated material') will be disposed offsite to a lawful facility following treatment. The EPA supports this. However, AECOM 2015 (page 16, section 5.1) indicates that 'for the ex-situ option… wherever possible, this material will be reused for backfilling works onsite'. Section 5.1 appears to be inconsistent with section 2.2.

The proponent will need to:

(i) clarify the remediation strategy;
(ii) consider disposal for all materials after treatment; and
(iii) amend the appropriate sections of the EIS and AECOM 2015.

5. Surface and groundwater discharges.

EPA advice at focusses on defining appropriate surface water and groundwater discharge criteria. Key areas for surface water and groundwater discharges include water management controls and monitoring for:

- potential discharges to waters from extracted groundwater's or other potentially contaminated waters/liquids generated and appropriate treatment systems;
- potential mobilisation of contaminants in groundwater or movement of the in-situ treatment front towards the Harbour during remediation;
- any proposed reuse of wastewater or effluent onsite including reinjection of in-situ treatment liquids.

As the remediation technology will not be selected until after a trial of the preferred in-situ methods, it is difficult to fully assess the proposal as there are detailed design elements that will not be developed until the technology is selected. EPA recommends that a surface and groundwater management plan be prepared following the trial to incorporate a consolidated set of analytes; trigger values and licence limits for various aspects of the works including: surface water discharges, analytes and trigger values for groundwater at the site boundary, water treatment plant commissioning monitoring, and reuse criteria.

- The preliminary work plan (Appendix Z) states that Darling Harbour is classified in ANZECC (2000) as a 'highly disturbed system'. This is a misinterpretation of the

ANZECC (2000) guideline. ANZECC does not classify the current state of ecosystems but provides levels of protection as goals for a system. The goal selected by the community for Darling Harbour is slightly to moderately disturbed.

- There are inconsistencies between the in-situ and ex-situ water management and monitoring procedures (Appendices O and P) that are not related to differences in both methods. A consolidated approach is required in the final design phase and surface and groundwater management plan(s).
- Table 6 in the EIS provides goals for groundwater quality leaving the EPA Declaration Area following remediation. The marine water quality criteria in Table 6 have a number or errors and a range of key contaminants for the site are not included, e.g. a range of PAHs such as benzo(a)pyrene; and cyanide. The contaminant list and criteria should be justified or amended. The criteria that should be reviewed are as follows:
    - Benzene: 500 µg/L is the default marine trigger value (ANZECC (2000) Table 3.4.1)
    - Ethylbenzene: 5 µg/L is the marine low reliability trigger value (ANZECC (2000) Table 8.3.14)
    - Ammonia-N value appears to be pH corrected, however, the pH of the receiving waters (tidal water in the groundwater) should be used and therefore the default trigger value of 910 µg/L appears to be more appropriate.
- Naphthalene: the default marine trigger value is 50 µg/L (ANZECC (2000) Table 3.4.1).Section 4.2.1, paragraph 2 of the "In Situ Soil and Water Impact Assessment" states that "…can be managed such that they are harmless to the environment…" Further clarification is required about this statement. The concentrations of chemicals being injected and the resultant concentrations expected in groundwater should be assessed against acute/chronic toxicity levels and/or any guideline trigger values and appropriate monitoring trigger values for action and management actions documented in a surface and groundwater management plan.
- **The proponent needs to clarify whether or not the quality of water being fed into the WTP is expected to remain consistent beyond one month, or is it expected to get progressively more contaminated (increasing concentrations of COPCs). Commissioning monitoring should be representative of highest risk periods for the selected remediation methodology.**
- It is not clear how all injection wells along site boundaries will have down hydraulic gradient monitoring, e.g. Figure 4 (page 34) of the EIS shows monitoring locations along the boundary of the south west part of Hickson Road and it is unclear which sites will monitor down hydraulic gradient to assess risk of contaminant moving out of the declared area and towards Darling Harbour.
- Section 6.15 of Soil and Water Impact Assessment (Ex-situ Method), use of sediment basins. Clarification is required if the sediment basins (if used) would require use of any flocculants and/or coagulants. Use of any such chemicals should include an assessment of risk if released into the harbour.
- Appendix B of "In Situ Soil and Water Impact Assessment" cites the limit of reporting (LOR) of PAHs as 1 µg/L. Table 8-2 (Ex-situ method) proposes a limit of 2 µg/L for PAHs based on a LOR of 2 µg/L. The reason for this discrepancy should be clarified.
- The groundwater discharge study (Appendix II) should account for potential increased groundwater movement due to injection and potential increased groundwater movement due to injection and chemicals following preferential pathways.

Wastewater Treatment Plant

The EIS indicates potential use of a temporary wastewater treatment system (WTS). For any surface water discharges to stormwater or Darling Harbour the WTS must be designed to meet the concentrations limits that were attached to Environment Protection Licence (EPL) 13336 prior to licence variation Notice number 1530261 (see attachment "B"). The WTS must be used

to treat all contaminated water (including surface water and extracted groundwater) on-site prior to any discharge.
The proponent must ensure that the special conditions (attachment C) relating to the Barangaroo Water Treatment Plant, are complied with and appropriate monitoring is in place to characterise the new wastewater stream. This characterisation must be representative of the potential wastewater, e.g. wastewater from a more highly contaminated area should be used in the commissioning monitoring.
It is recommended that the limits in "B" attached and conditions in "C" attached are included in the consent conditions for potential surface water discharge points from the site.

Water management plans
Following the completion of the approved pilot trial and selection of remediation technology, EPA recommends that all surface water discharge and groundwater environmental monitoring elements are consolidated into a single document and submitted to the EPA for review. A consolidated surface and groundwater plan is preferred as there are inconsistencies in proposed approaches across the EIS, RAP, in-situ and ex-situ water management and monitoring procedures (appendices O and P), and the work plan.

EPA recommends also that any consent conditions include a requirement for a Surface Water and Groundwater Management Plan. The Plan must be developed in consultation with the EPA and submitted to the EPA for review and comment following the in-situ trial and prior to commencing the injection and system operation phase. The Plan must include but not be limited to the following elements:

- Specifications and design details of any Water Treatment Plant (WTP);
- Details of how the WTP can achieve the licence limits that have been applied previously to Barangaroo site discharges under EPL 13336;
- A WTP commissioning stage monitoring program;
- A operation stage discharge quality monitoring program;
- Monitoring details for all groundwater points for the preferred remediation option including injection wells, monitoring wells and wells to monitor potential mobilisation of pollutants off-site including monitoring during injection phase, system operation phase and post-injection monitoring phase;
- Trigger criteria and actions for exceedance of triggers at groundwater monitoring wells to assess mobilisation of contaminants and movement of the in-situ treatment front including specific triggers for contingency extractions;
- Details of monitoring of movement and performance of the injected chemistry including surrogate indictors such as pH, temperature, cations, bromide and chloride, and total organic carbon;
- Analytes and trigger criteria for in-situ methods (if selected) to cover all relevant risk factors including but not limited to heavy metals, cyanide, total petroleum hydrocarbons (TPHs), and polycyclic aromatic hydrocarbons (PAHs);
- Trigger criteria for exceedance of surface water discharges;
- Specific actions for any exceedances of trigger values for all potential pollutants that may be discharged in surface water or may move off site in groundwaters;
- Reuse criteria for any proposed reuse of wastewater onsite including reuse of in-situ treatment wastewater or effluent by reinjection;
- Groundwater/marine water quality criteria/trigger values and monitoring for assessing success of the remediation (based on Table 6 of the EIS) that incorporate all relevant risk factors;
- Details of how all contaminated water (including stormwater collected in disturbed contaminated areas and works areas, and groundwater form disturbed contaminated areas) will be collected for treatment on-site prior to any discharge; and

- Demonstration of how the network on groundwater monitoring wells can detect down-hydraulic gradient mobilisation of chemicals including a map of the groundwater monitoring network in relation to hydraulic gradients and site boundaries.

Attachment B – Water Quality Limits

	Units	Criteria
Total suspended solids	mg/L	50 (100-percentile concentration limit that already incorporates dilution)
Turbidity	NTU	0.5 – 10 (ambient guideline for outside silt curtain – a trigger value above background could be calculated for ambient monitoring/licence limit purposed for wet and dry weather). NTU discharge criteria from sediment basins would need to be developed based on a good site specific relationship to TSS
Sheens or plumes	daily inspections	No visual sheens or plumes outside silt curtain
pH	pH	6.5 – 8.5 (100-percentile concentration limit that already incorporates dilution)
Arsenic	µg/L	2.3
Cadmium	µg/L	0.7
Copper	µg/L	1.3
Lead	µg/L	4.4
Mercury	µg/L	0.1
Zinc	µg/L	15
Chromium (trivalent)	µg/L	27
Chromium (VI) compounds	µg/L	4.4
Nickel	µg/L	7
Cyanide	µg/L	4
Ammonia	µg/L	910
BTEX		
Benzene	µg/L	500
Ethyl benzene	µg/L	80
Toluene	µg/L	180
m-Xylene	µg/L	75
p-Xylene	µg/L	200
o-Xylene	µg/L	350
Phenol	µg/L	400
Total Petroleum Hydrocarbons C10-C14 Fraction	µg/L	50[#]
Total Petroleum Hydrocarbons C15-C28 Fraction	µg/L	100[#]
Total Petroleum Hydrocarbons C29-C36 Fraction	µg/L	50[#]
Total Petroleum Hydrocarbons C6-C9 Fraction	µg/L	20[#]
Oil and grease	mg/L	10 (100-percentile concentration limit that already incorporates dilution)
PAHs		
Naphthalene	µg/L	50
Anthracene	µg/L	2 (0.01)*
Phenanthrene	µg/L	2 (0.6)*
Fluoranthene	µg/L	2 (1.0)*
Benzo(a)anthracene	µg/L	2 (0.5)*
Benzo(a)pyrene	µg/L	2 (0.1)*
Benzo(b)fluoranthene	µg/L	2 (0.1)*
Benzo(k)fluoranthene	µg/L	2 (0.1)*
Acenapthene	µg/L	2*
Acennapthylene	µg/L	2*
Chrysene	µg/L	2*
Indeno(1,2,3-cd)pyrene	µg/L	2*
Pyrene	µg/L	2*
Flourene	µg/L	2*

Benzo[ghi]perylene	µg/L	2*
Dibenz[a,h]anthracene	µg/L	2*
Electrical conductivity		monitor
Dissolved oxygen		-
Total Polychlorinated Byphenols (PCBs)	µg/L	Early non-detects and this can be removed from any ongoing monitoring requirements

* The limit of reporting of 2 µg/L is proposed when ANZECC criteria are lower than this detection limit

Standard limit of reporting

Note: Where default trigger values are not available then ANZECC criteria from volume 2 of the Water Quality Guidelines is used. These are environmental concern levels and the guidelines explain their application.

Attachment C
Recommended consent conditions – Water management

WTP Management Plan
Prior to the operation of any new WTP at the premises the licensee must prepare and supply to the EPA for comment a WTP Management Plan which must include but not be limited to details of treatment processes and systems as well as details of the influents likely to be treated in the new WTP.

WTP Commissioning Report
Within 60 days from the date of commissioning of any Water Treatment Plant (WTP) the licensee must submit to the Manager Sydney Industry, Environment Protection Authority, PO Box 668 Parramatta NSW 2124, a WTP commissioning report ("the report"). The report must include but not be limited to details about plant performance when treating a representative range of influents encountered during the initial stage of the works. The report must be updated ("the updated report") as works progress and as other influents are encountered at the site and directed to the WTP for treatment (for example contaminated groundwater, clean storm-water/surface water; contaminated storm-water/surface water; stockpile leachate etc). The updated report must be made available to an Authorised EPA officer on request.

WTP Performance Report
Commencing one month from the first day of operations of any WTP and monthly thereafter or unless otherwise agreed in writing by the EPA, the licensee must submit to the Manager Sydney Industry, Environment Protection Authority, PO Box 668 Parramatta NSW 2124, a monthly WTP Performance Report. The report must review and compare the performance of the WTP against the requirements of this EPL, concentration limits, discharge volumes, recycled water quantities and quality. The report must outline the circumstances which will trigger additional monitoring arrangements and include details about incidents and responses. The report must include the results of the visual inspections of water quality controls including silt curtains and any remedial action undertaken to ensure compliance with licence conditions including O1 and O2.