THIESS SERVICES

SITE MANAGEMENT PLAN

for

LEDNEZ SITE
40 Walker Street
Rhodes, NSW 2138

Table of Contents

1 Introduction

This Site Management Plan (SMP) has been prepared for the former Lednez Site, 40 Walker Street, Rhodes, NSW.

This SMP provides:

- Background information describing the site location and history;
- A review of remediation and validation work carried out by Thiess Services (Thiess) in the period 2005 – X;
- Information on the nature of contaminants present on the site;
- Details of the protocols to be followed to minimise exposure to contaminants and to ensure the integrity of the remediation is maintained; and
- Information on the land uses for which the site is suitable.

2 Background

2.1 Site Location

[Updated DP details and description of surrounding land use to be inserted when site is subdivided and remediation works completed]

The site is located at 40 Walker Street, Rhodes NSW, and comprises Lot 10 in Deposited Plan 1007931 in the Canada Bay Local Government Area, Parish of Concord, County of Cumberland ("the site"). The site location is shown on **Figure 1**. The site is commonly referred to as the "Lednez Site".

The site is zoned for residential and commercial uses under the State Regional Environmental Plan No 29 (SREP 29) and occupies an area of approximately 10.5ha.

The former Orica chemical manufacturing facility is located to the south of the site. That site is being progressively redeveloped for commercial and residential use by Walker Corporation. To the west lies Homebush Bay, a tidal embayment opening into the Parramatta River.

Land uses across the bay are residential, light industrial and commercial. To the far south-west, across the Bay, is the former Olympics 2000 site. To the east, and parallel to Walker Street, is an active railroad track which adjoins an existing residential area. On the northern boundary is the former Allied Feeds site owned by Meriton Apartments, and proposed to be redeveloped for residential purposes. Outside the immediate area, mixed commercial, light industrial and residential uses predominate.

2.2 Historical Usage

The site has a history of chemical manufacturing beginning in 1928 and ending in 1986. The original owner was Timbrol Limited, a small Australian company, which established a wood preservation plant in 1928 utilising waste coal tar oils from the Australian Gaslight Company's operations at Mortlake.

In 1957, Timbrol Limited, merged with Union Carbide to form Union Carbide Australia Limited, which was 60% owned by Union Carbide Corporation of the United States and the remainder by various Australian entities. The chemical manufacturing operations continued on the site, which was progressively enlarged by reclamation of the bay. Significant quantities of process by-products were utilised in land reclamation operations, resulting in the site being contaminated with a range of chemicals.

The history of chemical manufacture on the site is summarised in **Table 2.1**. Nitric acid, sulfuric acid and zinc chloride was also made on site, though the period of their manufacture is unknown.

Table 2.1: History of Chemical Manufacture on the Site

Chemical Manufacture	Period of Manufacture
Coal tars	1928-1936
Xanthate	1933-1986
Aniline and Mononitrobenzene	1940-1961
Synthetic Phenol	1943-1971
Chlorobenzene/Chlorophenol/DDT	1948-1983
Chlorine (Electrolytic Chlorine Plant)	1953-1976
2,4-D and 2,4,5-T Herbicides	1949-1976
Bisphenol A	1960-1976
Phenol Formaldehyde Resins	1964-1976

Partial remediation of the site was undertaken targeted to a residential land use standard from 1988 to 1993. These works involved excavating selected areas, primarily within the original site (before reclamation), of fill and solid debris (construction materials), to shale bedrock and encapsulating these materials over the reclaimed parts on site.

The site was not used for any purpose from 1993 until Thiess commenced remediation operations in 2005.

3 Remediation and Validation

This section summarises the remediation and validation of the site undertaken in the period 2005 – X.

3.1 Chemicals of Concern

[The following list may be extended subject to the results of validation testing undertaken during the remediation works]

Based on a review of the site history and the results of previous site investigations and remediation operations undertaken at the site, the following chemicals are considered to be of concern:

- BTEX (Benzene, Toluene, Ethylbenzene, Xylene);
- Chlorobenzenes;
- Organochlorine Pesticides;
- Phenols, Cresols & Chlorophenols;
- Poly cyclic Aromatic Hydrocarbons (PAHs);
- Dioxin and Furans;
- Total Petroleum Hydrocarbons (TPH);
- Amines;
- Nitrosamines;
- Ketones;
- Phthalates;
- PCBs;
- Phenoxy Acid Herbicides;
- Ammonia; and
- Metals (Arsenic, Cyanides, Beryliium, Cadmium, Chromium (III and VI), Copper, Lead, Manganese, Methyl Mercury, Mercury, Nickel and Zinc).

3.2 Overview of Remediation Works

[The following summary may need to be amended following completion of the works]

3.2.1 Introduction

The remediation was conducted in stages. Key activities included:

- Earthworks required to excavate, stockpile and classify contaminated material from Homebush Bay and the site;
- Treatment of material with contaminant concentrations above soil remediation criteria;

- Beneficial reuse of material to reinstate the site to levels suitable for future residential development.

Information regarding material characteristics and contaminant concentrations was used to categorise the material into the following broad categories:

- Category 1: contaminated treatment material
- Category 2: geotechnically limited regrade
- Category 3: general application regrade.

Treatment was undertaken for material classified as Category 1 material. A large proportion of Category 1 materials comprised spent lime sludges and sediment. Materials classified as Categories 2 or 3 were suitable for reinstatement on-site without treatment. Category 2 material comprised soft material including sediment, spent lime sludges and clay considered unsuitable from a geotechnical point of view for use in areas designated for roadways due to its limited load-bearing capacity. Accordingly, this material was primarily placed in open space areas and under areas designated for high density residential development. Category 3 material comprised soil, rock and crushed masonry that could be placed and compacted to produce a sound and stable landform. These materials were used where structural soundness was required, for example, beneath roadways, and as capping to the balance of the site.

3.2.2 Project Staging

The works were staged to enable progressive completion and handover of remediated areas. In total there were three remediation stages, and a corresponding three land releases following EPA-accredited auditor sign off. The land release schedule is summarised in Figure 2.

Table 3.1 summarises the key work components and the timing of each stage.

Table 3.1: Key Work Components and Timing

Stage	Approximate timing	Key work components
1	0 to 24 months	Demolition of derelict buildings on the site. Ongoing operation of water treatment plant and associated water management measures. Ongoing installation and maintenance of environmental controls. Excavation, stockpiling and classification of Stage 1 materials. Reclassification of treated material. Validation of excavations and reinstatement with suitable material. Establishment and operation of pre-treatment building. Soil treatment plant establishment and commissioning.
2	24 to 42 months	Ongoing operation of water treatment plant and associated water management measures. Ongoing installation and maintenance of environmental controls. Excavation, stockpiling and classification of Stage 2 materials. Soil treatment plant operation.

		Pre-treatment plant operation. Reclassification of treated material Validation of excavations and reinstatement of Stage 2 with suitable material.
3	42 to 60 months	Ongoing operation of water treatment plant and associated water management measures. Ongoing progressive installation and maintenance of environmental controls. Excavation, stockpiling and classification of Stage 3 materials. Soil treatment plant operation. Pre-treatment building operation. Reclassification of treated material. Validation of excavations and reinstatement of land with suitable materia. Decommissioning and validation of thermal and water treatment plant footprint.

3.2.3 Bay Remediation Works

Coffer Dam construction and Dewatering

To isolate the sediments to be excavated from Homebush Bay and to facilitate a 'dry' excavation process, a number of coffer dams were constructed in stages along the foreshore to enclose the area to be remediated. The coffer dams were constructed from low-permeability Category 3 materials taken from the Lednez site.

Each coffer dam enclosed an area of approximately 150 metres by 60 metres. Each coffer dam was approximately 3.5 metres high, with a width of approximately five metres at the top and 11 metres at the base.

Coffer dams were constructed by end-tipping soil from dump trucks and spreading it by bulldozer. Each coffer dam was enclosed at low tide to minimise the volume of water trapped in the dam. The area enclosed by each coffer dam was then dewatered to facilitate the excavation of sediment in a dry and isolated environment.

Homebush Bay Excavation

Sediments were excavated to a depth of 0.5 metres to a distance of 45 metres from the seawall using a long reach excavator. Excavated sediments were transferred to the Lednez site by articulated dump trucks and stockpiled for the purpose of classification.

Seawall Removal and Reinstatement

The bay works included the removal of the seawall along the foreshore of the Lednez site. The pre-existing seawall of the Lednez site was demolished to allow for contaminated sediments and fill located beneath and behind it and sediment enclosed within the coffer dams to be removed simultaneously.

As the remediation works were completed, the seawall was reconstructed in its original location to maintain the boundary alignment of the Lednez site. These works occurred progressively within the confines of a coffer dam. The new seawall was constructed to the satisfaction of the NSW Waterways Authority.

Excavation Restoration and Coffer Dam Removal

Progressively, as the final sediment excavation levels were reached in each coffer dam, the excavations were reinstated to pre-remediation levels. Once the excavation surface has been surveyed and sampled a geo-fabric was laid down. The subsequent backfill materials were primarily sourced from the coffer dam wall materials. Ultimately all reinstatement material were sourced from the Lednez site.

After reinstatement of sediments was complete, the remaining portions of the respective coffer dams were removed. Surplus coffer dam materials were reused in the construction of subsequent dams or taken onto the Lednez site.

Classification and Treatment of Excavated Sediment

Excavated sediments transferred to the site were classified as per the description given below. Following classification as either Category 1, 2 or 3 it was incorporated into the Lednez site remediation works.

3.2.4 Lednez Site Remediation Works

Demolition of Structures

A licensed demolition subcontractor was commissioned to undertake the site demolition works and to remove asbestos material contained in structures on the site. The works associated with demolition included removal of:

- The former Lednez offices (a two- and three-storey building that faced Walker Street); and
- The partial demolition of the former Glad factory which encroached on the southern part of the site.

Most of the material resulting from the demolition was uncontaminated and suitable for recycling and use on-site. Any materials containing asbestos were transported to and disposed of at a landfill licensed to receive asbestos.

Excavation and Stockpiling of Category 1, 2 and 3 Materials

The process for excavating, handling and processing material that was excavated from the Lednez site is outlined in the materials flow diagram in Figure 3. The sediments excavated from the bay are also included in this process as these were managed in the same manner once they were moved onto the Lednez site.

A total of approximately 430,000 cubic metres of rock and reclamation material was excavated as part of the remediation works, with up to approximately 2,100 cubic metres of material being excavated daily.

Materials were excavated and stockpiled to enable classification. Category 2 materials were used as backfill to reinstate excavations in open space areas and in future residential areas. Category 3 materials were used to reinstate areas designated for roadways and as capping to the balance of the site. Category 1 material were treated by thermal desorption and then reclassified as either Category 2 or 3 material and dealt with accordingly. Equipment used to excavate and haul material included tracked excavators, articulated dump trucks, a range of bulldozers to rip rock and maintain stockpiles, graders for haul road maintenance and water carts for dust control.

Excavation at Lednez Site Boundaries

Due to the nature of some of the materials present at the boundary of the Lednez site with adjacent sites, there was a need to prevent cross-boundary migration of contaminants onto previously remediated areas.

To this end, a vertical steel sheet pile wall was installed along those same site boundaries before commencing excavation. The piles were driven from the surface and keyed into the underlying natural clays and bedrock. As excavation progressed soil anchors were installed to maintain stability. The sheet pile was removed at completion of backfilling activities.

Establishment and Operation of Pre-treatment Building

Pre-treatment of Category 1 material was conducted inside an enclosed building to accomplish the following objectives:

- Minimise fugitive dust and odour emissions;
- Minimise noise emissions;
- Prevent rainfall from contacting contaminated material; and
- Limit visual impacts resulting from pre-treatment operations.

The pre-treatment building was constructed of a steel frame with metal sheeting. The building was approximately 70 metres long and 40 metres wide. All walls and building entrances were constructed to prevent rainfall entering the building.

The building was equipped with two personnel entrances and one truck entrance. The truck entrance included an airlock comprised of a small structure attached to the pre-treatment building. The airlock was equipped with two doors. When a truck entered the building, the inner door was closed and the outer door opened to allow the truck to enter the airlock. The outer door would then close, the inner door would open and the truck would enter the pre-treatment building. The procedure was reversed when a truck exited the building.

The pre-treatment building was designed to control potential fugitive emissions of dust and organic vapours. This was accomplished by the design, installation and operations of a building ventilation system.

The ventilation system comprised of a series of louvred openings along each side of the building, a ductwork system, induced draft fan, particulate control device, activated carbon adsorption system and stack.

A rubber-tyred loader was used to transfer material from the stockpiles in the pre-treatment area to the pre-treatment building. The transfer of material from the covered stockpiles to the building commenced once the treatment building had been established on-site in Stage 1.

Within the pre-treatment building a loader was used to load a vibrating 'powerscreen' used to remove oversized debris unsuitable to be fed into the thermal treatment plant. Also, a rubber-tyred loader was used to move materials, undertake blending of materials and addition of lime if required and load the feed hopper of the thermal treatment plant.

Thermal Treatment Plant

Category 1 material was treated using an indirect thermal desorption plant. All materials were fed into the indirect thermal desorption plant from within the building to ensure that contaminated dusts and odours were contained. Treated materials were then stockpiled in the post-treatment storage area outside the building.

The indirect thermal desorption plant operated 24 hours a day, seven days a week. The average rate of treatment through the thermal desorption plant was approximately 15 tonnes per hour with a maximum rate of approximately 20 tonnes per hour.

A schematic process flow diagram for the indirect thermal desorption plant is shown in Figure 4.

The indirect thermal desorption plant comprised the following process sub-systems:

- The materials feed system;
- An indirect desorption chamber to remove contaminants from feed soil;
- A gas treatment system comprised of a baghouse and vapour treatment system to filter contaminants from the vapour stream;
- A treated materials handling system; and
- A liquids treatment/separation system to collect and treat contaminants from the gas treatment liquid stream.

The indirect thermal desorption process produced treated soil and a concentrated organic liquid (condensate) containing the desorbed contaminants.

Treatment of the condensate from the ITD process was conducted by BCD Technologies (BCDT), utilising the base catalysed dechlorination (BCD) and plasma arc plants at their Narangba facility in Queensland.

The containerised condensate was transported to Queensland by road at the rate of approximately one semitrailer each month.

Reclassification and Post-treatment Storage

A post-treatment material storage area was located adjacent to the thermal treatment plant. Treated material outputs from the plant were transferred to the storage area via a radial conveyor (stacker). Treated materials then underwent validation sampling and reclassification. This determined whether the process has been effective and whether or not the materials were ready for reinstatement on-site.

Materials that were treated to an acceptable level were transported to suitable areas for reinstatement and compaction as part of the backfilling process. Materials that required further treatment were transported back to the pre-treatment building and reprocessed through the thermal treatment plant.

Final Landform

After stockpiled material has been deemed to meet the site soil remediation criteria, it was hauled to its backfill location, spread and compacted. Equipment used for the relocation of stockpiled material comprised rubber-tyred loaders or excavators for loading, a variety of articulated dump trucks (up to 40 tonnes) and bulldozers and compactors.

The basement levels for the proposed residential development were incorporated into the final landforms for the remediated site. Figure 5 depicts the finished surface levels and land use locations.

3.3 Remediation Criteria by Landuse

A site-specific risk-based asessment, which considered both human health and environmental aspects, was utilised to derive soil remediation criteria for the site. The criteria are applicable only to the intended redevelopment of the site, and have been approved by the EPA and an EPA accredited site auditor. The soil remediation criteria are presented in Appendix A.

Appendix B presents the exposure scenarios used in the derivation of the soil remediation criteria for each landuse scenario.

3.4 Permitted Landuse

Figure 6 details the intended land use areas of the site, that being high density residential with basement car park, open space and roadways.

3.5 Validation Process

The site has been validated to the designated future land uses. The overall goal of the site validation was:

- The 95% UCL of the arithmetic average concentration for soils to be below the relevant remediation criteria;
- No soil sample analytical result to be more than 250% of the relevant remediation criteria; and
- To verify the assumptions used in the groundwater model.

This was achieved by:

- Soil sampling of excavated areas, previously remediated areas, material reused onsite (including material treated by the indirect thermal desorption plant) and material imported onsite; and
- Testing of the reinstated materials for compaction ratio, permeability and total organic carbon content.

3.5.1 Open Space

Validation samples were collected at a rate of one per 20m square grid in natural strata that underlay the open space areas. The grid origin was selected at random. Samples were collected from a depth interval of 0 to 100 mm. In addition, materials used to reinstate the open space areas were sampled at a rate of one per $200m^3$ for materials not requiring thermal treatment and one per $500m^3$ for materials subject to thermal treatment.

3.5.2 High Density Residential with Basement Car Park

Validation samples were collected at a rate of one per 15m square grid in natural strata underlying areas designated for high density residential with basement car park use. The grid origin was selected at random. Samples were collected from a depth interval of 0 to 100 mm. In addition, materials used to reinstate the high density residential with basement car park areas were sampled at a rate of one per $200m^3$ for materials not requiring thermal treatment and one per $500m^3$ for materials subject to thermal treatment.

3.5.3 Roadways

Validation samples were collected at a rate of one per 20m square grid in natural strata underlying roadways. The grid origin was selected at random. Samples were collected from a depth interval of 0 to 100 mm. In addition, materials used to reinstate the roadway areas were sampled at a rate of one per 200m^3 for materials not requiring thermal treatment and one per 500m^3 for materials subject to thermal treatment.

3.6 Configuration of the Subsurface

3.6.1 Open Space

Foreshore (less than 40m from Homebush Bay)

In the foreshore area, the subsurface comprises 0.5m of material deemed by the EPA to satisfy its requirements for Virgin Excavated Natural Material (VENM), overlying 0.5m of material classified as meeting the Open Space 0~1m criteria overlying up to 4m of material classified as meeting the Open Space 1~5m criteria. In some locations material classified as meeting the Open Space >5m criteria will occur at depths greater than 5m. All materials within the foreshore area must also comply with the 40m Foreshore criteria.

Balance of Open Space

The subsurface of the open space areas comprise 0.5m of capping material which has been validated to the Maintenance Worker and 0~1m Open Space criteria overlying 0.5m of material classified as meeting the Open Space 0~1m criteria overlying up to 4m of material classified as meeting Open Space 1~5m criteria. In some locations material which is classified as meeting the >5m Open Space soil criteria occurs at depths greater than 5m.

3.6.2 High Density Residential with Basement Car Park Subsurface

Foreshore (less than 40m from Homebush Bay)

In the foreshore area, the subsurface of the high density residential areas with basement car park comprise 0.5m of capping material deemed by the EPA to satisfy its requirements for Virgin Excavated Natural Material (VENM), with the material below this classified as being acceptable for Building with Basement Car Park criteria. All materials within the foreshore area must also comply with the 40m Foreshore criteria.

Balance of High Density Residential with Basement Car Park

The subsurface of the high density residential areas with basement car park comprise 0.5m of capping material validated to the Maintenance Worker criteria, with the material below this classified as being acceptable for Building with Basement Car Park criteria.

3.6.3 Roadways Subsurface

Foreshore (less than 40m from Homebush Bay)

In the foreshore area, the areas designated for roadways comprise 0.5m of capping material deemed by the EPA to satisfy its requirements for Virgin Excavated Natural Material (VENM), overlying 0.5m of material classified as meeting the Maintenance Worker and Open Space 0~1m criteria, with the material from 1~5m below the final surface level validated as meeting Open Space 1~5m criteria and material at depths greater than 5m validated as meeting the >5m Open Space soil criteria. All materials within the foreshore area must also comply with the 40m Foreshore criteria.

Balance of Roadways

Areas designated for roadways comprise 1.0m of capping of material validated to the Maintenance Worker and Open Space 0~1m criteria, with the material from 1~5m below the final surface level validated as meeting Open Space 1~5m criteria and material at depths greater than 5m validated as meeting the >5m Open Space soil criteria.

4 Nature and Occurrence of Contamination

This section describes the location, type and concentration of the chemicals present in the site soils. Details are also provided regarding the potential hazard posed by the impacted soils at the site, and relevant exposure pathways.

4.1 Occurrence of Contaminated Material

[Summary data tables will be inserted below to document the chemical characteristics of the site soils]

Table 4.1 details the analytical results of the validation samples collected from the open space areas. Sample locations are illustrated on Figure 7.

Table 4.2 details the analytical results of the validation samples collected from the high density residential with basement car park areas. Sample locations are illustrated on Figure 8.

Table 4.3 details the analytical results of the validation samples collected from the roadway areas. Sample locations are illustrated on Figure 9.

4.2 Nature of Site Contaminants

Table 4.4 provides general information on the toxicity of the chemicals present at the site.

Table 4.4 Overview of chemical characteristics

Group Name	Chemical / Compound Name	General Toxicity Information
Organics and Semi-Volatile Organic Compounds	Dioxin and Furans (Polychlorinated dibenzo dioxins (PCDDs), Polychlorinated dibenzo furans (PCDFs), Polychlorinated biphenyls (PCBs), 2,3,7,8 Tetra-chlorodibenzo-p-dioxin (2,3,7,8-TCDD).	These compounds are considered carcinogenic and cause a variety of symptoms including chloracne, genotoxicity, weakened immune system, injury to the liver, miscarriage, lowered sperm count, birth deformalities, headache, nervousness, dementia, irritability, depression, loss of sleep.
	Phenols, cresols, chlorophenols, analine and derivatives Chlorobenzenes Pyridine Methyl Ethyl Ketone (MEK) Nitrobenzene	Skin, nose throat and eye irritant. Can cause skin burns. Analine is a suspected carcinogen. Unconsciousness, cyanosis, muscle spasms Eye & Skin Irritant, Dizziness Dermatitis Methemoglobinemia

Group Name	Chemical / Compound Name	General Toxicity Information
Semi-Volatile Organic Compounds	Polycyclic aromatic hydrocarbons (PAH's)	Some PAH's are carcinogenics and can cause immunosuppression, dermatitis and other skin disorders.
Other Organics	Organo-chloro Pesticides Napthalene Bisphenol 'A'	CNS effects, headaches, nausea Haemolytic anaemia Eye and skin irritant
Petroleum Hydrocarbons	Chlorinated Benzenes, Benzene Toluene Ethylbenzene Xylene Aliphatic Hydrocarbons	Established and suspected human carcinogens, central nervous system depressants, skin, nasal and eye irritant, unconsciousness, muscle spasms, liver and kidney damage, headaches.
Metals and Cyanide	Copper Lead Zinc Chromium Nickel Cadmium Arsenic Cyanide	Not generally considered toxic Reproductive and central nervous system hazard. Throat dryness, cough, weakness, chills Skin and respiratory system irritant, CrIV considered to be a carcinogen May cause dermatitis, nausea, vomiting May cause vomiting, abdominal pain, anaemia, diarrhoea May cause irritation of gastrointestinal tract, nausea, vomiting, diarrhoea, liver and kidney damage High level exposure harms the brain and heart and may cause coma and death.
Other	Asbestos	Known to cause asbestosis from exposure which may lead to mesothelioma.

This information is not intended to be a comprehensive review of such factors. It is the responsibility of any party responsible for handling or otherwise disturbing site soils to prepare a health and safety plan incorporating specific information on:

- Hazards associated with site contaminants;
- Nature of the work being undertaken; and

- Measures required to be adopted to prevent exposure to these chemicals.

4.3 Exposure Pathways

4.3.1 Intrusive Activities

Workers involved in disturbing the subsurface of the site could be exposed to the chemicals by:

- Dermal: Direct contact though the skin;
- Inhalation: Respiration of dust/vapours generated from the fill material/groundwater;
- Ingestion of fill materials through poor hygiene practices; and
- Possible secondary exposure from contaminated equipment and clothing.

Planning of intrusive works and implementation of appropriate health and safety measures will minimise the potential for worker (and public) contact with contaminated materials through the above listed pathways. Recommendations for health and safety planning are provided in Section 5.

4.3.2 Passive Activities

Future users of the site, including residents (children & adults), workers, visitors and trespassers undertaking passive activities could be exposed to the chemicals by:

- Dermal: Direct contact though the skin from contact with soils;
- Inhalation: Respiration of dust/vapours generated from the fill material/groundwater; and
- Ingestion of fill materials through poor hygiene practices.

Measures are required to minimise the potential for users of the site undertaking passive activities to contact with contaminated materials through the above listed pathways. As a minimum the following measures are required:

- Car park air ventilation must comply with AS1668.2-2002;
- Open space areas (including roadways) shall include a surface cover (ie. bitumen or topsoil) which will prevent direct contact by users undertaking passive activities with the remediated soils.

4.4 Acid Sulphate Soils

Potential Acid Sulphate Soils (PASS) are known to exist at the site. While PASS are unlikely to present a risk to human health, they have the potential to adversely effect the environment and therefore require appropriate management if disturbed. Recommendations for PASS management are provided in Section 5.

5 Intrusive Site Works Management

5.1 Introduction

Where disturbance of the site soils is proposed, certain restrictions will apply. This section provides guidance on the processes which should be followed if intrusive works are proposed.

5.2 Application and Approval Process

Any party proposing to undertake intrusive works must consult with and satisfy the requirements of the NSW EPA and an EPA accredited Site Auditor prior to commencement of any activity that disturbs the subsurface of the site. It is recommended that any proposal to disturb the subsurface be accompanied by an application addressing the following:

- Applicants details;
- A description of the proposed works (location, depth, length);
- Types of equipment proposed to be used;
- Assessment of contaminated soils which will be encountered;
- Specific health and safety plan for the proposed works;
- Site specific environmental protection plans for the works including air, water and noise management plans;
- Contaminated materials management plan;
- PASS management plan; and
- Method of reinstatement and potential disposal/storage of impacted soils excavated.

5.3 Excavation and material handling protocols

5.3.1 Earthworks

During excavation works, care should be taken to separate differently classified materials from each other and from the surrounding soils. Excavated/disturbed materials must be replaced in the order/depth that they were removed and the surface level maintained and restored upon reinstatement.

Excess spoil generated that cannot be reinstated to the original excavation area (or at another suitable location) must be classified and assessed for off-site disposal as per the NSW EPA's *Environmental Guidelines: Assessment, Classification and management of Liquid and Non-Liquid Wastes* waste (1999).

5.3.2 Erosion and Sedimentation Controls

To minimise the potential of contaminants migrating into Homebush Bay or surrounding areas, appropriately installed siltation controls should be provided and maintained.

Intrusive works should be developed to prevent surface water originating in surrounding areas from being contaminated. Surface water runoff should be controlled by intercepting and redirecting runoff in a controlled manner by appropriate means including, but not limited to, the use of temporary bunds, diversion drains, ditches, straw bales and silt fences. The runoff controls should be installed in accordance with Department of Land & Water Conservation Guidelines and regulatory requirements. The work may include the construction of stormwater retention basins, covers over stormwater pits, bunding, silt fences, straw bale barriers, and the use of oil absorbent products.

5.3.3 Air Quality Management

A detailed air quality management plan should be prepared prior to excavation/disturbance of the soils on-site and implemented for the duration of the works. The air quality management plan should include consideration of the following:

- Monitoring procedures for gaseous and particulate emissions from the works;
- Pro-active and reactive management and response mechanisms for particulates, odour and gaseous emissions;
- Procedures and processes for monitoring ambient air quality impacts including (as appropriate) high volume air samplers, dust deposition gauges, olfactory observations and sampling pumps fitted with reactive tubes targeted to volatile organic compounds, including chlorinated compounds;
- Provisions for review of air monitoring data as required;
- Complaints management procedures in the event that air quality complaints are received;
- Procedures for the minimisation of gaseous and particulate emissions from the works; and
- A contingency plan should an incident or other initiating factor lead to elevated air quality impacts, whether above normal operating conditions or environmental performance goals.

5.3.4 Water Management

A detailed water management plan should be prepared prior to excavation/disturbance of the soils on-site and implemented for the duration of the works. The water management plan should include consideration of the following:

- Methods to avoid discharges to ground and / or ambient waters including methods to minimise the volume of contaminated water generated;
- Procedures for separating “clean” water from any contaminated areas;
- Details of water management measures to be implemented for clean and dirty waters;
- Calculation of a water balance for all waters generated on-site including potential volumes of groundwater and stormwater for treatment onsite or offsite, proposed discharges, recycling or reuse;

- Details of remedial actions to be taken by the applicant and site operators in response to an exceedance of the ambient water management controls, including but not limited to:
  - Use of fences/curtains;
  - Contingency actions for flood, heavy rainfall and storm surges into the work areas; and
  - Contingency actions for failure of sediment controls.
- Procedures for reviewing and updating the water management plan as works progress.

5.3.5 Noise Management

A detailed noise management plan should be prepared prior to excavation/disturbance of the site and implemented for the duration of the works. The noise management plan should include consideration of the following:

- Procedures to ensure that all reasonable noise mitigation measures are applied to the works;
- Identification of the noise sources/activities that will be carried out during the works;
- Assessment of the works noise impacts against the construction noise goals;
- Details of overall management methods and procedures that will be implemented to control noise from the works;
- Noise monitoring, reporting and response procedures;
- Internal compliance audits of all plant and equipment;
- Works timetabling to minimise noise impacts; and
- Procedures for notifying residents of work activities likely to affect their noise amenity.

5.3.6 Equipment Control Measures

On account of the presence of contaminated materials at the site, the following should be considered to control the movement of vehicles from work areas:

- All surfaces carrying vehicular traffic should be kept free of contaminated material;
- All trucks transporting solid materials should be securely and completely covered immediately after loading the material, to prevent wind blown emissions and spillage. Such covering should be maintained until immediately before unloading the trucks;
- All truck tailgates should be securely fixed prior to loading and immediately after unloading solid material;
- Trucks or equipment should only move within designated transportation corridors. No trucks or equipment carrying contaminated materials should be allowed to move across remediated or clean areas except across designated transportation corridors; and
- All vehicles transporting materials should be operated in a manner aso as to prevent any loss of materials during loading, transport and unloading activities.

The following requirements should be considered in relation to equipment cleaning:

- All equipment that comes in contact with any contaminated material should be washed and cleaned before its removal from the site;
- Equipment working within an excavation area containing contaminated soils may be washed inside the area so that any wash water remains within the excavation. Wash waters may be allowed to naturally evaporate or be removed from the excavation along with other ponded water;
- Subject to the scope of works, a dedicated wash facility may need to be installed for the effective cleaning of equipment prior to leaving the site. All equipment that has come in contact with contaminated materials should be cleaned prior to leaving the site; and
- All vehicles leaving the site should have clean wheels and underbodies. A high-pressure washer may be used to effectively clean all plant prior to leaving the site.

5.3.7 Contaminated Soil Management

A detailed contaminated soil management plan should be prepared prior to excavation/disturbance of the site and implemented for the duration of the works. The contaminated soil management plan should include consideration of the following:

- Procedures for testing and classification of excavated/disturbed impacted materials;
- Procedures and processes for the management of excavated materials;
- Provision for the management of excavated materials during all stages of the works, including excavation, transport, storage and disposal/reinstatement;
- Details of measures to be implemented to minimise the loss of chemicals of concern to the environment by volatilisation, dust or leachate generation and other significant emission pathways that may occur as result of intrusive activities on the site;
- Management systems, procedures, structures and equipment to be applied to ensure best environmental practice for all contaminated materials disturbance and handling activities on the site, including but not limited to:
    - Excavation and related activities;
    - Transport of materials;
    - Storage and handling of excavated materials; and
    - Reinstatement of materials.

5.3.8 Disposal of Excess Spoil

Spoil that is not returned to its original location (depth and area) must be appropriately managed. This may entail assessment and off-site disposal to a licenced landfill facility. If the material is to be disposed to landfill, the process should be conducted in accordance with the NSW EPA's *Environmental Guidelines: Assessment, Classification and management of Liquid and Non-Liquid Wastes* (1999) (or other relevant EPA requirements) and will involve (at a minimum) analytical testing for the chemicals of concern. Provisions for temporary storage of the excess spoil in an environmentally responsible manner prior to disposal should be detailed in any application for excavation on-site. This should include measures such as:

- Placement of material on a sealed or plastic lined surface;
- Construction of sediment retention features around stockpiled materials;
- Vapour and odour suppression;
- Dust suppression; and
- A monitoring program to ensure the effectiveness of these storage measures.

5.3.9 Acid sulphate soils

Should disturbance of any PASS material be anticipated an Acid Sulphate Management Plan should be developed for the management of the PASS. Guidance for the development of an Acid Sulphate Soil Management Plan is provided in the *Acid Sulphate Soil Manual* (Acid Sulphate Soil Management Advisory Committee, 1998).

5.4 Record Keeping Requirements

At a minimum, the following documentary records should be maintained:

- Daily logs documenting the quantities of material excavated, the amount reinstated and the amount disposed of from the site to landfill. This should be noted along with the progress of the excavation/disturbance works;
- Receipts from the licensed facility to which the spoil has been sent;
- Soil analytical results including the samples origin;
- All environmental monitoring results (air, noise, water);
- A copy of the complaints register (if applicable), including details of all complaints and actions taken;
- Survey reports for each area of work at the completion of works, documenting that the final surface levels for each area of work have not been altered from the post remediation final surface levels without written approval from the EPA. This clause does not prohibit the installation of additional suitably classified material on top of the post remediation final surface levels.

5.5 Health and Safety Planning

Prior to commencement of any intrusive activity an Occupational Health and Safety Plan (OHSP) should be developed. The purpose of the OHSP is to provide all relevant health and safety information for personnel undertaking work at the site.

The information provided by the OHSP should include:

- assignment of responsibilities;
- a discussion of site conditions;
- details of the work;
- an evaluation of on-site and off-site hazards;

- establishment of personnel protection standards and mandatory safety practices and procedures;
- establishment of OHS monitoring protocols;
- training and responsibilities of emergency team members;
- evacuation procedures and emergency drills; and
- provision for contingencies that may arise while operations are being conducted during the project, both on-site and off-site.

5.6 Contingency and Emergency Response Planning

Prior to any works commencing a detailed contingency and emergency response plan should be prepared.

6 Groundwater

6.1 Groundwater Monitoring

[The Site Auditor shall determine if there is a requirement for groundwater monitoring of the site at the conclusion of the remediation works with reference to the pre-remediation groundwater model and the data collected during the remediation works. Should groundwater monitoring be required the scope of the activity will be included here]

6.2 Use and Handling of Groundwater

No use of site groundwater is permitted.

Basements and other subsurface structures should be designed so as to not penetrate the groundwater table. Where this is unavoidable measures should be designed and implemented to prevent the ingress of groundwater into subsurface structures.

Alternatively, drainage structures and equipment should be installed and maintained to recover groundwater encountered in such structures. Once collected, testing will be required to determine contaminant concentrations, and appropriate disposal options in accordance with the NSW EPA's *Environmental Guidelines: Assessment, Classification and management of Liquid and Non-Liquid Wastes* (1999) (or other relevant EPA requirements).

7 Surface Cover Management

As noted earlier the site soils have been placed in layers, each with particular chemical characteristics according to a site specific risk assessment. In order for the exposure scenarios upon which the risk assessment was founded to remain valid, the integrity of these layers (and in particular the surface layers) must be maintained to minimise health and environmental risks. The following controls should be employed at the site as a minimum to ensure the protection of the integrity of the remediated surface:

- Surface water flows must be controlled to prevent erosion and subsequent exposure/transportation of contaminated material;
- All surfaces should be finished and maintained so as to be stable. Suitable finishes include turf, paving or other hard surfaces (concrete/bitumen or similar) and any other finish that ensures erosion of surfaces and direct contact with the remediated surfaces does not occur.

8 Seawall management

The seawall of Homebush Bay forms the western boundary of the site. The seawall was installed as part of the remediation program.

The risk of erosion of contaminated material from the site to the bay along this boundary is considered minimal as long as the integrity of the wall is maintained. Periodic inspections of the sea wall and the timely completion of maintenance works (if required) should be undertaken to ensure sea wall integrity.