

13 October 2010

Our Ref: AS121111B & C

Lend Lease (Millers Point) Pty Ltd
Attn: Warwick Bowyer
Level 4, 30 The Bond
Hickson Road
Millers Point NSW 2000

Dear Warwick

Re: Review of Block 5 and Hickson Road Pilot Test, S-ISCO and SEPR, Barangaroo

1 Introduction

1.1 Background

As a NSW-EPA accredited Contaminated Sites Auditor, I am conducting a contamination audit in relation to the southern portion of the site known as "Barangaroo", at Millers Point, NSW on behalf of Lend Lease (Millers Point) Pty Ltd (Lend Lease). Barangaroo is a large site to be developed in stages and for a variety of uses, with different portions subject to separate audits.

The portion of Barangaroo (and part of the adjacent Hickson Road) that is the subject of this audit has been designated as the "Declaration Area" (the site). The Declaration Area is identified in the NSW Environment Protection Authority (EPA), part of Department of Environment, Climate Change and Water (DECCW), Declaration Number 21122, Area Number 3221, and is also known as the former Millers Point gasworks. The site includes parts of Block 3, Block 4, Block 5, Southern Cove and Hickson Road. The portions of Blocks 3, 4 and 5 within the Declaration Area are intended to be re-developed for high density residential and commercial purposes. The site location is shown on Attachment 1, and the proposed development layout is shown on Attachment 2.

1.2 Objective

The Barangaroo Delivery Authority (BDA) has entered into a Voluntary Management Proposal (VMP) with the EPA, Approval No. 20101719, dated 23 July 2010, that addresses those works required to remove the declaration. The VMP is proposed in two phases. The following objectives are included in Phase 1 of the VMP:

- O3. *Conduct Surfactant-enhanced In Situ Chemical Oxidation ("S-ISCO") bench scale and pilot trials to determine the applicability of S-ISCO.*
- O5. *Conduct Surfactant Enhanced Product Recovery ("SEPR") pilot trial.*

The proposed methodology for conducting the S-ISCO and SEPR pilot trials for the Declaration Area has been documented by VeruTEK Technologies, Inc. (VeruTEK) in 'Work Plan, Block 5 and Hickson Road Pilot Trial' dated 7 October 2010. VeruTEK has been subcontracted by AECOM Australia Pty Ltd (AECOM) who is undertaking remediation of the site on behalf of Lend Lease.

The objective of this review is to provide my comments on the suitability and appropriateness of the proposed S-ISCO and SEPR pilot trial methodology as a trial of potential remediation methods for clean-up of the site and removal of the declaration. A remediation action plan (RAP) and remediation work plan (RWP) will also be prepared addressing remediation of the site.

Separate RAPs are to be prepared for each development stage at Barangaroo. As it is envisaged that remediation in different portions of Barangaroo will be linked, for example by re use of material from one part in another, an Overarching RAP has also been prepared to identify strategies and remedial options for remediation of the whole site. Review of the Overarching RAP has been conducted as a separate audit.

1.3 Scope of Work

This letter is based on a review of the documents listed below and observations made during a site visit on 18 March 2010, as well as correspondence with Lend Lease, AECOM and VeruTEK:

- 'Report to Sydney Harbour Foreshore Authority on Geotechnical Investigation for Proposed Redevelopment of Wharves 3-8 at Hickson Road, Darling Harbour East, NSW' dated 21 August 2006, by Jeffery and Katauskas Pty Ltd (J&K)
- Report 'Land at Millers Point, Ownership and Usage' dated 1 June 2007, by Rosemary Broomham
- Final Report 'Environmental Site Assessment, East Darling Harbour, Sydney, NSW' dated 21 June 2007, by Environmental Resources Management Australia Pty Ltd (ERM)
- Report 'Preliminary Environmental Investigation, 30-38 Hickson Road, Millers Point, NSW, 2000' dated 12 May 2008, by Coffey Environments Pty Ltd (Coffey)
- Report 'Additional Investigation Works at Barangaroo, Hickson Road, Millers Point, NSW' dated July 2008, by ERM
- Report 'Draft Stage 2 Remedial Action Plan for Barangaroo, Hickson Road, Sydney' dated September 2008, by ERM
- Draft Report 'Sampling, Analytical and Quality Plan Declaration Area – Issue 1 VMP Works, NSW EPA Declaration Area 21122, former Millers Point Gasworks' dated 2 March 2010, by AECOM
- EPA Declaration of Remediation Site, Declaration No. 21122, Area No. 3221, dated 6 May 2009 (the declaration)
- Report 'Sampling, Analytical and Quality Plan Declaration Area – Issue 2 VMP and PDA Works, NSW EPA Declaration Area 21122, former Millers Point Gasworks' dated 6 July 2010, by AECOM

- Report 'Data Gap Investigation, EPA Declaration Area (Parts of Barangaroo Site and Hickson Road), Millers Point, NSW' dated 23 September 2010 (and drafts dated 16 April and 30 July 2010), by AECOM (the DGI)
- Report 'Overarching Remedial Action Plan for The Barangaroo Project Site, Sydney' dated 1 June 2010 by ERM (the Overarching RAP)
- EPA Notice of Approval of Voluntary Management Proposal, Approval No. 20101719, Area No. 3221, dated 23 July 2010 (the VMP)
- Final Report 'Treatability Study Recommendations for the Implementation of an In Situ Remedy Barangaroo – Block 5 and Hickson Rd Site, Lend Lease, Sydney, Australia' dated 23 September 2010 (and draft dated 16 June 2010) by VeruTEK
- Final Report 'Work Plan, Surfactant Enhanced In Situ Chemical Oxidation, Surfactant Enhanced Product Recovery, Block 5 and Hickson Road, Pilot Trial' dated 7 October 2010 (and drafts dated June 2010, 27 August 2010 and 28 September 2010) by VeruTEK.

2 Site Details

2.1 Location

The site details are as follows:

Street address:	Wharf 8, Hickson Road (Sussex Street), Barangaroo, NSW 2000
Identifier:	Part Lot 3 and Part Lot 5 in DP 876514, section of Hickson Road in State Plan 118 and 162 (refer Attachment 3)
Local Government:	City of Sydney
Owner:	Barangaroo Delivery Authority, City of Sydney Council
Site Area:	Approximately 2.1 ha

The current zoning of the site was identified by AECOM in the DGI as:

- Portion within Hickson Road: Maritime and Transport Zone
- Portion within Barangaroo: Zone B4 Mixed Use.

2.2 Adjacent Uses

The site is located within an area of mixed uses as follows:

- North: Barangaroo open space (concrete/hardstand), including remainder of Block 5. Currently vacant except for public walkway access and temporary Overseas Passenger Terminal. Former commercial and port related activities.
- South: Barangaroo open space (concrete/hardstand), comprising Blocks 1-3. Recently vacated Wharf 8 Overseas Passenger Terminal (including cruise ship loading dock, terminal, car park and landscaped areas). Former commercial and port related activities.

- East: Commercial and high density residential buildings.
- West: The remainder of Blocks 4 and 5 and Southern Cove, followed by Darling Harbour. Former commercial and port related activities.

There may have been localised sources of contamination at the adjacent portions of Barangaroo, however, these are not considered to have potential to have caused significant contamination at the site, given the primary contaminant source in the local area is the gasworks formerly located at the site.

2.3 Site Condition

The site is flat and at an elevation a few metres above Darling Harbour water level. Hickson Road is a public roadway for both vehicle and pedestrian traffic. AECOM noted the following current features at the portion of the site on Barangaroo in their DGI report:

- The site is covered by hard surfacing including concrete and bitumen with only a few structures and large light towers. The site is vacant and former large warehouses have been demolished
- There is a disused brick amenities building in the east of the site near Hickson Road
- There is a sewage pumping station (SPS) north of the amenities building. ERM reported in the draft RAP (2008) that this feature is identified on the NSW State Heritage List
- There is part of the vacant 'former maintenance building' in the southeast of the site near Hickson Road.
- The site is secured by fencing, with the exception of a fenced public walkway access that crosses the site.

3 Environmental Investigation Results

The following brief summary is based on review of the ERM and Coffey investigations and the AECOM DGI, as listed in Section 1.

3.1 Site History and Contaminants of Concern

The site was historically used to manufacture gas from approximately 1840 to 1921. It is understood that some of the former gasworks infrastructure remains in place beneath the current slab and roadways (including Hickson Road). Attachment 3 indicates the location of these features. The gasworks were demolished in the mid 1920s when new finger wharves were constructed, and the area was subsequently used for various workshop facilities. In addition to the original filling for development of the gasworks, filling also occurred in 1961-1968 for the construction of longshore berthage, with some additional filling in the south of the site (area of former Southern Cove) in the late 1980s or early 1990s.

The primary sources of contamination at the site include the former gasworks operations and uncontrolled fill used in various stages of site reclamation. Relevant contaminants of concern are:

- **Gasworks:** could include metals, TPH, BTEX, PAHs, phenols, sulphate, cyanide, ammonia, asbestos. These are generally consistent with the VMP which identifies the chemical composition of gasworks waste to include: PAH, BTEX, TPH, ammonia, phenol and cyanide.
- **Fill:** could include metals, TPH, BTEX, PAHs, PCBs, OCPs, VOCs, SVOCs, asbestos.

There is also potential for Acid Sulphate Soils (ASS) and hazardous building materials such as lead, PCBs and asbestos to be present.

3.2 Soil and Groundwater Investigations

Soil and groundwater conditions at the site have been assessed in multiple stages of investigation by ERM, Coffey and AECOM, with locations shown on Attachment 2.

Soil sampling has focussed primarily on fill materials which extend to between 0.43 and 17.5m below ground level (mBGL), increasing from the east (Hickson Road) to west (towards Darling Harbour). Investigations have also assessed underlying natural sediments, however there has been minimal sampling of bedrock.

Groundwater at the site is shallow, generally within 3mBGL, and is subject to tidal fluctuations indicating a high degree of connectivity between groundwater at the site and the adjoining waters of Darling Harbour. The tidal influence extends as far east (inland) as Hickson Road, although the degree of fluctuation is much less in the eastern portion of the site.

3.3 Investigation Results

According to AECOM, "Contamination has been reported in fill material, natural soil and groundwater underlying the Site, other adjacent portions of Barangaroo, adjacent portions of Hickson Road and sediment in the nearby Darling Harbour." The key investigation findings reported by AECOM in the DGI were as follows:

- The following contaminants were detected in soil at concentrations exceeding the site assessment criteria: lead, TPH, BTEX, PAHs (including benzo(a)pyrene) and sulfate.
- The maximum concentrations in soil were generally located in proximity to and down gradient of the former gasworks infrastructure in Block 4 and Hickson Road. Free tar was identified at eight locations within Hickson Road and Block 4 in the vicinity of the tar tank, purifying beds and 1870 gasholder indicating these locations are the main areas of contamination.
- Soil vapour results indicated some gasworks-derived impacts (indicated by the presence of naphthalene) in locations closest to the former gasworks area, and low concentrations of toluene, chloroform and tetrachloroethene in some locations.
- The following dissolved phase contaminants were detected in groundwater at concentrations exceeding the site assessment criteria: lead, cadmium, chromium (III+VI), cobalt, copper, mercury nickel, zinc, benzene, naphthalene and phenol.
- The most significant groundwater contamination was identified in the immediate vicinity of the former gasworks infrastructure and contamination is present in both dissolved and free phase forms (non-aqueous phase liquid – NAPL).

- Concentrations of contaminants in excess of the site assessment criteria were also identified in down-gradient groundwater wells, indicating the westerly migration of contamination. The results of the investigation indicate that the variable nature and distribution of fill materials at the site cause localised variations in groundwater flow and associated contaminant migration, which is further complicated by tidal movements.

3.4 EPA Findings

The EPA has declared that the site is contaminated with gasworks waste and particularly waste tar as a result of the previous use of the site as a gasworks. This contamination was considered significant enough to warrant regulation under the NSW *Contaminated Land Management Act 1997* hence the site was previously declared as an Investigation Area (2007), and is currently declared as a Remediation Site (No. 21122, 2009). This declaration was made based on the following:

- *“Groundwater on the site has been found to be contaminated by TPHs, PAHs, BTEX, ammonia, phenol and cyanide at concentrations significantly exceeding the relevant trigger values for the protection of human health and aquatic ecosystems in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, 2000).*
- *These groundwater contaminants include human carcinogens and substances toxic to aquatic ecosystems.*
- *The contaminated groundwater is impacting on the surrounding areas including the basement of a residential building adjacent to the site, potentially exposing humans in that building to harmful vapours; however it is currently being effectively controlled.*
- *Contaminated groundwater is likely to be migrating from the site to Darling Harbour and could ultimately affect aquatic ecosystems”.*

4 Evaluation of Pilot Trial

4.1 Introduction

As discussed in Section 1.2, completion of pilot trials at the site for S-ISCO and SEPR are requirements of the VMP (Approval No. 20101719). The purpose of this review letter is to provide my comments on the suitability and appropriateness of the proposed pilot trial methodology. The proposed methodology has been documented in a Work Plan.

The following sections provide an overview of the proposed trial methodology, an evaluation of the Work Plan document and consideration of the monitoring program. An assessment of potential risks and mitigation measures is included in Section 5.

4.2 Proposed Pilot Trial Methodology

4.2.1 Remediation Technology Overview

As outlined by VeruTEK in the Work Plan, the S-ISCO process involves the injection of an oxidising agent (and activator if required) and a cosolvent (surfactant) into the subsurface to reduce the amount of source NAPL and reduce the flux of groundwater constituents. SEPR

uses plant-based surfactants and hydrogen peroxide to enhance product recovery of NAPL. SEPR is also used as a pre-treatment for S-ISCO. Both processes utilise enhanced desorption and solubilisation of the gas works organic chemicals from soils and simultaneous chemical oxidation of the solubilised chemicals.

According to VeruTEK, S-ISCO and SEPR, as a pretreatment step, are proposed for treatment of the Hickson Road portion, and S-ISCO is proposed for use within the Barangaroo Site, specifically (but not necessarily limited to) Block 5 within the Declaration Area.

The proposed pilot trial remediation technology is consistent with the remedial options identified in the Overarching RAP.

4.2.2 Bench Scale Treatability Study

The type of oxidant, activator, cosolvent and proposed dosage for the pilot trial has been selected based on the findings of a bench scale treatability study (VeruTEK, 23 September 2010). Treatability tests were performed on soil samples from Block 4, Block 5 and Hickson Road, and a sample of NAPL from Block 5.

The samples used in the treatability study are considered adequately representative of the soils to be treated in the Pilot Trial based on the sample collection location, sample material type and contaminant concentrations.

I have not reviewed the appropriateness of the bench scale testing undertaken, the agents selected or the proposed dosages due to the specialised technical nature of the study and the proprietary additives considered.

4.2.3 Pilot Trial Methodology

The pilot trial is proposed to be conducted in two separate areas - within Block 5, and within the tar tank on Hickson Road. The Pilot trial will involve injection of water, oxidant, activator and cosolvent, which are proposed to move naturally with the flow of groundwater. Extraction wells are not proposed to force the flux of treatment chemicals through the ground, however, extraction within the tar tank (Hickson Road) is proposed to allow product recovery and to maintain hydraulic control over the fluids in the tar tank. Monitoring will be conducted to follow the magnitude and rate of the movement and influence of the treatment front. Initial injection rates will be low, and they will gradually be increased once it is established how fast the chemistry moves within the subsurface. A number of groundwater or soil vapour extraction contingencies are defined, to be enacted in the event the treatment front approaches receptors or excess vapours are generated (refer Section 5).

The following Table 4.1 provides a summary of the pilot trial details and proposed monitoring networks in each area. Attachment 4 shows the location of the two trial areas and monitoring features, with further detail in the two trial areas shown on Attachments 5 and 6, respectively.

Table 4.1: Summary of Proposed Pilot Trial and Monitoring Networks

Trial Aspect	Block 5 (Attachment 5)	Hickson Road (Attachment 6)
Trial area	10 x 10m (100m ²), adjoining eastern boundary of Block 5	16m diameter tar tank (approx. 200m ²), adjacent to 36 Hickson Road, under roadway and footpath
Relevant investigation bores	<i>Inside trial area:</i> ERM BH198, AECOM BH66 <i>Nearby:</i> AECOM BH65, ERM BH60	<i>Inside trial area:</i> Coffey BH7, AECOM BH53
Trial area contamination status and below ground features	TPH, BTEX and PAH soil and groundwater contamination with some tar impact Fill depth of around 3-5mBGL Gasworks infrastructure including retort house and 1880 extension and purifiers	TPH, BTEX and PAH soil and groundwater contamination, and tar sludge at base of tank (approx. 5.4mBGL) Shallow bedrock, around 1mBGL, around tar tank Steel lined tar tank, expected limited connectivity with surrounding bedrock
Rationale for selection of trial area	Based on location, level of contamination and lithology. In particular: - Proximity to utilities - Adjacent to Hickson Road, facilitating simultaneous trials - Far away from Darling Harbour, minimising chance of impact - Includes BH198, where soil exhibited high levels of contamination - Contains contamination that is representative of contamination elsewhere within Block 5, and relatively shallow fill depth is desirable for defining a Pilot trial area.	Trial not intended to be applicable to all of Hickson Road. Location selected for evaluation of NAPL treatment and to allow design of full-scale tar tank treatment. Other considerations were: - Results will be applicable for other confined or semi-confined structures from the former gasworks, including the former gasholder annulus or geological features (i.e. bedrock depressions) where pockets of NAPL requiring treatment may be discovered during full-scale implementation. - Need to trial how tar and tar-contaminated material within historic structures would be remediated. - Need to determine how the proposed in situ technology would (if at all) impact the basement of 38 Hickson Road.

Table 4.1: Summary of Proposed Pilot Trial and Monitoring Networks

Trial Aspect	Block 5 (Attachment 5)	Hickson Road (Attachment 6)
Remediation trial approach	Two phases of S-ISCO: 1. 6 weeks hydrogen peroxide activated by Fe-TAML, enhanced by VeruSOL 2. 2 weeks alkaline persulfate	SEPR followed by S-ISCO <u>SEPR:</u> 1. 5 days injection, hydrogen peroxide enhanced by VeruSOL 2. 5 days extraction of injected fluid and solubilised product <u>S-ISCO:</u> 3. 4 weeks hydrogen peroxide activated by Fe-TAML, enhanced by VeruSOL
Number of injection wells	4	3
Injection well construction	Screen from 2.5 to 3.5mBGL Separate injection into fill and natural materials (see Section 4.4, below)	Screen from 3 to 5mBGL (approx.) Will screen to base of tar tank (see Section 4.4, below)
Number of extraction wells	0 (Extraction can occur from groundwater wells as a contingency)	3 – combined with monitoring wells Dual phase extraction is proposed - NAPL and emulsified fluids Initial extraction volume will be equal to injection volume, will be adjusted to maintain hydraulic control (Extraction can also occur from groundwater wells as a contingency)
Groundwater monitoring network		
Total wells to be monitored	12 5 existing, 7 new	8 3 existing, 5 new
Locations inside trial area	2	3
Locations outside trial area	10 1 upgradient 2 cross gradient 7 downgradient	5 2 cross gradient 3 downgradient
New groundwater well construction	Clusters of up to 3 wells (depending on depth to bedrock) – screened at shallow, intermediate and deep (to bedrock) depths. 3m screen length, 50mmUPVC construction.	Clusters of up to 3 wells (depending on depth to bedrock), anticipated to only be shallow depth. 3m screen length, 50mmUPVC construction.
Soil vapour monitoring network		
Total wells to be monitored	4 3 existing, 1 new	4 all new

Table 4.1: Summary of Proposed Pilot Trial and Monitoring Networks

Trial Aspect	Block 5 (Attachment 5)	Hickson Road (Attachment 6)
Locations inside trial area	1	1
Locations outside trial area	3 to south and west	3 Buildings at 30 and 38, to north and south
Soil vapour point construction	0.25 inch Teflon tubing with vapour tip. Two screened depths – 0.3-0.5 and 1.3-1.5mBGL (approx.)	0.25 inch Teflon tubing with vapour tip. Two screened depths – 0.3-0.5 and 1.3-1.5mBGL (approx.)

In the Auditor's opinion:

- The proposed pilot trial methodology documented in the Work Plan and summarised in Table 4.1 above is considered to be a reasonable approach to trialling the identified technologies at the site.
- The proposed monitoring network is considered adequate, with soil vapour and groundwater monitoring points adequately located in proximity to sensitive receptors.

The monitoring program is discussed further in Section 4.4 and risk mitigation and contingency measures are discussed in Section 5.

4.3 Evaluation of Work Plan

The Auditor has undertaken a review of the Work Plan to determine the suitability and appropriateness of the Work Plan to meet the objectives of the pilot trial. The review has not addressed the adequacy of the Work Plan with respect to occupational health & safety, dangerous goods management, traffic management and other areas that are not relevant to the subsurface contamination and associated risks to human health and the environment during the pilot trial.

The Auditor's review is summarised in Table 4.2, below.

Table 4.2: Evaluation of Pilot Trial Work Plan

Work Plan Element and Where Addressed	Details	Auditor Comments
Objective s1.2	The objective of the Pilot Trial is "to verify the effectiveness of the S-ISCO® and SEPR™ remedies in the field, and to acquire data that can be used to optimise the design of the Full-Scale S-ISCO® and SEPR™ implementations". A number of more specific objectives are presented, including: • the objective of the SEPR pilot trial to treat up to 25 % of the soil contaminant mass in order to demonstrate that SEPR	The primary and specific objectives are considered appropriate. The remediation criteria for removal of the Declaration is not yet determined and will be subject to EPA approval.

Table 4.2: Evaluation of Pilot Trial Work Plan

Work Plan Element and Where Addressed	Details	Auditor Comments
	is capable of removing the tar from the tar tank in Hickson Road. The objective of the S-ISCO pilot trials in both Hickson Road and Block 5 is to demonstrate that S-ISCO is capable of remediating contamination such that the EPA Declaration can be removed.	
Process Description s3.1-3.7 s5.6	The Work Plan describes the various systems that make up the pilot trial, including: - Injection system - Extraction system - Soil vapour extraction (SVE) and treatment system - Trenching system, particularly in Hickson Road	The level of detail provided for the process description is generally adequate, although the trigger for replacement of the SVE system carbon filters is not addressed. The Auditor has not reviewed technical design elements of the system.
Test site rationale s2.1 and 2.3	Test site rationale was discussed in the Work Plan and is summarised by the Auditor in Table 4.1, above	Based on the rationale presented, the selected test sites are considered appropriate.
Consideration of laboratory to field pilot trial scaling issues s1.3.1 Also treatability study report.	VeruTEK considers the results of the short-term treatability tests (up to 28 days in the laboratory) to be extremely conservative with respect to field scale implementation since chemical oxidation reactions are rate limited and the field treatment duration will be in the order of many months. VeruTEK also notes that the results of the laboratory study are conservative since the study used soils taken from the most highly contaminated areas.	The Auditor notes that the contact (mixing) conditions during the laboratory testing are not conservative when compared to the likely conditions in the field. However, the Auditor is satisfied that the laboratory testing undertaken is sufficient to allow for the appropriate selection of additives and dosage.
Consideration of field pilot trial to full scale scaling issues s1.3.1	“VeruTEK does not anticipate that any scale-up or staging factors will affect the relationship between the results attained in the pilot trial and what can be achieved during the Full-Scale implementation. One key objective of the pilot trial is to provide sufficient and necessary information to design the Full-Scale implementation and therefore minimise the risk	The Auditor notes that the fill depth in the Block 5 trial area is relatively shallow compared to the remainder of the site. However, based on the pilot trial objectives

Table 4.2: Evaluation of Pilot Trial Work Plan

Work Plan Element and Where Addressed	Details	Auditor Comments
	of any issues that might otherwise occur between the bench scale trials and full scale implementation".	and the test site rationale, the Auditor is satisfied that, if implemented successfully, the field pilot trial should be scalable to Full Scale remediation at the site.
Site management plan, including contingency plan to respond to site incidents s3.12 S4	A separate Construction Management Plan (CMP) is to be prepared covering incident management, communication plan and environmental management plans relating to: • Traffic; • Noise and Vibration; • Waste; • Water; • Air Quality and Odour; and • Aesthetics. The Work Plan also includes information relating to roles and responsibilities and data management.	The Auditor has not reviewed the CMP or operational management issues such as dangerous goods management. Consideration of these elements is not relevant to the current review. The proposed roles, responsibilities and data management are considered appropriate.
Health and safety plan s4.4	A separate Health and Safety Plan (HSP) is to be prepared. The Work Plan states that the HSP will be certified, peer reviewed and independently endorsed by an occupational health and safety expert.	The Auditor has not reviewed the HSP. This is not relevant to the current review.
Management of extracted fluids s4.5.1	It is anticipated that up to 80,000L of fluid will be extracted as part of the SEPR process. The Work Plan identifies the following options for management of extracted fluids, which are discussed further in the waste management plan in the CMP: • Progressively treated on site and re-used in subsequent injections to the greatest extent possible; or, where this is not possible, • Disposed of to sewer in accordance with a trade waste agreement; • Disposed of to storm water in accordance with appropriate license conditions; or • Disposed of off- site prior to completion of the pilot trial.	The Auditor has not reviewed the waste management plan contained within the CMP. The options identified are considered reasonable, although are subject to licences and / or approval by others.

Table 4.2: Evaluation of Pilot Trial Work Plan

Work Plan Element and Where Addressed	Details	Auditor Comments
Monitoring and validation s3.8, s.9, 3.10, 5 Table 7A (Block 5) Table 7B (Hickson Road)	The proposed monitoring schedule and validation sampling are discussed in the Work Plan and are addressed by the Auditor in Section 4.4, below. Tables 7A and 7B are attached to this review letter.	Refer Section 4.4
Consideration of environmental risks and mitigation measures s1.1.1, 1.3.4, 3.11	Potential risks and mitigation/ contingency measures are discussed in the Work Plan and are summarised by the Auditor in Section 5, below.	Refer Section 5
Licence and Approvals s7 s5.6 s4.5.1	A specific discussion of the approvals required for the pilot trial is not provided in the Work Plan. The following reviews/ approvals are mentioned: • Department of Planning review • Construction Certificate • DECCW permit • Road closure permit • Police permit The Work Plan states that "It is expected that the soil vapour extraction system will not require an Environmental Protection License and hence will not be subject to requirements under the POEO Clean Air Regulations. Notwithstanding, and based on the requirements of the POEO Clean Air Regulations, a trigger level of 10mg/m³ of total VOC will be adopted for operation of the SVE system with a limit of 20mg/m³ of total VOC proposed as a maximum limit never to be exceeded". Disposal of extracted fluids to sewer, stormwater and off-site are identified as options for the management of extracted fluids. Waste disposal requirements are addressed in the CMP. The Work Plan makes reference to a trade waste agreement, license (presumably under POEO) and classification for disposal in accordance with DECC (2008).	The Auditor has not reviewed the licensing/ approval requirements for the pilot trial works. The Auditor has not reviewed the licensing/ approval requirements related to discharges from the SVE system. Control limits are subject to approval by others. The Auditor has not reviewed the CMP or the detailed licensing/ approval requirements related to waste management. Classification of liquid wastes for disposal is required in accordance with DEC (1999) 'Environmental Guidelines: Assessment, Classification and