Mirvac Projects Pty Ltd

Air Quality Management Plan
'For Construction'

Locomotive Workshop
Australian Technology Park, Eveleigh, NSW

3 December 2018

51142/ 119641 Rev 1

JBS&G Australia Pty Ltd

www.jbsg.com.au

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1. Introduction

JBS&G Australia Pty Ltd (JBS&G) was engaged by Mirvac Projects Pty Ltd (Mirvac, the client) to prepare an Air Quality Management Plan (AQMP) for redevelopment of the Locomotive Workshop building within the Australian Technology Park (ATP) located at 2 Locomotive Street, Eveleigh, NSW 2015 (the Site, as shown on **Figures 1** and **2**). The Site location and layout is shown on **Figures 1** and **2** respectively.

Mirvac has acquired the ownership and redevelopment rights of the Site for adaptive reuse and proposed ongoing commercial land use excluding childcare facilities. Redevelopment works will include reconfiguration and refurbishment of the internal building layout with the heritage foundations and building exterior to be retained. All modern fixtures within the Locomotive Workshop are proposed to be removed to highlight the building architecture and antiquity.

1.1 Purpose

The AQMP is primarily concerned with air quality impacts during the construction works phase and does not specifically address issues associated with any specific remediation works which are addressed in the Remedial Action Plan (RAP) and Occupational Hygiene Management Plan (OHMP) for the broader ATP Site.

As per regulatory requirements, the AQMP shall:

- Be prepared by a suitably qualified and experienced expert in accordance with the EPA's *Approved Methods for Modelling and Assessment of Air Pollution in NSW*;
- Contain relevant environmental criteria to be used in the day-to-day management of dust and volatile organic compounds (VOC), including consideration of any contaminated materials and/or hazardous materials;
- Contain a mission statement;
- Contain dust and VOC/odour management strategies consisting of:
    - Objectives and targets;
    - Risk assessment; and
    - Suppression improvement plan.
- Set out monitoring requirements including assigning responsibilities (for all employees and contractors);
- Contain a communication strategy; and
- Include a performance review system for continued improvements.

The AQMP is required to detail management practices to be implemented for potential airborne contaminants at the Site. The AQMP must also detail the air monitoring program to be undertaken for the project, taking into consideration potential contaminated materials.

The objective of this plan is to prepare a construction phase Air Quality Management Plan (AQMP) in accordance with the consent condition and ensure the health and safety of Site workers, users and the broader community.

2. Condition and Land Use

2.1 Site Identification

This Site is covered by the heritage Locomotive Workshop building, which is currently used for commercial land use purposes, i.e. offices. The Site is located approximately 5 km south of the Sydney CBD, 8 km north of Sydney airport and within 200 m of Redfern Railway Station. The site is legally identified as Lot 4000 in Deposited Plan (DP) 1194309, occupies an area of approximately 2.7 hectares (ha) and is located within the City of Sydney LGA.

The Site is bound to the north by a railway easement, east by Innovation Plaza, south by Locomotive Street and to the west by State Rail Operation Facilities (Large Erecting Shed).

The Site location and layout are shown in **Figures 1** and **2** respectively. Site details are summarised in **Table 2.1**.

Table 2.1 Summary Site Details

Lot Numbers (as shown on **Figure 3**)	Lot 4000 in DP 1194309 (previously Lot13 DP 1136859)
Street Address	Australian Technology Park, 2 Locomotive Street, Eveleigh, NSW, 2015
Site Area	Approximately 2.7 ha
Local Government Authority	City of Sydney
Geographic Coordinates (MGA 56)	Please refer to **Figure 3**
Zoning	SEPP Major Development 2005 under the City of Sydney Local Environment Plan 2012
Previous Land Uses	Locomotive building and repairs
Current Land Uses	Commercial land use
Proposed Developable Land Uses	Adaptive reuse for ongoing commercial land uses

2.2 Site Description

Construction of the Locomotive Workshop commenced in 1887. The Workshop consists of a very large brick building divided into 16 bays running north-south. Each bay was originally used for one or more trades required to repair or manufacture locomotives and their components. Bays 1 to 4, at the east end, contained trades such as blacksmithing and boiler making, while Bays 5 to 15 contained the machining, tooling and assembly areas.

The building is of masonry construction with a concrete floor and metal roof and presents as a two-storey structure. A series of small annexes have been built along the southern side of the building. Internally, the building is supported on a steel frame and metal roof trusses. Items of heritage machinery have been placed on display throughout the bays of the building. Only Bays 1 and 2 at the east end of the building are substantially original, with the remaining bays having been converted to commercial office space, function and exhibition areas in a variety of styles.

2.3 Surrounding Land Uses

The surrounding land uses have been identified as comprising:

- North – The Site is bound to the north by a railway easement and in turn mixed land use comprising heritage (Carriage Works) renewal (commercial land use - art centre, restaurant/bar and markets), residential allotments and the University of Sydney campus facilities;
- East – The Site is bound to the east by Innovation Plaza, the Innovation Centre and Cornwallis Street, across which are mixed land uses comprising residential and commercial allotments;
- South – The Site is bound to the south by Locomotive Street, Lot 12 ATP and the Channel 7 building, which are of commercial use; and

- West – The Site is bound to the west by a railway easement and associated State Rail infrastructure (RailCorp Depot) and the Large Erecting Shed, which are used to commercial / industrial land uses.

2.4 Geology and Soils

Reference to the 1:100 000 Geological Series Sheet for Sydney (DMR 1983[1]) indicates that the Site is largely underlain by Ashfield Shale of the Wianamatta Group and Quaternary sediments, although limited in extent and skeletal in nature. Ashfield Shale, typically comprises black to dark grey shales with laminate.

Based upon the Sydney 1:100,000 Soil Landscape series (DLWC 1989[2]) the Site is located within the Blacktown soil landscape group overlying Ashfield Shale. The landscape is generally characterised by gently undulating rises on Wianamatta Group shales, local relief to 30 m and slopes usually <5%, broad rounded crests and ridges with gently inclined slopes, cleared eucalypt woodland and tall, open forest (dry sclerophyll forest).

Soils are characteristically shallow to moderately deep (<100 cm) hard setting mottled texture contrast soils, red and brown podzolic soils and crests grading to yellow podzolic soils on lower slopes and in drainage lines. Limitations of the Blacktown group include moderately reactive, highly plastic subsoil, low soil fertility and poor soil drainage.

Previous investigations within the broader ATP site, not specifically the Locomotive Workshop Site, have identified fill materials across the entire ATP site with minor exceptions, ranging from a skeletal fill soil profile to 7.6 m in depth. In general, the vertical extent of fill is reported to be greatest within the northern site extent, adjacent the Locomotive Workshop. Fill materials are considered resultant from a combination of Site activity (waste products) and importation of fill materials to establish Site levels.

2.5 Acid Sulfate Soils

Review of the *Acid Sulfate Soil Risk Map for Botany Bay*[3] indicates that the Site is located within an area of '*no known occurrence of Acid Sulfate Soils*'. Acid sulfate soils (ASS) are not known or expected to occur in areas having this classification.

Notwithstanding the aforementioned, previous investigations have reported potential for ASS/potential acid sulfate soils (PASS) associated with the occurrence of Quaternary sediments.

With due consideration to the geological and soil characteristics of the Site (i.e. peat material), in addition to historical information, management of development activities should consider the potential for ASS/PASS if development activities involve excavation of natural soils beneath the water table.

An Acid Sulfate Soil Management Plan (ASSMP) has been prepared for the broader ATP Site.

2.6 Topography

A review of the *1:25,000 Botany Bay Topographic M*ap (9130-3-S) indicates that the Site lies at an elevation of between approximately 10 m and 20 m above Australian Height Datum (AHD). The Site is reported to slope gently to the south west.

The Site is situated within an area of gently undulating rises associated with Ashfield Shale to the north and east and Quaternary sediments to the south. In the vicinity of the Site, regional ground

[1] Sydney 1:100 000 Geological Series Sheet 9130 (Edition 1). Department of Mineral Resources, 1983 (DMR 1983)
[2] 1:100 000 *Sydney Soil Landscapes Map Sheet 9130 Edition 1*, Department of Land and Water Conservation, Published 1989
[3] *Acid Sulfate Soil Risk Map – Botany Bay,* Edition 2, 1997 1:25 000 Ref: 91 30S3. NSW DLWC

levels fall gently toward the south generally toward Shea's Creek, located approximately 600 m to the south east of the Site and Alexandra Canal located approximately 1.4 km to the south of the Site.

2.7 Hydrology

The nearest surface water receptor is the Alexandra Canal, located approximately 1.4 km to the south of the Site. Alexandra Canal flows into the Cooks River, located approximately 4.5 km to the south west of the Site which discharges into Botany Bay approximately 6 km to the south west of the Site.

Existing pavements occupy almost 100% of the Site and as such, rainfall within the Site is anticipated to generally be controlled by the current storm water system and then into the regional storm water system. It is understood that regional storm water flow occurs via below ground infrastructure to the Alexandra Canal.

For any unsealed areas, rainfall is expected to infiltrate the relatively permeable sandy fill soils, with the remainder of rainfall becoming surface water run off toward the Site boundary and then the regional storm water system.

2.8 Hydrogeology

Based on local topography, geology and reported depths to groundwater, groundwater flow is anticipated to be to the south, towards Shea's Creek/Alexandra Canal. Shallow groundwater at the Site is anticipated to occur perched at the base of the fill/sand materials and at the interface with the much less permeable shale/sandstone following rain fall events. Within the underlying bedrock, groundwater is expected to be confined to zones of relatively higher permeability (i.e. faults, fractures and weathered seams of clay and sandy clay within the bedrock) and therefore limited in extent.

Previous assessments within the broader ATP site have identified groundwater at depths of approximately 16.8 m AHD within the northern site extent.

A review of the Botany Groundwater Management Zones map (DNR 2009[4]) indicates that hydrogeologically downgradient areas are located within, Zone 2 of the Botany Sands Aquifer Embargo Area. The DNR indicate that the Embargo Area "*incorporates localities with known or suspected contamination from past industrial activity*". Residents of properties situated within this zone are advised that groundwater use is now banned, especially for drinking water, watering gardens, washing windows and cars, bathing or to fill swimming pools. Industrial users are required to test the bore water at least annually and provide the results to the NSW Department of Primary Industry - Water (DPI) and the Office of Environment and Heritage (NSW OEH).

2.9 Meteorology

A review of average climatic data for the nearest Bureau of Meteorology monitoring location (Sydney Airport AMO[5]) indicates the Site is located within the following meteorological setting:

- Average minimum temperatures vary from 7.2 in July to 19.0 in February;
- Average maximum temperatures vary from 17.0 in July to 26.5 in January;
- The average annual rainfall is approximately 1083 mm with rainfall greater than 1 mm occurring on an average of 96 days per year; and

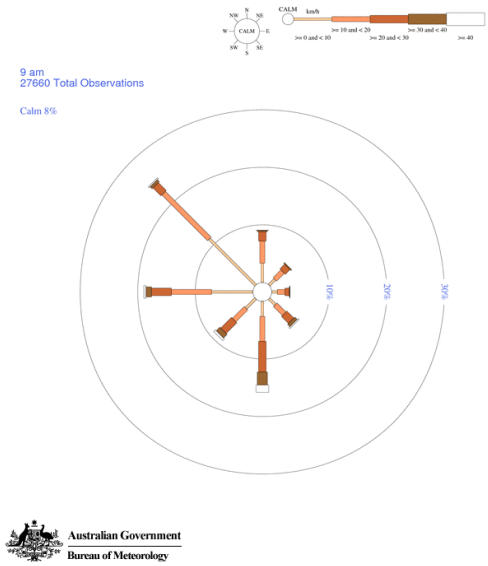
[4] Botany Groundwater Management Zones map, www.water.nsw.gov.au/water-management/water-quality/groundwater/botany-sand-beds-aquifer/Botany-Sands-Aquifer/default.aspx NSW Department of Natural Resources (DNR 2009)

[5] http://www.bom.gov.au/climate/averages/tables/cw_066037.shtml Commonwealth of Australia, 2013 Bureau of Meteorology, Product IDCJCM0028 prepared at 20 October 2015.

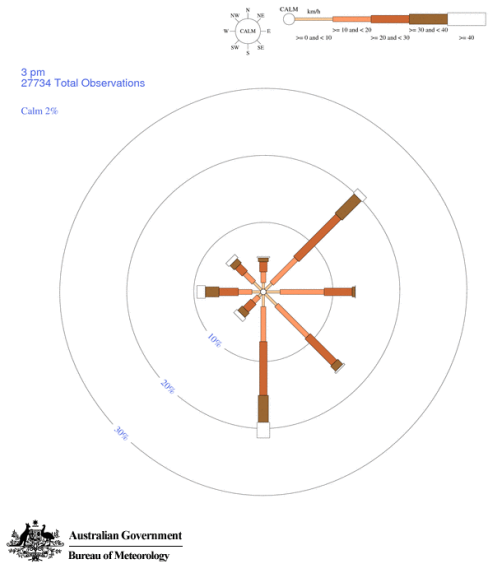
- Monthly rainfall varies from 60 mm in September to 121 mm in June with the wettest periods occurring on average in February, March and June.

2.10 Prevailing Winds

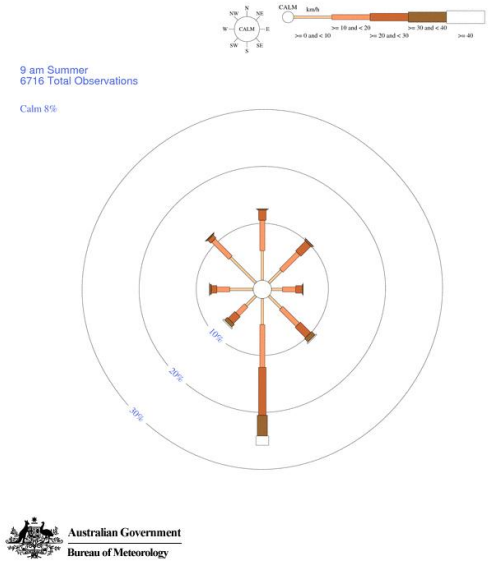
Local meteorological data were collected at the Sydney Airport Automatic Weather Station. Data from 1939 to 2016 have been analysed and annual and seasonal wind roses are presented below.



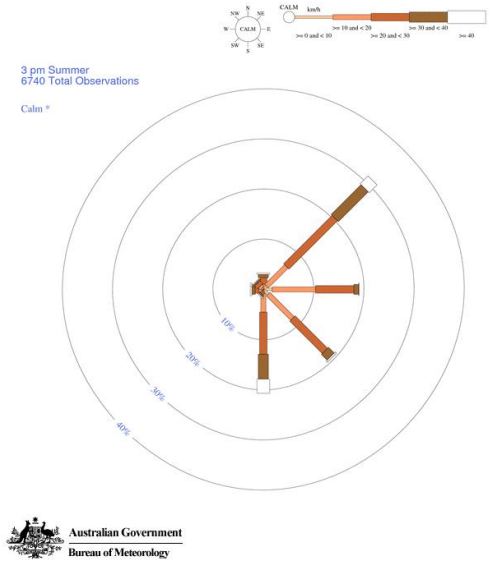
Wind Roses 9am Annual



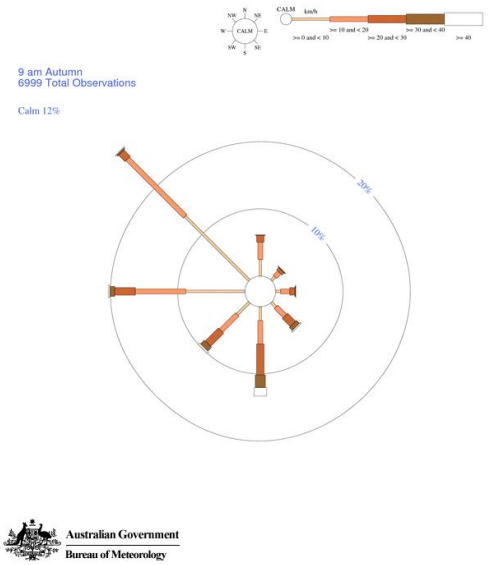
Wind Roses 3pm Annual



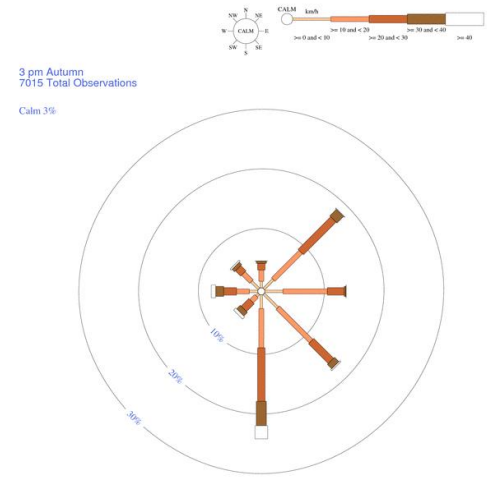
Wind Roses 9am Summer



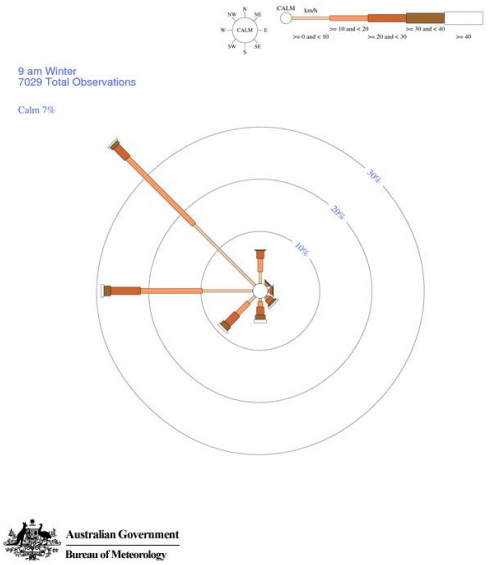
Wind Roses 3pm Summer



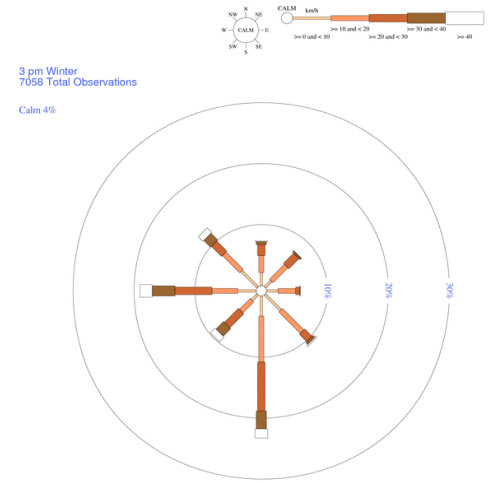
Wind Roses 9am Autumn



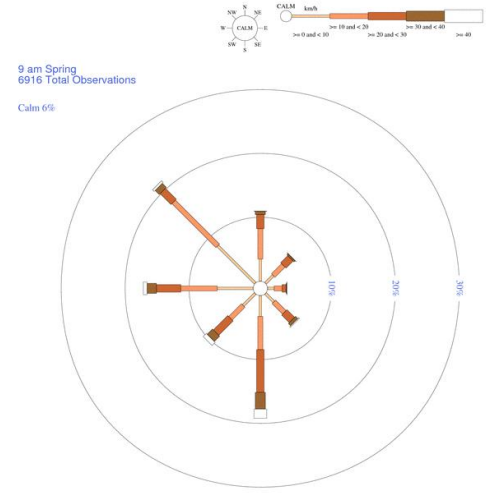
Wind Roses 3pm Autumn



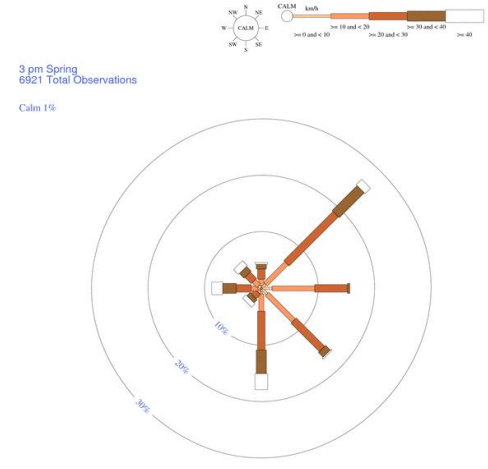
Wind Roses 9am Winter



Wind Roses 3pm Winter



Wind Roses 9am Spring



Wind Roses 3pm Spring

On an annual basis, the most common winds are from the north west and west quadrant, with small percentages to the south in the morning. In the afternoon, common winds are from the north east and southern quadrant, with small percentages to the south east. The patterns are similar in autumn and spring. In summer winds are more mild and from the south in the morning and north east to south quadrant in the afternoon. Wind is the most dominant in the winter and most common from the north west and west quadrant. In the afternoon, common winds are from the southern quadrant and noticeably subdued.

3. Contamination Status

3.1 Summary of Known Fill/Soil Contamination Status

Although the broader ATP Site has been the subject of over one hundred contamination investigations over a period of 22 years, as the building footprint covers almost the entire Site, very limited testing and characterisation of the soil/fill materials underlying the Locomotive Workshop Site has been completed.

In general, fill materials across the broader ATP site with minor exceptions, range from a skeletal fill soil profile to 7.6 m in depth. Fill materials were noted to comprise gravelly sandy, silty sands, clayey sands, peat with inclusions of railway ballast, glass, ash, metal, ceramic, brick, slag, sedimentary clast and construction rubble. Fill materials across the broader ATP site have been shown to contain elevated concentrations of heavy metals (principally copper, zinc and to a lesser extent lead), semi to non-volatile total petroleum hydrocarbons (TPHs)/total recoverable hydrocarbons (TRH), polycyclic aromatic hydrocarbons (PAHs) (including concentrations of carcinogenic PAH compounds as benzo(a)pyrene TEQ) and, in parts, asbestos.

No significant amounts of volatile contaminants have been detected in fill materials at the ATP.

3.2 Summary of Known Groundwater Impact

Groundwater has been assessed across the entire ATP site and no groundwater remediation is considered to be required.

Identified historical groundwater contamination issues underlying the Site, incorporating but not necessary directly applicable to the ATP site, include:

- Elevated concentrations of heavy metals (principally zinc and copper) in groundwater identified in various parts of ATP site;
- Light non-aqueous phase liquid (LNAPL) historically reported (in the 1990s) within the northern Site extent and to the north west of the ATP site; and
- Dissolved phase concentrations of TRH in groundwater related to the presence of LNAPL and in localised areas likely associated with other TRH sources (e.g., UST(s) and/or historical site activities).

No known LNAPL sources have been reported during recent groundwater sampling events and TRH (and other organics) concentrations have generally been below the laboratory limit of reporting (LOR) or only marginally exceeding the laboratory LOR.

3.3 Summary of Known Soil Vapour Contamination Impact

Sub-slab vapour samples collected from underlying Bays of the Locomotive Workshop have reported trichloroethene (TCE) concentrations ranging between 0.0655 mg/m^3 to 6.167 mg/m^3. Concentrations of tetrachloroethene (PCE) ranging from 0.1667 mg/m^3 to 3.167 mg/m^3 have also been reported beneath the Locomotive Workshop along with other volatile compounds. However, on the basis that previous ambient air quality sampling results were reported below the adopted assessment criteria, no risk from sub-slab vapour conditions to current users of the building has been identified. Ongoing ambient air monitoring is required to demonstrate ongoing commercial land use suitability as part of the Site EMP.

Additional soil vapour assessment throughout the Locomotive Workshop (JBS&G 2017[6]) concurred with the findings of earlier assessments to demonstrate that provided a physical separation remains

[6] Mirvac Projects Pty Ltd, *Soil Vapour Assessment, Locomotive Workshop Building, Australian Technology Park, 2 Locomotive Street, Eveleigh, NSW*. JBS&G Australia Pty Ltd, 23 July 2017, Rev 2, Ref: 51142-109193. (JBS&G 2017)

in place, i.e. concrete slab floor, soil vapour conditions underlying the Locomotive Workshop do not present an unacceptable risk to current / future site users or down gradient receptors. Notwithstanding this, during future site redevelopment works that involve removal of the concrete slab floor and excavations, it is recommended that these works are overseen by an occupational hygienist / environmental consultant and representative air monitoring is undertaken to confirm that construction workers and nearby persons are not subject to adverse vapour related health risks.

4. Sources of Emissions to Air

Construction activities have the potential to generate fugitive dust emissions, particularly during drier conditions. With due consideration to the proposed development the following dust generation activities have been identified:

- Removal and handling of hazardous materials.
- Removal of Site pavements (i.e. exposed surfaces).
- Site excavations and grading activities to reach the required construction basal levels.
- Movement of heavy vehicles/plant on unsealed areas.
- Handling of materials including:
  - Excavation to Stockpile;
  - Excavation to Placement;
  - Import to Placement;
  - Import to Stockpile;
  - Stockpile to Stockpile; and
  - Offsite disposal.
- Wind Erosion.

Development Conditions permit the following hours of operation for remedial/civil works:

- Monday to Friday: 7:30 am to 5:30 pm.
- Saturday: 7:30 am to 3:30 pm.
- Sunday and public holidays: No work permitted.

Dust emissions from sources which are dependent on operation activities would be limited to periods of activity between these hours.

Wind erosion from exposed surfaces could occur outside these times, subject to Site management practices, but would generally be limited to periods of moderate to strong winds (wind speeds greater than ~ 5 m/s) depending on the material properties (i.e. moisture content and threshold friction velocity).

Emissions of fugitives dust from construction activities will comprise of mostly coarse particle size fractions, that is, in the PM_{10} and TSP range. While construction does generate fine particulate (i.e. $PM_{2.5}$ and less) the bulk of these fine particulates are typically derived from combustion sources such as diesel powered plant and equipment.

Emission of carbon monoxide (CO), nitrogen dioxide (NO_2) and sulfur dioxide (SO_2) would also occur from diesel powered plant and equipment on Site and vehicle movement to Site, but anticipated to be minor.

In addition to the above, as discussed in **Section 3.3**, sub-slab vapour samples collected from underlying Bays of the Locomotive Workshop have reported TCE concentrations ranging between 0.0655 mg/m^3 to 6.167 mg/m^3. Concentrations of PCE ranging from 0.1667 mg/m^3 to 3.167 mg/m^3 have also been reported beneath the Locomotive Workshop along with other volatile compounds. However, on the basis that ambient air quality sampling results were reported below the adopted assessment criteria, no current risk from sub-slab vapour conditions has been identified. Ongoing ambient air monitoring is required to demonstrate ongoing commercial land use suitability.

5. Environmental Management Controls

5.1 Dust Management and Mitigation Measures

In accordance with the consent conditions, the following dust mitigation measures are required to be implemented:

- Covering of truck loads during transport.
- Road sweeping, vehicle speed limits, truck washes and rumble grids at Site (or staged sites) exits to avoid tracking of dirt onto public roads.
- Sealing of trafficable areas and areas susceptible to windblown dust, including the use of stockpile covers, application of water via water cart to suppress dust potential etc.
- Cessation of relevant works under adverse meteorological conditions such as high winds.

Consideration of these and other best practice controls will be incorporated into operating procedures to ensure compliance with regulatory criteria. These measures are outlined below.

5.1.1 General

- Under no circumstances should any material be burnt on Site.
- Silt and other materials will be removed from around erosion control structures following any significant rain events to ensure sediment deposits do not become dust sources.

5.1.2 Wheel Generated Dust

- All vehicles on Site shall be confined to a designated route with a speed limit of 10 km/h strictly enforced.
- Material should be, where possible, loaded directly into a truck for off-site disposal rather than excavation, stockpiling and then load out. Where materials have been identified as suitable for beneficial re-use, materials should be excavated and taken to their emplacement location rather than excavation, stockpiling, transport and emplacement. This approach reduces the double handing of materials and potential for dust generation.
- A designated route to works area(s) (i.e. stockpile/materials storage areas, emplacement locations etc.) shall be established. When conditions are dry the use of a water truck (or similar) should be implemented.
- It is recommended that a water truck (or similar) be kept on Site at all times.
- At Site exit points and/or as trucks move onto sealed roads, rumble grids should be installed to remove excess dirt from truck/plant wheels. The rumble grid should be cleaned regularly.
- In the event of dirt being tracked onto pavements, the road will be cleaned prior to the material drying out and becoming a dust source.

5.1.3 Wind Erosion

- Wind erosion from temporary stockpiles can be limited by covering stockpiles when left for a period greater than 24 hours as per the requirements of the Remedial Action Plan (RAP) and sediment and erosion procedures prepared for the Site.
- When conditions are dry and windy, wind erosion from exposed surfaces and stockpiles should be controlled via application of a water spray/mist;
- Finished surfaces should be compacted and care taken not to re-disturbed, to reduce wind erosion.

- Where grounds works are complete, exposed soil surfaces should be sealed and completed with the final hardstand pavement or landscaping cover for future management.
- Installation of water cart spray or sprinkler system for the stockpile area which can be activated during adverse weather.

5.1.4 Excavation and Materials Handling

- During the works, if necessary, excavation areas will be wetted down using a water spray to minimise the potential for dust to be generated. Care should be taken to not over-wet excavations and/or stockpiles such that excess runoff is generated.
- Any excess soil/fill excavated during the works must be securely stockpiled on a sealed surface (e.g. concrete pad) or on plastic sheeting away from all storm water infrastructure. Stockpiles must be placed in a secure location on Site and covered with plastic sheeting if they are to remain for more than 24 hours, unless specifically advised otherwise by the consultant.
- Should excess soils be stockpiled on Site, sediment control measures (e.g. silt fences, hay bales) must be installed to protect run off from stockpiled/exposed soil materials into stormwater infrastructure.
- Material should be, where possible, loaded directly into a truck for off-site disposal rather than excavation, stockpiling and then load out. Where materials have been tested, characterised and identified as suitable for beneficial re-use in the broader ATP site, materials should be excavated and taken to their emplacement location rather than excavation, stockpiling, transport and emplacement. This approach reduces the double handing of materials and potential for dust generation.
- When dust cannot be effectively controlled using application of a water spay/mist (or similar), consideration should be given to modifying the works by limiting the use of significant dust generating equipment (i.e. dozers, loading/unloading fill) during periods of dry and windy conditions.
- If any excess excavated soil/fill material is to be disposed off-site, it should be classified in accordance with EPA guidelines (NSW EPA 2014) by the environmental consultant. Waste must be managed in accordance with the provisions of the *Protection of the Environment (Waste) Regulation 2014*.

5.2 Vehicle Exhaust Emissions Management and Mitigation Measures

- Trucks and construction plant entering the Site should be well maintained in accordance with the manufacturer's specifications to comply with relevant regulations. Vehicles which are identified to be or considered to be defective (i.e. high exhaust levels) should be stood down for maintenance.
- Unnecessary idling for delivery trucks and plant should be avoided with engines turned off during periods of inactivity.
- Delivery of materials should be planned and coordinated to avoid congestion and excessive truck queuing/idling.
- The number of trucks and distance they are required to travel should be controlled and reduced where possible.

5.3 Volatile Impacted Fill Management and Mitigation Measures

With regards to excavations during redevelopment of the Locomotive Workshop, it is recommended that representative air monitoring is conducted using a Photo Ionisation Detector (PID). The Unexpected Finds Protocol (UFP) in place at the site and covered in the site induction, will trigger workers to stop work and follow protocol should they encounter any olfactory odours indicative of potential vapours. The area will be isolated and works will cease until assessed and cleared by the environmental consultant / hygienist. Representative occupational sampling in accordance with **Section 6.4.7** is to be undertaken as required to demonstrate that excavations and other subsurface works undertaken during redevelopment of the Locomotive Workshop do not constitute an elevated vapour risk to nearby workers and other surrounding personnel.

5.4 Ambient Air

During Site establishment, in addition to the above management controls, ambient air thresholds will be recorded using procedures outlined in **Section 6**, providing background concentrations and enabling an assessment of Site contribution during Site development activities.

6. Monitoring

6.1 Exposure Pathways

Potential exposures to Site contaminants may occur by inhalation (dusts and/or vapours), oral and dermal exposure pathways. For Site personnel, oral and dermal exposure pathways are anticipated to be substantially mitigated by standard construction Site personal protective equipment requirements (i.e. clothing) and anticipated worker hygiene on construction Sites.

The most sensitive potential exposure pathway is considered to be inhalation of Site constituents. It is considered that where potential inhalation/airborne exposures are able to be controlled, that potential exposures via other exposure pathways will also be acceptable.

6.2 Air Monitoring

Potential airborne pollutants that will be managed during the works include:

- General dust, Particulate Matter less than 10 microns (PM_{10}) from general excavations, earthworks and construction activities;
- VOCs, including TCE and PCE (chlorinated ethenes) emissions from handling and excavation of impacted soils;
- Heavy metals and PAH emissions during the remediation of soils impacted with these contaminants;
- Respirable quartz / crystalline silica from concrete cutting, jackhammering and general handling of earthen materials on the Site, generally consisting of soils;
- Asbestos fibres from the storage and handling of soils impacted with free asbestos fibres/friable asbestos if identified; and
- Lead from the removal and remediation of lead based paints and lead impacted dusts within the Locomotive Workshop.

The air monitoring program to address each of these potential airborne hazards is summarised in the following sections.

6.3 Monitoring Plan

The sampling/monitoring requirements for works related to soil disturbance work are generally summarised as:

- Representative monitoring of the works area (with a particular focus on areas where impacted materials are most likely to be encountered) will be undertaken where possible using real-time monitoring methods (PID and DustTrak);
- Where DustTrak readings exceed 0.05 mg/m^3 (measured as an average over a minimum sampling time), additional measures may need to be considered to minimise dust generation; and
- Occupational monitoring to be implemented during the removal of hazardous materials and representative contaminated soils, as deemed necessary, to ensure worker health is not compromised. Occupational sampling results are compared against the relevant workplace exposure standards (WES).

6.4 Sampling Methods

6.4.1 Asbestos

Air monitoring for airborne asbestos will be undertaken in accordance with the *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres* [NOHSC: 3003 (2005)]. Analysis of asbestos fibre samples will be then performed by a NATA Accredited laboratory.

Personal (Exposure) Air Monitoring

Asbestos exposure monitoring (breathing zone sampling) can be undertaken to assist in the quantification of asbestos risk assessment of the receptor groups which include but are not limited to Mirvac staff and appointed subcontractors. The personal air monitoring can be undertaken based on the work shift duration, staff work activities and tasks.

Static (Control) Air Monitoring

Static air monitoring is undertaken throughout the site in locations mainly where staff and contractors occupy certain work zones, carry out specific work activities/tasks as well as perimeter sampling of the site. Static monitors do not provide an indication of worker exposure but rather an indication of effectiveness of control measures in place to control dust levels. Static boundary monitoring also provides an indication of potential off site impacts. Static monitoring will typically be undertaken on the site and/or remediation work area boundaries, decontamination areas, lunch rooms, excavators disturbing impacted soils, etc.

Table 6.1 below is an explanation of the asbestos air control limits for the site.

Table 6.1: Asbestos Action Levels

Action level	Control	Action
Less than 0.01 fibres/ml	No new control measures are necessary	Continue with control measures.
At 0.01 fibres/ml or more than 0.01 fibres/ml but less than or equal to 0.02 fibres/ml	Review, Investigate and Implement	Review control measures, Investigate the cause, Implement controls to eliminate or minimise exposure and prevent further release.
More than 0.02 fibres/ml	1. Stop removal work	Stop removal work.
	2. Notify regulator	Notify the relevant regulator by phone followed by fax or written statement that work has ceased and the results of the air monitoring.
	3. Investigate the cause	Conduct a thorough visual inspection of the enclosure/controls (if used) and associated equipment in consultation with all workers involved with the removal work.
	4. Implement controls to eliminate or minimise exposure and prevent further release	Extend the isolated/barricaded area around the removal area/enclosure as far as reasonably practicable (until fibre levels are at or below 0.01 fibres/ml). Where relevant wet wipe and vacuum the surrounding area, seal any identified leaks and smoke test the enclosure until it is satisfactorily sealed.
	5. Do not recommence removal work until further air monitoring is conducted	Do not recommence until fibre levels are at or below 0.01 fibres/ml.

6.4.2 Dust – Particulate Matter (PM10)

General dust monitoring will be undertaken at the site during excavation works to ensure that dust levels generated during the excavation process remain at an acceptable level. This dust monitoring will be undertaken using a 'DustTrak II', a light scattering, laser photometer that calculates real time results for concentrations of dust in the atmosphere at the time of sampling.

6.4.3 Real Time Monitoring - Lead and PAHs

A Human Health Risk Assessment (HHRA) for the ATP site has been prepared by JBS&G (2016a[7]). Based on the outcomes of the HHRA, real-time monitoring criteria for airborne site contaminant concentrations have been derived (JBS&G 2016b[8]) included as **Appendix A**.

In summary, the assessment uses relationships between the following to calculate real-time criteria for the various site contaminants

- Site soil type and potential airborne levels of respirable particulates (<10µm dia.) generated during the earthworks;
- Maximum contaminant concentration in soil data acquired through previous site environmental investigations;
- The process of physical attachment / binding of contaminants to soil particles; and
- Mean airborne particle diameter, density and surface area.

The assessment identified that the relative ratio of surface area to mass for airborne respirable particulates as compared to site soil particles is 17.6. This indicates that contaminants would be present at concentrations approximately 17.6 times higher within airborne respirable particulates, as relative to laboratory reported soil concentrations.

The derivation assessment concluded that an occupational real-time respirable particulate monitoring threshold of 500 µg/m³ (0.5 mg/m³), measured using a calibrated DustTrak II Aerosol Monitor (PM_{10}), will be protective of potential site worker inhalation exposures to soil borne contaminants.

This criterion has considered:

- The maximum concentration of each contaminant as reported in soils on any portion of the site;
- The potential increased concentration of each contaminant as present in respirable particulates as compared to soil samples assessed to determine soil borne levels as estimated at 17.6;
- Assumption that the particulates being generated solely from the areas of the soils with the maximum levels of contamination present and causing a level of airborne respirable particulates of 0.5 mg/m^3 solely attributable to those soils (i.e. no background sources of dust present which is a highly conservative assumption); and
- The occupational criterion as specific to each contaminant.

Notwithstanding the above, a site criteria for real-time (PM_{10}) dust monitoring of 50 µg/m³ (0.05 mg/m³) has been established as a Tier 1 action level for dust control during earthworks at the site [*National Environment Protection (Ambient Air Quality) Measure, 2016 Amendment*].

This approach has a real-time monitoring advantage as opposed to conventional occupational sampling where sampling results can often take several days to be received, which does not facilitate a prompt response to minimise any potential exposures. Nonetheless, it is acknowledged that representative occupational sampling for these aerosol contaminants, accompanied with laboratory analysis is also required to reinforce the calculated action levels.

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[7] *Human Health Risk Assessment, 2 Locomotive Street Eveleigh, Rev D,* JBS&G, 29 Jan 2016 (JBS&G 2016a)

[8] *Derivation of Real-Time Occupational Monitoring Criteria, Proposed Occupational Monitoring during Site Remediation and Earthworks, ATP, Eveleigh*, JBS&G, 28 November 2016 (JBS&G 2016b)

6.4.4 Heavy Metals – Lead, Copper and Zinc

Personal and control monitoring of heavy metals within dust will be conducted for various site tasks, areas and conditions. This may be undertaken in representative and/or worst case scenario situations to demonstrate that the level of heavy metals in air, predominantly lead, do not present an elevated health risk to workers or the surrounding public. This method is to be used during lead removal and remediation works within the Locomotive Workshop.

The sampling and analysis for metals in dust would be performed in accordance with *Australian Standard (AS) 3640-2009 "Workplace Atmospheres –Method for sampling and gravimetric determination of inhalable dusts*". The sample collection will be performed using portable sampling pumps fitted with IOM sampling heads containing 25mm PVC membrane filters (SKC) and generally sampled at a flow rate of 2.0L/min.

The filters will then be sent to a NATA Accredited laboratory for metals analysis by (but not limited to) mineral acid digestion and Inductively Coupled Plasma – Atomic Emission Spectrometry (ICP-AES/MS and/or CV/AAS). All measurements will be expressed as a dust concentration in milligrams per cubic metre of air sampled i.e. mg/m^3.

6.4.5 PAHs

Personal and control monitoring of PAHs will be conducted as per *NIOSH Method No. 5506 (National Institute of Occupational Safety and Health, US Centre for Disease Control, 1998).* Personal exposure sampling is conducted within the workers breathing zone using portable constant flow air sampling pumps connected to a filter and/or a XAD-7 sorbent tube or similar. This may be undertaken in representative and/or worst case scenario situations to demonstrate that the concentrations of PAHs in air, do not present an elevated health risk to workers or the surrounding public. The flow rate will be set to 2L/min.

The calibrated pumps are flow tested prior to sampling commencing and at the conclusion of sampling. At the conclusion of sampling the sorbent tubes will be sealed and transported to a NATA accredited laboratory for analysis using gas chromatography, high-performance liquid chromatography and mass spectrometry techniques. The sorbent tubes will be analysed for a specific range of compounds. This method achieves a detection limit of 1 or 5 µg depending on the compound.

6.4.6 Crystalline Silica / Respirable Quartz

Monitoring for crystalline silica will be completed in accordance with *Australian Standard AS2985-2009 Workplace Atmospheres – Method for sampling and gravimetric determination of respirable dust*. Both personal and static sampling may be conducted using portable continuous flow air sampling pumps attached to SKC conductive plastic cyclone samplers fitted with laboratory prepared and pre-weighed 37mm filters within a sampling cassette. Sampling pumps are calibrated to a flowrate of 2.2 L/min and are flow tested prior to commencing and at the conclusion of sampling.

Each filter sample is placed and sealed into an individual petri dish prior to transport to a NATA accredited laboratory under chain of custody control. Samples are analysed for total suspended particulates (TSP / respirable dust) and crystalline silica (quartz). A blank sample is used and analysed to assess any potential for cross contamination during the sampling process. All results are expressed as a concentration in milligrams per cubic metre of air sampled (mg/m^3).

6.4.7 VOCs (PCE / TCE)

Static monitoring of VOCs is be conducted as per *Australian Standard 2986.1 – 2003 Workplace air quality – Sampling and analysis of volatile organic compounds by solvent desorption/gas chromatography*. Sampling will be performed in static monitoring locations using portable constant flow air sampling pumps connected to sorbent tubes containing activated charcoal. This may be undertaken in representative and/or worst case scenario situations to demonstrate that the

airborne VOC concentrations, do not present an elevated health risk to workers or the surrounding public. The flow rate will be set to 200ml/min (AS 2986.1-2003).

The calibrated pumps will be flow tested prior to sampling commencing and at the conclusion of sampling. At the conclusion of sampling the sorbent tubes will be sealed and transported to a NATA accredited external laboratory for analysis using gas chromatography, high-performance liquid chromatography and mass spectrometry techniques. The sorbent tubes will be analysed for a specific range of volatile organic compounds. This method achieves a detection limit of 1 or 5 µg depending on the compound.

Monitoring for VOCs may also be conducted using passive badges in accordance with *Australian Standard AS 2986.2-2003 Workplace Air Quality – Sampling and Analysis of Volatile Organic Compounds by Solvent Desorption/Gas Chromatography – Diffusive Sampling Method*. This involves placing static sampling devices on the collar of site personnel and at several static locations on site. After sampling, the sampling devices will be collected and sent to an accredited laboratory for analysis.

A portable PID fitted with an 9.8 eV bulb, will be used as required to take direct field readings for total VOCs. The PID can detect airborne total VOCs to parts per million (ppm) levels. Spot measurements are conducted at various locations to determine the airborne total VOC levels. PID monitoring will be undertaken during site works using a portable 'Ion Tiger (or similar), that calculates real time results for concentrations of volatile in the atmosphere at the time of sampling. Calibration of the unit shall be regularly tested using an isobutylene and fresh air calibration standard. Measurements shall be undertaken in locations representative of worker exposure zones and downwind of vapour generating activities. Where PID readings exceed 2.7 ppm (taken as a 3-minute average), during works related to PCE and TCE, additional measures will be considered to minimise emissions of volatiles prior to continuing the works

6.5 Reporting

Daily air monitoring reports shall be displayed in a common area outside of restricted zones/exclusion zones for all Site works to see or be able to be produced upon request.

6.6 Exceedances of the Criteria

Should relevant action criteria for each of the sampling methods be exceeded (with consideration to ambient air thresholds), works within the area should be suspended. An assessment must be made as to what the probable cause may have been and determine any action that should be taken to address dust, odours (volatiles) and/or airborne asbestos exceedances.

7. Community Consultation Process

7.1 The Communication Approach

Mirvac support an open and transparent approach to community relations and values the feedback and commitment provided by interested residents, businesses and community groups in the local area. Mirvac aim to share information in a timely way using a range of communication tools and seeks to respond quickly to stakeholders concerns and questions.

During project development of the broader ATP, Mirvac have engaged in discussions with local and state government, neighbouring businesses, local government and special interest groups and interested individuals in the local community. Mirvac have maintained this communication during recent development activities and will continue to maintain this communication approach throughout the project.

Example Community Fact Sheets in relation to air quality at the ATP site are included as **Appendix B**.

7.2 Communication Tools

Communication tools that will continue to be utilised throughout the project will include:

- Phone – A 24 hr 1800 number is in place to receive complaints, queries and feedback from any parties interested in the project. Records of all complaints, enquiries and comments are be logged into a database. Mirvac will aim to respond within one working day to all non-urgent complaints and enquiries.
- Email – regular updates to a project contact list. Parties which register will be provided with updates on the works progress.
- Meetings – Mirvac will hold regular meetings with the community to provide updates on the works progress and pending works.
- Signage – Site works signage and contact details will be maintained around the Site advising contact details of the Principal Contractor.

7.3 Complaints and Enquiries

Complaints and enquires about the project will be managed via:

- The 24 hour 1800 number (1800 743 436).
- In person at meetings to be held at Suite 7001, Bay 7, 2 Locomotive Street, Eveleigh, NSW, 2015.
- Complaints can be emailed directly via: atp.communications@mirvac.com.

7.4 Reporting Requirements

As required by the Consent Conditions, copies of complaints and meeting minutes will be issued to Council.

8. Responsibilities

Table 8.1: Roles and Responsibilities

Activity	Potential Impact / Requirements	Principal Contractor	Contractors	Environmental Consultant
Engagement of a suitability trained and experienced occupational hygienist/environmental consultant	The Principal Contractor shall engage a suitably trained and experienced environmental consultant/occupational hygienist to undertaken monitoring requirements outlined in this plan.	Yes	-	-
Implementation of Management Controls (**Section 5**)	Ensure controls as documented in this plan and other management plans are implemented.	-	Yes	-
Undertaking Air Monitoring Activities (**Section 6.2 and Section 6.4**)	The monitoring plan outlined in Section 6 is to be undertaken in accordance with EPA made or endorsed guidelines.	-	-	Yes
Compliance Inspections	The Principal Contractor is required to ensure procedures and controls in this plan are implemented and action taken where required by undertaking regular inspections and compliance audits of all aspects of works. The Principal Contractor is responsible for: Assessing Contractor's ability to comply with this plan; Conducting an on-going evaluation of the Contractor's/Sub-Contractor's performance; Issuing non-conformance reports; Reviewing corrective action reports; and Acting on any incidents or emergencies.	Yes	-	-
Reporting (**Section** Error! Reference source not found.)	The environmental consultant/occupational hygienist shall prepare reports for issue the following day documenting the results of the monitoring program and notifying the Principal Contractor of exceedances (if recorded) and recommend corrective action.	-	-	Yes
Improvements	Where exceedances are reported, corrective action is required to ensure compliance with relevant Australian standards and EPA made and/or endorsed guidelines. In addition, regular assessment of general environmental compliance as documented in this plan will be undertaken.	Yes	Yes	Yes
Plan Update	If unacceptable exceedances occur, then procedures and controls in this plan are required to be amended to ensure compliance with relevant Australian standards and EPA made and endorsed guidelines.	Yes	Yes	Yes
Community Consultation	The Principal Contractor is to notify Mirvac and the issue closed out in 1 working day	Yes	-	-

9. Limitations

This report has been prepared for use by the client who has commissioned the works in accordance with the project brief only, and has been based in part on information obtained from the client and other parties.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

JBS&G accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced without prior approval by the client, or amended in any way without prior approval by JBS&G, and should not be relied upon by other parties, who should make their own enquires.

Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements.

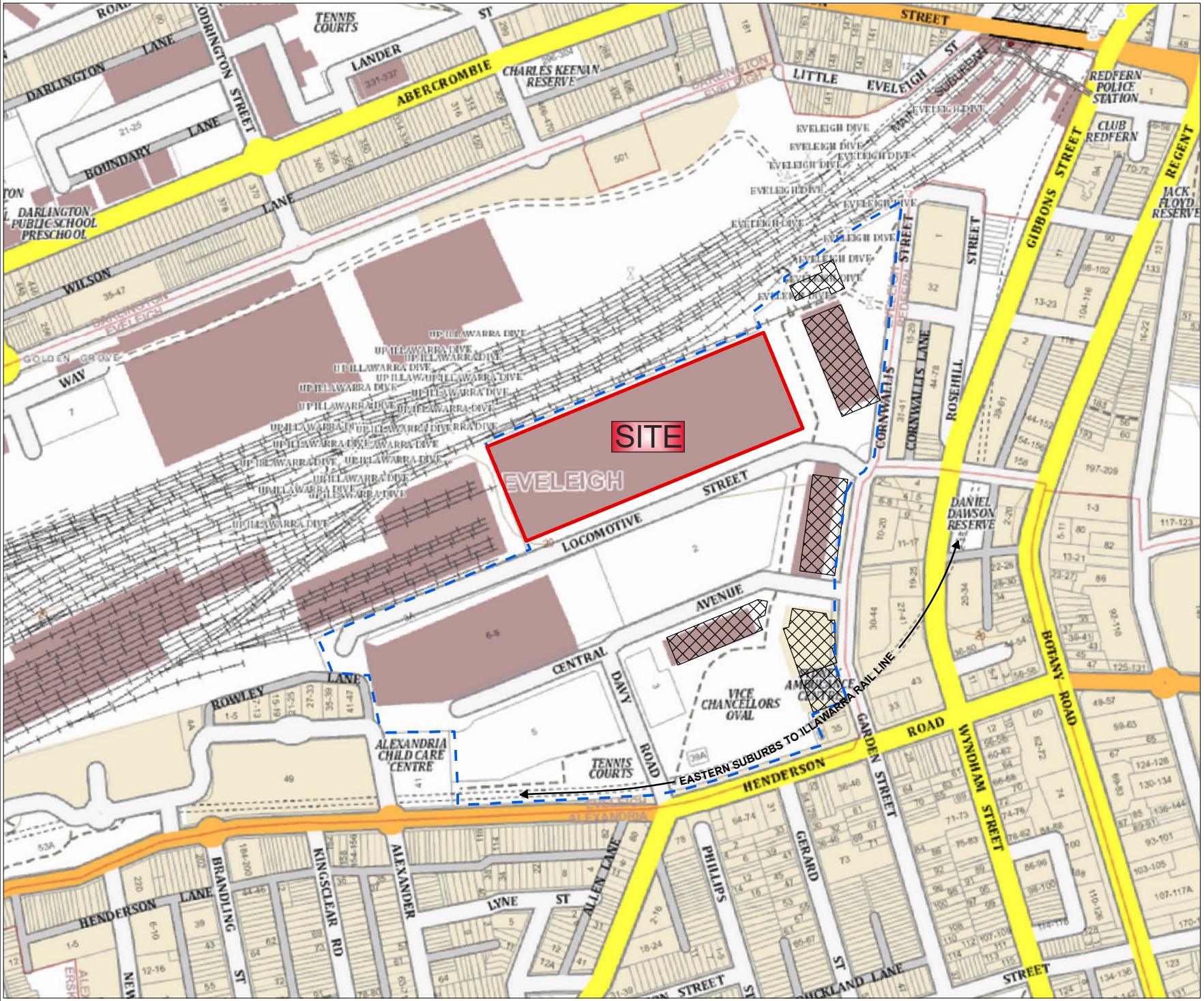
Limited sampling and laboratory analyses were undertaken as part of the investigations undertaken, as described herein. Ground conditions between sampling locations and media may vary, and this should be considered when extrapolating between sampling points. Chemical analytes are based on the information detailed in the site history. Further chemicals or categories of chemicals may exist at the site, which were not identified in the site history and which may not be expected at the site.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, JBS&G reserves the right to review the report in the context of the additional information.

become available regarding conditions at the site including previously unknown sources of contamination, JBS&G reserves the right to review the report in the context of the additional information.

Figures



Legend:

- Approximate Boundary - ATP
- Approximate Site Boundary - "The Site"
- Existing Building Footprint Excluded from "The Site"

JBS&G

Job No: 51142

Client: Mirvac

Version: R28 Rev 0	Date: 29-Aug-2017
Drawn By: RF	Checked By: AS

Scale 1:4,500

0 50 100
metres

Coor. Sys. GDA 1994 MGA Zone 56

Locomotive Workshop
Australia Technology Park
Eveleigh, NSW

SITE LOCATION

FIGURE 1

File Name: 51142_01
Reference: https://maps.six.nsw.gov.au/

Legend:

- Approximate Boundary - ATP
- Approximate Site Boundary - "The Site"
- Cadastral Boundaries
- Existing Building Footprint Excluded from "The Site"
- UST (Inferred Historical Location)

JBS&G

Job No: 51142

Client: Mirvac

Version: R28 Rev 0	Date: 29-Aug-2017
Drawn By: RF	Checked By: AS

Scale 1:1,600

0 10 20
metres

Coor. Sys. GDA 1994 MGA Zone 56

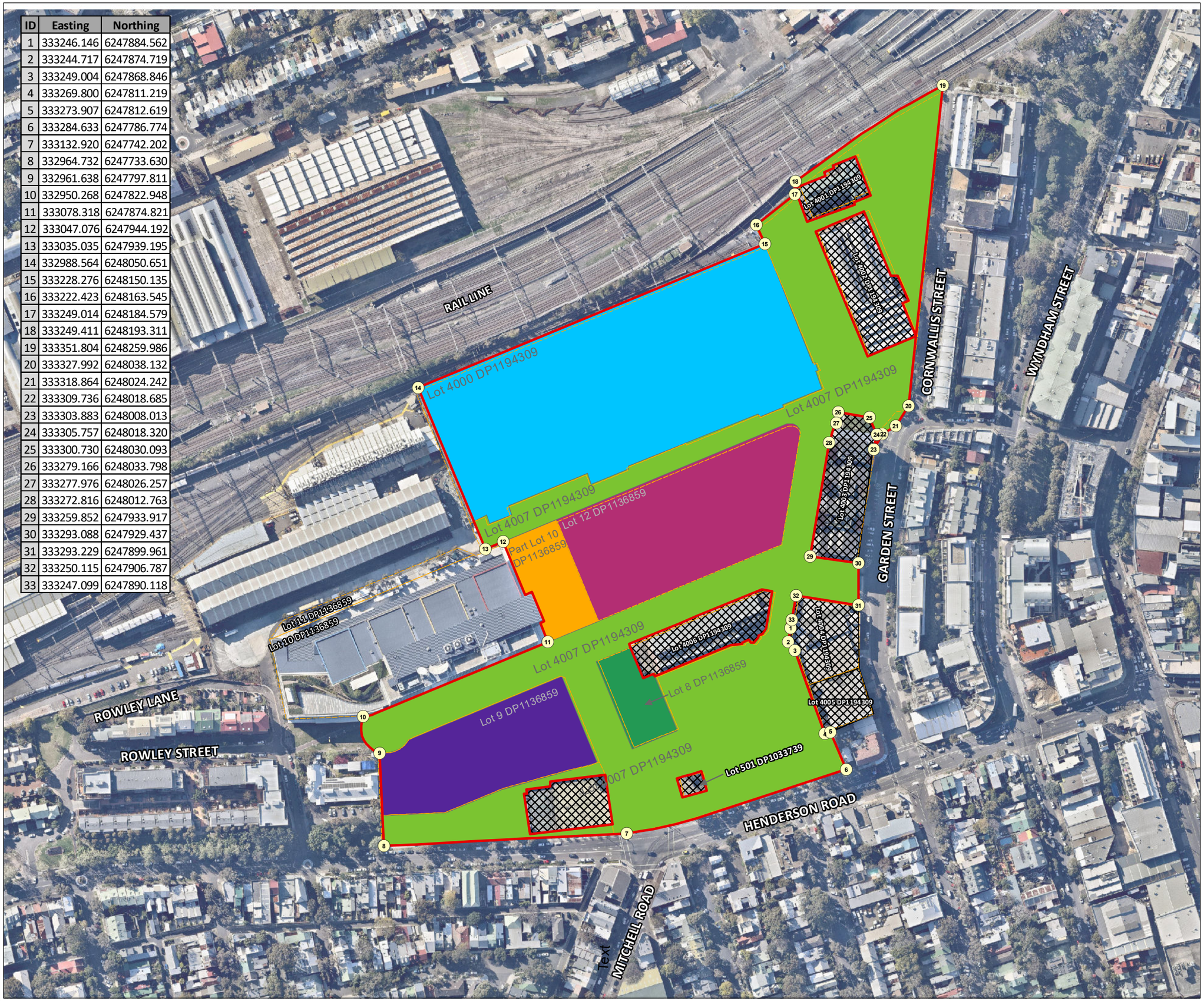
Locomotive Workshop
Australia Technology Park
Eveleigh, NSW

SITE LAYOUT

FIGURE 2

File Name: 51142_02
Reference: Imagery - www.nearmap.com: Cadastre Boundary -maps.six.nsw.gov.au

ID	Easting	Northing
1	333246.146	6247884.562
2	333244.717	6247874.719
3	333249.004	6247868.846
4	333269.800	6247811.219
5	333273.907	6247812.619
6	333284.633	6247786.774
7	333132.920	6247742.202
8	332964.732	6247733.630
9	332961.638	6247797.811
10	332950.268	6247822.948
11	333078.318	6247874.821
12	333047.076	6247944.192
13	333035.035	6247939.195
14	332988.564	6248050.651
15	333228.276	6248150.135
16	333222.423	6248163.545
17	333249.014	6248184.579
18	333249.411	6248193.311
19	333351.804	6248259.986
20	333327.992	6248038.132
21	333318.864	6248024.242
22	333309.736	6248018.685
23	333303.883	6248008.013
24	333305.757	6248018.320
25	333300.730	6248030.093
26	333279.166	6248033.798
27	333277.976	6248026.257
28	333272.816	6248012.763
29	333259.852	6247933.917
30	333293.088	6247929.437
31	333293.229	6247899.961
32	333250.115	6247906.787
33	333247.099	6247890.118



Legend:

- Cadastral Boundaries
- Approximate Boundary - ATP Precinct

Lot and DP Boundaries

- Lot 8 DP1136859
- Lot 9 DP1136859
- Lot 10 DP1136859
- Lot 12 DP1136859
- Lot 4007 DP1194309
- Lot 4000 DP1194309
- Cadastral Boundaries Excluded from "The Site"
- Site Coordinate Location

JBS&G

Client: Mirvac

Version: R29 Rev A	Date: 28-Aug-2017
Drawn By: RF	Checked By: AS

Scale 1:2,500

0 40 80
metres

Coor. Sys. GDA 1994 MGA Zone 56

Australia Technology Park
Eveleigh, NSW

CADASTRE - LOT AND DP LOCATION

FIGURE 3:

File Name: 51142_03
Reference: Imagery - www.nearmap.com: Cadastre Boundary -maps.six.nsw.gov.au

Appendix A Derivation of Real-Time Monitoring Criteria

JBS&G 51142-106227
L018 (Derivation of Monitoring Criteria) Rev A.docm

28 November 2016

Warren Henson
Mirvac Projects Pty Ltd
Via email: warren.henson@mirvac.com

Derivation of Real-Time Occupational Monitoring Criteria
Proposed Occupational Monitoring during Site Remediation and Earthworks
Australian Technology Park, Eveleigh, NSW

Dear Mr Henson,

1. Introduction & Background

JBS&G Australia Pty Ltd (JBS&G) was engaged by Mirvac Projects Pty Ltd (Mirvac, the client) to undertake environmental assessments, remedial planning and preparation of occupational health and safety plans for the proposed redevelopment of the Australian Technology Park, Eveleigh, NSW (the site). The remedial works proposed to be undertaken on the site are described in *Mirvac Projects Pty Ltd Australian Technology Park Remedial Action Plan 2 Locomotive Street, Eveleigh, NSW rev 0*, 15 June 2016, JBS&G Australia Pty Ltd (JBS&G 2016a). Consistent with project ecologically sustainable development objectives a substantial extent of earthworks and soil handling is proposed with the site remediation.

JBS&G (2016a) has identified contaminants present in site soils as consisting of polycyclic aromatic hydrocarbons (PAHs), semi- and non-volatile total petroleum / recoverable hydrocarbons, heavy metals particularly including copper, lead, nickel and zinc and asbestos. Potential speciated constituents with hydrocarbons constituents have been identified as potentially including monocyclic aromatic hydrocarbons and naphthalene. The constituents were reported to principally be present in fill materials present across the site. Works described as occurring in JBS&G (2016a) are substantially restricted to remediation / handling of fill materials.

Potential occupational hazards for the site workforce during earthworks by exposures to these constituents was identified in *Mirvac Construction Pty Ltd Occupational Hygiene Management Plan Lot 9 Building 1 Australian Technology Park, 5 Henderson Road Eveleigh, NSW*, 18 November 2016, JBS&G Australia Pty Ltd (JBS&G 2016b). JBS&G (2016b) has identified a potentially complete occupational exposure pathway of site worker exposure to particulates as generated from site soils. Consistent with the contaminated nature of the site, same exposures to a range of contaminants as potentially occurring with particulate emissions from the site have also been identified.

A range of speciated exposure standards were identified in JBS&G (2016b). It was further identified in JBS&G (2016b) that real time monitoring is preferred to assess potential exposures to site constituents. To this extent, site contaminants can be divided into three broad categories:

- Volatile organic compounds – real time monitoring is proposed for these constituents by the use of a photo-ionisation detector (PID). An action criterion for the PID has been further defined in JBS&G (2016b);
- Asbestos – asbestos monitoring is proposed to be undertaken by filter sample collection and analysis by phase contrast microscopy. No real-time method is proposed in JBS&G (2016b). However this is discussed further in **Section 2**; and

- Heavy metals / Semi- and Non-Volatile Organic Compounds – filter sample collection and analysis by a range of methods is proposed for these constituents. However a further requirement for a real-time method as based on respirable particulates has been further identified as necessary for the site works and reported in JBS&G (2016b). A respirable particulate based criterion has been required to be derived as protective for the range of inorganic / semi- and non-volatile contaminants as present on the site and is summarised in **Section 3**.

The real time criterion as derived by this assessment are proposed to be used to inform the requirements of JBS&G (2016b).

2. Asbestos Exposure Real Time Criterion

Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia, May 2009, Western Australian Department of Health (WA DoH 2009) provides guidance for the real-time monitoring of particulate levels to monitor potential exposures to asbestos fibres as liberated from soils. It is reported here that nuisance dust monitoring may be also necessary and can be used to complement asbestos sampling, especially since it allows for more immediate responses to any failures in dust management measures. For nuisance dust, the National Environment Protection Measure (NEPM) 24-hour guidance goal of 50 µg/m^3 for PM10 (particulate matter with an equivalent aerodynamic diameter of 10 µm or less) should apply (NEPM 2003).

In the further discussion provided to WA DoH (2009) it is noted that the particulate criterion is protective of community health. Community health risk objectives are typically significantly lower than those applied to occupational criteria, such as the asbestos occupational criteria adopted in JBS&G (2016b). WA DoH cites that the discrepancy is in the range of one to three orders of magnitude. On this basis, where the real-time criterion is intended to be applied to an occupational exposure only (as proposed in JBS&G 2016b), the criterion can be increased by a factor of at least one order of magnitude. The real-time respirable particulate criterion as protective of asbestos exposure is proposed to be increased by a factor of 10 to 500 µg/m^3.

This action criterion is able to be readily measured by a light scattering laser photometer aerosol monitor, such as a Dust-trak. The Dust-trak, as noted in JBS&G (2016b) is able to provide real time measurements of respirable particulates.

3. Heavy Metals and PAHs Real-Time Criterion

It is proposed to assess compliance with heavy metals and PAH based constituents in 'real time' on the basis of airborne levels of respirable particulates. Heavy metal and PAH based contaminants in soils on the site occur as physically attached to the soil particles. Environmental data is available for soils on the site and has been summarised in *Mirvac Projects Pty Ltd Human Health Risk Assessment 2 Locomotive Street Eveleigh NSW rev 0*, 12 June 2016, JBS&G Australia Pty Ltd (JBS&G 2016c).

The maximum levels of each soil constituents across the site as summarised in JBS&G (2016c) for each of the constituents nominated in JBS&G (2016b) is summarised in **Table 1** following. The occupational criteria for each constituent as also provided in JBS&G (2016b) is also summarised in **Table 1**.

Table 1 – Summary of Maximum Levels of Soil Constituents

Constituent	Maximum Level in Soils (mg/kg)	JBS&G (2016b) Occupational Criteria (mg/m^3)
Arsenic (As)	625	0.05
Cadmium (Cd)	8	0.01
Chromium (VI)	140	0.05
Copper (dust)	27 000	1.0
Lead	12 000	0.15
Mercury (Hg)	4.6	0.01
Nickel (dust)	1200	1.0
Zinc [Oxide{dust}]	4550	10
Naphthalene	20.2	52
Benzo(a)pyrene	220	0.2

Soils on the site have been typically characterised as sands. *Users Guide for Evaluating Subsurface Vapour Intrusion into Buildings*, US EPA, 2003 reports an arithmetic mean particle diameter of 0.0044 cm for sand based soils.

Respirable particulates as may be generated from the site will have a diameter less than 10 microns (µm). It is likely, as estimated by a comparison of the relative surface area to mass of an airborne particulate to a soil particle, that contamination may be concentrated within particulates at higher levels that the majority of presumably larger soil particles. By this, the concentration of a constituent as reported with site soils is potentially an underestimation of the concentration of the constituents that will occur in respirable particulates generated from site soils.

Potential concentration of inorganic / non-volatile contaminants within particulates relative to soils has been estimated. For the purpose of this calculation, it has been assumed that a mean airborne particle diameter of 2.5 µm occurs from the soil on the site. Assuming a particle density of 2.65 tonnes/m^3, the following is calculated:

- The mean soil particle (diameter $4.4*10^{-5}$ m) has a surface area of $6.1*10^{-9}$ m^2 and a mass of $8.9*10^{-8}$ g; and
- The mean particulate (diameter $2.5*10^{-6}$ m) has a surface area of $2.0*10^{-11}$ m^2 and a mass of $1.6*10^{-11}$ g.

The relative ratio of surface area to mass for the particulate as compared to the soil particle is 17.6. This indicates that contaminants would be present at concentrations approximately 17.6 times higher within airborne respirable particulates, as relative to the laboratory reported soil concentration.

A real-time respirable particulate criterion of 500 µg/m^3 has been proposed in **Section 2** to be protective of potential asbestos exposures. This criterion has been considered with the maximum level of each soil constituent as summarised in **Table 1** to determine whether it is also protective of potential inorganic / non-volatile contaminant exposures. This has considered:

- The maximum concentration of the constituent as reported in soils on any portion of the site;
- The potential increased concentration of the constituent as present in respirable particulates as compared to soil samples assessed to determine soil borne levels as estimated at 17.6;

- Assumption of particulates being generated solely from the areas of the soils with the maximum levels of contamination present and causing a level of airborne respirable particulates of 0.5 mg/m^3 solely attributable to those soils (i.e. no background sources of dust present which is a highly conservative assumption); and
- The occupational criterion as specific to each constituent.

No potential exceedances of any of the occupational criterion have been identified, and it is considered that an occupational real time respirable particulate monitoring criterion of 0.5 mg/m^3 will be protective of potential site worker inhalation exposures to soil borne contaminants.

4. Conclusions and Recommendations

In accordance with the limitations provided as **Attachment 1** it has been found that where levels of respirable particulates (PM10) are less than 0.5 mg/m^3 that potential levels of airborne asbestos and inorganic, semi- and non-volatile contaminants as occurring as sorbed impact to particulate emissions generated from the site, are not likely to pose an occupational risk by inhalation exposure to site workers.

It is recommended that the PM10 real-time monitoring criterion of 0.5 mg/m^3 is adopted in JBS&G (2016b). The monitoring criterion is appropriate to be applied to all stages of site remediation and earthworks on the ATP site.

Should you require clarification, please contact the undersigned on 02 8245 0300 or by email ncussen@jbsg.com.au.

Yours sincerely:

Matthew Parkinson
Environmental Consultant
JBS&G Australia Pty Ltd

Approved/Reviewed By:

Nathan Cussen
Environmental Consultant
JBS&G Australia Pty Ltd

Attachments:
1) Limitations

Attachment 1 – Limitations

This report has been prepared for use by the client who has commissioned the works in accordance with the project brief only, and has been based in part on information obtained from the client and other parties.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

JBS&G accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced without prior approval by the client, or amended in any way without prior approval by JBS&G, and should not be relied upon by other parties, who should make their own enquires.

Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements.

Limited sampling and laboratory analyses were undertaken as part of the investigations undertaken, as described herein. Ground conditions between sampling locations and media may vary, and this should be considered when extrapolating between sampling points. Chemical analytes are based on the information detailed in the site history. Further chemicals or categories of chemicals may exist at the site, which were not identified in the site history and which may not be expected at the site.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, JBS&G reserves the right to review the report in the context of the additional information.

Appendix B Example Community Information Sheets

19 December 2016

Dust Management Lot 9/Building 1
Dust Fact Sheet #1

Introduction

Stage 1 of the civil works program for Lot 9/Building 1 is commencing. Earthworks including excavation, stockpiling, truck loading, movement and placement of site soils, drilling, grading, importation and spreading of road-base and other fill materials, etc. will be undertaken as part of the civil works program. Management of dust generated during the civil works is required to satisfy both onsite and offsite environmental, health and safety criteria adopted for the project.

This fact sheet aims to provide our neighbours information about how dust generated on site will be controlled, managed and monitored during the civil works program. It builds upon information shared already with the community regarding the project. Control and management of site generated dust and its potential impacts on the surrounding community, site workers and staff is of highest importance to Mirvac.

What dust controls will be implemented on site?

A site-specific Air Quality Management Plan (AQMP) has been independently prepared for the project. The AQMP stipulates the requirement for numerous dust control measures to be undertaken during the civil works program. These control measures include:

- Maintaining sealed asphalt surfaces onsite for as long as practical to minimise areas of exposed soil that are susceptible to windblown dust;
- Use of rumble grids, wheel washes and street sweepers as required to minimise the build-up of dirt and dust on asphalt both within the site and on surrounding roads;
- Direct use of hoses and water spray during excavation to minimise airborne dust;
- Minimisation of stockpiling and double handling of soil materials where possible;
- Wetting of exposed soil stockpiles and covering with geofabric;
- Cessation and/or modification of works during strong winds, where implemented measures are not adequate in controlling dust levels;
- Cleaning and maintenance of site sediment controls as a potential dust source;
- Ensuring that dust control measures are in-place and adequate prior to forecasted windy weather, weekends, public holidays and other site closure times; and
- Ongoing dust suppression across ground surfaces throughout the project by use of a watercart, hoses, misters, sprinklers, etc.

Implementation of the abovementioned controls is expected to increase during seasonal hot and dry conditions.

Who is responsible for dust management?

The following are responsible for the control, management and monitoring of dust risks at the site:

- Mirvac Projects – the principal contractor and site owner has an obligation to ensure that all risks, including dust risks, are adequately managed to ensure protection of the environment, site workers, employees, visitors and persons within surrounding public areas;
- Mainland Civil – the civil works contractor is responsible for managing site generated dust through the implementation of the control measures outlined above in accordance with the site specific AQMP; and
- JBS&G Hygiene – a full-time site based occupational hygiene consultant is responsible for monitoring dust levels to ensure compliance with relevant air quality standards.

In addition to the above, acting in the capacity of a third party independent auditor, is Dr Peggy Trompf of Industrial Health Matters (IHM). Dr Trompf will review and comment on proposed and existing procedures and controls associated with dusts and health and safety for the site.

How is dust being monitored?

Dust monitoring as PM_{10} (Particulate Matter ≤ 10 micrometres in diameter) is conducted both within the site and at the perimeter site boundaries each work day when earthworks are occurring. The dust monitoring is conducted using a calibrated light scattering, laser photometer, which calculates real time results for concentrations of dust in the atmosphere. Dust monitoring results are compared to national ambient air quality standards as specified in the [*National Environment Protection (Ambient Air Quality) Measure, 2003, (Amended 2016)*].

Additional workplace air monitoring will be conducted as required with regards to known soil contamination at the site. Sampling locations are selected to provide an indication of representative conditions with a focus on activities considered to provide a "worst-case" situation. These samples are analysed by a National Association of Testing Authorities (NATA) accredited laboratory and compared against relevant contaminant specific criteria.

All dust / air monitoring is conducted by the independent consultant for the purpose of ensuring dust levels generated during earthworks processes are controlled and managed at an acceptable level. If during the project dust levels are not acceptable, all responsible parties will be notified, the causes investigated and appropriate actions implemented.

The communication approach

Mirvac supports an open and transparent approach to community relations and values the feedback and commitment provided by interested residents, businesses and community groups in the local area. Mirvac aims to share information in a timely way using a range of communication tools and seeks to respond quickly to stakeholders concerns and questions.

Mirvac will maintain this communication approach throughout the project.

For further information please contact:

Mirvac Australian Technology Park Community Relations Team via:

- The 24 hour 1800 number (1800 743 436);
- In person at Suite 7001, Bay 7, 2 Locomotive Street, Eveleigh, NSW, 2015; and/or
- Email atp.communications@mirvac.com.

5 December 2016

Contamination Management – Asbestos Removal Works Fact Sheet #1

Introduction

Mirvac has been announced by UrbanGrowth NSW Development Corporation as the successful party in securing ownership and redevelopment rights for the site for ongoing use as a campus style precinct catering for science and technology bases occupants. In addition, Mirvac propose to develop Lots 8, 9 and 12 in DP 1136859 for commercial land use. Adaptive reuse of Locomotive Workshop is proposed for ongoing commercial land use.

Stage 1 of the civil works program is about to start. This involves the remediation and development of Lot 9 (Building 1) for commercial land use. This fact sheet aims to give our neighbours an update on upcoming site remedial works. It builds upon information shared already with the community throughout the project.

Assessment and management of any contamination risk to the community and workers is of the highest priority throughout the project.

What is the nature of contamination on site?

The site has been the subject of a number of previous investigations over the past 25 years prior to the civil works for construction of the commercial development within Lot 9. Historical investigations have identified historical former land uses comprising locomotive workshops, foundries, railway sidings and goods yards. The site was used to manufacture components required for steam locomotive assembly and repair. Site activities were reported to have comprised brass, iron and steel founding, heavy engineering machining, blacksmith works, refuelling, cleaning and degreasing including the use of solvents and paints. More recently, a portion of the site has been used as a campus style precinct catering for science and technology based occupants.

Soil impact has been identified as associated with hot-spots of semi- and non-volatile petroleum hydrocarbons and polycyclic aromatic hydrocarbons (PAHs), and/or heavy metals as associated with fill materials historically used across the sites or resultant from historical site activities. Localised areas of below ground/subsurface asbestos impacted fill materials have also been identified.

Within Lot 9 (Building 1), the reported concentrations of the identified contaminants (where present) in the fill material typically exceed ecological criteria and, in relatively few cases, exceed endorsed health-based criteria protective of child care centre land use.

Investigations within Lot 9 have detected two isolated areas of friable asbestos impacted soil, and it is on this basis that the procedures for managing its removal have been established by our specialist team.

Who is managing this risk?

Mirvac has assembled the following specialists to manage the asbestos removal works:

- IP Projects, a Class A licenced asbestos removal contractor, which has been engaged by Mainland Civil (the Early Works civil works contractor for Lot 9);
- JBS&G Hygiene, a full-time site based occupational hygienist overseeing the works and ensuring compliance with relevant Australian Standards and Codes of Practice; and

- JBS&G Environmental, a specialist environmental consultancy to validate the successful removal and disposal of asbestos impacted fill.

In addition to the above specialist, acting in the capacity of a third party independent auditor, is Dr Peggy Trompf of Industrial Health Matters. Dr Trompf will review and comment on proposed and existing procedures and controls associated with occupational health and safety.

Mr Graeme Nyland of Ramboll Environ, a third party independent EPA accredited site auditor, has been engaged to certify that the site has been made suitable for permissible land uses in accordance with the Development Consent conditions.

What procedures are in place to manage contamination on site?

Given the occurrence of two isolated areas of friable asbestos impacted fill, procedures in accordance with WorkSafe NSW requirments are to be implemented for the handling of this material.

Procedures to manage asbestos contamination include:

- Regular wetting of the site during periods of disturbance to minimise dust generation;
- Establishment of exclusion zones (areas where asbestos removal works are to occur);
- All workers within the exclusion zone are required to wear protective clothing which is either safely disposed of after leaving the exclusion zone or decontaminated;
- Daily dust monitoring to confirm control measures are appropriate;
- Daily air monitoring and asbestos laboratory analysis at a National Association of Testing Authorities accredited laboratory; and
- A procedure to assess the results of air monitoring and if required act to ensure sufficient controls are in place at all times.

What is an exceedance and what will happen when this occurs?

The WorkSafe NSW Code of Practice sets exposure standards at a level of 0.1 fibres/ml of air for respirable asbestos that may occur during the removal of asbestos materials. Procedures in place for works on site identify a two tier reporting limit – the first tier limit is set at 10 times lower than the standard (i.e. 0.01 fibres/ml), and the second tier limit at five times lower (i.e. 0.02 fibres/ml). These represent a very conservative position in managing this risk, which means the methodologies followed aim to reduce risk to be as low as possible.

In the event that these limits are breached the following actions take place:

- Tier 1 - Immediate investigation takes place to identify the cause, followed by a review of the controls and implementation of additional controls as required to minimise chances of further exceedances.
- Tier 2 – Works cease immediately and the WorkSafe regulator is notified. Other actions as outlined above then occur. No further works take place until levels return to below the lower exceedance level.

The exceedance levels outlined above are significantly below prescribed NSW Code of Practice safe limits. In the unlikely event that a Tier 2 exceedance occurs, Mirvac will notify residents/building occupants in the immediate vicinity and carry out localised testing to verify that no risk exists to our neighbours.

It is important to note that the controls that are in place on site are also for the protection of the workers that operate in and around contaminated material within the exclusion zone. Residents can be assured that in achieving this, the surrounding community is equally protected.

Do the works require an exclusion zone, and is demarcation fencing adequate to create this?

The NSW Code of Practice does not require a specific exclusion zone distance, however there is a requirement to restrict access to the asbestos removal area with barriers and signage. The site fencing, and "danger asbestos removal in progress" signage is the means by which this access is restricted. It is not intended, nor is it required for demarcation fencing to prevent contaminants from entering publicly accessible areas. The procedures in place will identify any exceedances and ensure levels will never get close to the safe limits prescribed by the NSW Code of Practice.

As work progresses, the asbestos removal areas change location within each construction site depending on the nature of the work being undertaken.

Why do workers wear suits if there is no risk to the community?

Workers in the asbestos removal area (exclusion zone) wear Personal Protective Clothing (PPE) for a number of factors that do not apply to people in the community. Primarily, PPE is a precaution to manage potential exposure of workers in the event of even minor exceedances. Given the specialist nature of this work, the wearing of PPE is a protective measure against the long term accumulative risk profile of these workers. The wearing of PPE also ensures that no contaminants can be unintentionally transported from the work area. As noted previously, PPE is either disposed of, or decontaminated daily to ensure this.

How often is testing done and how long does it take for an exceedance to be detected?

Air monitoring is conducted by JBS&G Monday through to Saturday when the site is operational, for a period of approximately eight hours per day. An average of ten monitors are used daily and placed around the site. The air monitors are analysed each afternoon at a NATA (National Accredited Testing Authorities) accredited laboratory with results distributed each morning. In the event of a Tier 1 or 2 exceedance, the action plan will be implemented immediately.

The communication approach

Miravc support an open and transparent approach to community relations and values the feedback and commitment provided by interested residents, businesses and community groups in the local area. Mirvac aim to share information in a timely way using a range of communication tools and seeks to respond quickly to stakeholders concerns and questions.

During project development, Mirvac engaged in discussion with local and state government, neighbouring businesses, local government and special interest groups and interested individuals in the local community. Mirvac will maintain this communication approach throughout the project.

For further information please contact:

Mirvac Australian Technology Park Community Relations Team via:

- The 24 hour 1800 number (1800 743 436);
- In person at meetings to be held at Suite 7001, Bay 7, 2 Locomotive Street, Eveleigh, NSW, 2015; and/or
- Email atp.communications@mirvac.com.

JBS&G 51142/108788
L053 (Lead Information Sheet - ATP) Rev A

17 May 2017

Warren Henson
Mirvac Construction Pty Ltd
Via email: warren.henson@mirvac.com

Lead Information Sheet: Australian Technology Park, Eveleigh NSW 2015

Dear Warren,

1. Introduction

JBS&G Australia Pty Ltd (JBS&G) has been engaged by Mirvac Construction Pty Ltd (Mirvac, the Client) to assess and assist with management of Environmental and Occupational Hygiene aspects of the Australian Technology Park (ATP) redevelopment project, located on Central Avenue, Eveleigh, NSW (the site).

Significant previous investigations of site soil and groundwater conditions has identified that lead has been identified as a soil contaminant at the ATP site and as such, controls have been implemented to manage human exposure to these soils, i.e. all grassed Public Domain areas have been capped with a physical barrier of non-impacted topsoil to prevent direct human contact by site users.

The objective of this correspondence is to provide a summary of the current status of the ATP site with regards to lead contamination and the lead management controls currently implemented at the site to assist with community / stakeholder communications.

2. General Information

Like copper and zinc, lead is a naturally occurring heavy metal and background levels of lead occur in all soils. Lead is also one of the most common soil contaminants in Sydney as a result of historical site activities particularly in former commercial / industrial areas such as ATP and also atmospheric deposition of lead from leaded petrol emissions. Lead contaminated soils are typically associated with industrial activities including smelting, lead acid batteries, degradation and demolition of structures containing lead based paint systems, etc. In addition, elevated lead levels can occur in dusts in roof spaces throughout many areas of Sydney as a result of fallout from industry, degradation of lead paint systems and past vehicle exhaust emission along busy roads (leaded petrol, pre 1990s).

Lead in soil as a human health risk can enter the body via three routes of exposure:

1. Inhalation - breathing in of airborne soils;
2. Ingestion- either direct eating of soil or hand to mouth transfer to foods to be eaten; and
3. Dermal - direct skin contact with soils, dust etc and absorption through the skin.

Note: The primary routes of exposure to lead are inhalation and ingestion, the risks associated with dermal exposure are significantly less.

3. Lead Contamination, Controls and Management at ATP

Over the past 22 years, there has been around 100 soil contamination investigations undertaken at the ATP site, the results of which have been consolidated by JBS&G into a report that summarises the current environmental status of the site. With regards to lead impacts, whilst some of these historical soil lead results exceed acceptable ecological levels, and to a lesser extent human health levels, the vast majority of results are considered acceptable when compared with current relevant guidelines endorsed by the NSW EPA. Separate to the soil investigation activities, lead based paint systems are also known to be present within the Locomotive Workshop, i.e. paint on structural steel columns and beams.

As part of the initial commercial redevelopment of the ATP by UrbanGrowth NSW, comprehensive controls to minimise potential lead exposure to site employees and the public have been implemented across the ATP site. All Public Domain areas of the ATP site not covered with buildings or hardstand pavements have been capped with validated non-impacted soil providing a physical barrier preventing direct contact between site users and potential lead impacted soils.

Within the Locomotive Workshop, the identified old lead based paints and residual dusts have been remediated, cleaned and stabilised, i.e. made safe such they do not present a lead risk to users and visitors to the building.

Current development works within ATP Lots 9 and 12 (Buildings 1 and 2) has involved removal of the former hardstand asphalt capping previously providing a physical barrier between site users and potentially lead impacted soils. Subsequent excavation works for building construction present the potential to disturb lead impacted soils such that without implementation of the appropriate environmental controls, there is a risk that airborne migration of lead impacted soil/dust may occur, presenting a risk to site workers and those working/using the broader ATP site.

JBS&G has maintained a fulltime site presence during these works and have conducted daily airborne respirable dust monitoring and representative lead in air testing as required to assist with confirming that site environmental controls implemented during the works are suitably managing the potential for airborne contaminant migration. Furthermore, 'worst case scenario' lead air testing has been conducted, i.e. samples collected at the point source during the excavation of soils with the highest lead levels known at the site. To date, all lead in air sampling results have been below the relevant exposure standard of 0.15mg/m^3 (SWA 2013[1]) and the adopted criteria for lead air monitoring (outdoor) of 0.03mg/m^3 (AS 4361.2[2]). Based on the results of the lead in air monitoring conducted at the ATP site during the redevelopment works, no unacceptable concentrations of airborne lead, presenting a potential elevated health risk, have been identified within the current work sites. It can therefore be inferred that there has been no appreciable migration of lead impacts beyond the work sites to the balance of the ATP, where existing ground surface exposure controls remain current.

Environmental Management Plans incorporating site specific management controls have been implemented to ensure that the public domain areas in their current condition, particularly the grassed areas, are suitable for recreational use by the public and other site users. Current redevelopment works across the broader ATP site are being undertaken subject to oversight by a NSW EPA accredited independent site auditor as per the conditions of development consent to ensure that ongoing remediation and contamination management controls are considered suitable

[1] *Health Monitoring for Exposure to Hazardous Chemicals, Guide for Persons Conducting a Business or Undertaking*. Safe Work Australia, February 2013 (SWA 2013)

[2] *Australian Standard 4361.2-1998 Guide to Lead Pain Management – Residential and Commercial Buildings.*

and appropriate for the long-term protection of human health for current and future site users and that such management controls continue to be implemented.

Should you require clarification, please contact the undersigned on 02 8245 0300.

Yours sincerely:

Aaron Smith
Senior Consultant
JBS&G Australia Pty Ltd

Approved by:

Joanne Rosner
Principal, Contaminated Land
JBS&G Australia Pty Ltd

Attachment 1: Limitations

Attachment 1 – Limitations

This report has been prepared for use by the client who has commissioned the works in accordance with the project brief only, and has been based in part on information obtained from the client and other parties.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in occupational hygiene and environmental investigations, before being used for any other purpose.

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Changes to the occupational and atmospheric conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

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