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REPORT NO. **113031**

INTERIM ENVIRONMENTAL MANAGEMENT PLAN FOR SANDERS RESERVE, SANDERS PARADE, CONCORD

ENVIRONMENTAL EARTH SCIENCES NSW
REPORT TO CITY OF CANADA BAY
DATE APRIL 2013
VERSION 2


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EXECUTIVE SUMMARY

The Council of the City of Canada Bay have requested Environmental Earth Sciences to prepare this Environmental Management Plan (EMP) for the site known as Sanders Reserve, Sanders Parade, Concord, NSW (Figure 1).

The site has been identified as containing contamination in the form of polyaromatic hydrocarbons (PAHs) total petroleum hydrocarbons (TPH) containing materials beneath a limited capping layer on the site, and some asbestos impacted capping material at one location on the site.

The asbestos identified to date is beneath the surface material. Based on the information known to date there is no imminent risk to human health or the environment and this situation should remain if the existing capping materials are maintained and monitored.

Council plan to carry out remedial works in the future, however, in the interim they require advice on how best to manage the site. This management plan summarises the site conditions, provides a risk assessment for site users and workers, and sets out protocols for likely activities that may occur during routine maintenance on the site.

In addition the management plan documents roles and responsibilities and lists the monitoring, reporting and protocols for review and improvement of the management plan so that it remains relevant and up to date until remediation has been achieved.

On behalf of
Environmental Earth Sciences NSW

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REVISION AND AMENDMENTS

REVISION AND AMENDMENT RECORD SHEET

Page	Section	Amend/Add/Delete	Version No	Authorised	Date of Issue
All	All	Draft Issue	1	C McKay	28 March 2013
All	All	Finalised Report	2	C McKay	9 April 2013

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1 INTRODUCTION AND BACKGROUND

1.1 Environmental Management Plan (EMP) context

The Council of the City of Canada Bay have requested Environmental Earth Sciences to prepare this Environmental Management Plan (EMP) for the site known as Sanders Reserve, Sanders Parade, Concord, NSW (Figure 1).

The site has been identified as containing contamination in the form of polyaromatic hydrocarbons (PAHs) total petroleum hydrocarbons (TPH) and asbestos containing materials beneath a limited capping layer on the site. Council plan to carry out remedial works in the future, however, in the interim they require advice on how best to manage the site. This management plan summarises the site conditions, provides a risk assessment for site users and workers, and sets out protocols for likely activities that may occur during routine maintenance on the site.

This EMP is not a construction environment management plan (CEMP) at the time that Council commences remedial works or carries out construction of site facilities they should prepare a CEMP that may reference this document but that will provide additional controls to manage specific risks presented by the planned activities at that time.

This EMP has been prepared with reference to

- NSW Department of Infrastructure, Planning and Natural Resources (DIPNR) *Guideline for the Preparation of Environmental Management Plans (*2004); and
- NSW Department of Environment and Conservation (DEC) (2006) Contaminated Sites: Guidelines for the NSW Site Auditor Scheme.

Professional judgment was used to extrapolate between inspected areas, however even under ideal circumstances actual conditions may vary from those inferred to exist. The actual interface between materials and variation of soil quality may be more abrupt or gradual than the report indicates.

Environmental Earth Sciences NSW is not responsible for variations due to alterations of site conditions since the time of our last site inspection in January 2013, for example through illegal dumping of chemicals onsite, or tampering/removal of the limited capping material.

1.2 EMP objectives

This EMP is a site-specific plan developed to ensure that Council and its sub-contractors understand the site conditions and carry out their activities in a manner that will ensure the risks to themselves and the general public are minimised.

The objective of this EMP is to provide a summary of the site conditions, and procedures for:

- monitoring of the site by Council;
- handling of material potentially uncovered during future maintenance works;
- management of excavated soil material (reuse or disposal); and
- importing material (if necessary).

2 CURRENT SITE CONDITION AND PLANNED USE

This section of the report provides a summary of pertinent site features and condition. Further details can be obtained from Environmental Earth Sciences, 2012 and Environmental Earth Sciences, 2013.

2.1 Site location

The following is a summary of the site location details.

TABLE 1 SITE LOCATION

Parameter	Details
Lot and DP	Lot 1, DP 1170235
Street address	Sanders Reserve, Sanders Parade, Concord
Local Government	Canada Bay

Sanders Reserve is a public park located between Saltwater Creek in the north (a lined open stormwater channel) and Sanders Parade in the south (See Figure 1 and 2). East of the park is part of the Massey Park Golf Course while to the west is the northern cul-de-sac of Salt Street. The park situated in a predominantly residential area and is accessible to the public. At present the site is mainly open turf with a few stands of trees – particularly in the north-western corner.

2.2 Environmental setting

The site appears to be reclaimed from the former rocky bank of Saltwater Creek. As such the site has between 0.1 and 1.9 metres of fill, which deepens with proximity to Saltwater Creek. Fill material overlies natural residual sandy clay soils (where present) and then bedrock at a depth of between 0.6 and 2.2 metres below the surface. Borelogs of the soil encountered on the site are presented in Appendix A for reference purposes and a cross section of the soils is provided as Figure 3.

The site has a slight slope towards the north and northeast and an elevation of less than 3 metres AHD.

2.3 Summary of site contamination

An environmental assessment was carried out in November 2012 (Environmental Earth Sciences 2012) and discovered that the deeper fill material contains material which on occasions has elevated polyaromatic hydrocarbons (PAHs), and total petroleum hydrocarbons (TPH) at levels exceeding the adopted health-based criteria for parks and open spaces (locations BH3_0.7m BH7_0.9m BH9_0.5m). These contaminants would have been brought onto the site within the fill material during original site reclamation works likely carried out between 1930 and 1978.

Subsequently a layer of soil that is free from this contamination was placed over the impacted soil to provide protection to the public. This “barrier” layer is understood to have

been placed since 2006 however the works were not documented at the time. This barrier appears to be between 0.3 and 0.4 metres thick.

Unfortunately the barrier itself was found to contain a sample of soil with asbestos present in it (BH8_0.3m). The asbestos was found at 0.3 metres and subsequent testing of the surrounding area has shown that the impact is not present at this surface in this location nor were any other instances of asbestos impacted soil discovered in samples analysed elsewhere in the cap.

Figure 2 shows the sampling locations tested to date and where contaminants have been detected.

2.4 Planned future remedial works

A recent reports (Environmental Earth Sciences, 2013) have indicated that, based on the results obtained to date, there is no imminent risk to human health and that the site is suitable for ongoing use. Nevertheless the cap design is less than ideal as its thickness is less than generally recommended and there is no easily identifiable marker layer to warn Council that the cap is being eroded or penetrated during maintenance works.

We understand that Council are working towards eventually replacing the capping material or retrofitting a marker layer. In the meantime, Council have plans to construct a half court basket ball facility in the south eastern portion of the site. This court will require some fill to be brought onto the site to form the level surface and it is planned that this fill will comprise (in part) the asbestos impacted soil from BH8. BH8 surrounds would then the validated and reinstated with validated imported topsoil. This will resolve the risk associated with asbestos identified in the current capping material as there will be no potential for access without breaching the concrete barrier.

A plan of the proposed basket ball court is provided as Figure 4.

3 INTERIM ENVIRONMENTAL MANAGEMENT

This management plan itself is not designed to be a construction management plan for future capping works or construction of the basket ball court – though it may be referred to in future construction environment management plans (CEMPs) that may be prepared.

The EMP is designed to provide advice and controls to protect the public and workers in the interim until those remedial works are complete.

3.1 Environmental management structure

Council and its contractors are responsible for protecting the environment and the health of the general public by ensuring that appropriate protection measures are installed and maintained, and that established environmental management systems are followed.

Personnel with specific responsibilities for scheduled and unscheduled site maintenance activities are also to be identified on specific Work Method Statements (WMSs). The following diagram presents and organisational chart for Council and its subcontractors. Key roles and responsibilities are listed in the following sections.

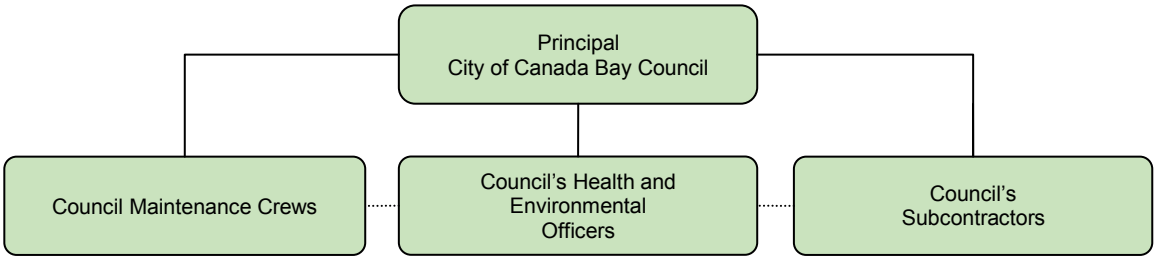


Diagram 1: Organisational Chart

3.2 Key roles and responsibilities

Title	Reports To	General Responsibilities
City of Canada Bay Council - Management	Council's CEO	The key responsibility of Council is to ensure the protection of the environment and site users. Specifically they will: • Ensure Compliance with all relevant Acts, Regulations, Standards and conditions of consent related to site works; • Engage, manage and coordinate suitably qualified subcontractors contractors; • Liaise the community as needed; • Control and coordinate management of environmental issues related to the site until such time as remediation has occurred; • Ensure all subcontractors are aware of their health and environmental obligations and responsibilities; • Establish environmentally safe work practices and provide for relevant training in those practices; • Control any identified environmental deficiency or unsatisfactory condition until it has been corrected; • Implement and verify preventative and corrective action following any environmental non-conformances; • Provide direction and/or supervision in emergency environmental incidents; • Ensure environmental incidents are investigated and reported; and • Advise to stop work in the event of an activity causing a significant risk to health or the environment.
Council's Health and Environmental Officers	City of Canada Bay Council – Management	Council's Health and Environmental Officers will be responsible monitoring compliance with the EMP and will: • Report to the Manager, Environmental Health on all environmental issues; • Provide advice on implementation of the EMP and any other environment issues arising on site; • Ensure that the EMP is current and updated as required; • Assist contractors and council staff in preparation of appropriate work method statements that refer to this EMP; • Conduct regular site inspections; • Record and evaluate the environmental monitoring data collected; • Ensure all environmental documentation required by this EMP is completed on time;

Title	Reports To	General Responsibilities
Council's Health and Environmental Officers	City of Canada Bay Council – Management	• Conduct audits to ensure compliance with the EMP and contractor WMSs; and • Advise Management on preventative or corrective actions where environmental issues are identified.
Council Maintenance Crews	City of Canada Bay Council – Management	The key responsibility of Maintenance Crews is to ensure the successful completion of activities in a manner that does not compromise the health of workers or the general public and is protective of the environment. Specifically the maintenance crews will: • Report to the Manager, Maintenance and Construction on all maintenance activities; • Liaise with Council Environmental and Health Officers in the control and coordination of environmental issues related to the site, subcontractors and suppliers; • Assist in the development of site specific work method statements that refer to recommendations in this EMP; • Assist Council Environmental and Health Officers in recognising where site conditions deteriorate so that rectification works can be carried out as efficiently as possible; • Make recommendations to the site supervisors of ways to improve the management of the environmental aspects of the site; and • Ensure that all Work Method Statements (WMSs) are being adhered to by staff and contactors.
Sub Contractors	City of Canada Bay Council – Management	All subcontractors have an obligation to protect the environment through carrying out their own work with due diligence. In particular, they must: • Comply with statutory and project requirements, as identified at the time of induction, as they apply to the type of work the subcontractors are involved in; • Prepare relevant WMSs with reference to this EMP for the work they will be conducting; • Have the WMSs reviewed by Council's Environmental and Health Officers, and amended if necessary prior to starting works; • Abide by their WMS that relates to the work they are doing; • Report any incident that may result in health or environmental risk that arises in the course of, or in connection with, their work; and • Implement practical ways to control environmental risks.

3.3 Reporting

As the health and environmental risk on this site is mitigated by a soil barrier that could potentially degrade with time, until remediation works are carried out it is important that Council implement a system of routine inspection and reporting. This data will be presented in a number of reports including:

- Routine maintenance personnel checklists;
- Monthly environment inspection reports; and
- Annual summary report for the site.

These reports will provide Council with a document trail for inspection records and ongoing information on the state of the site. Further details on the monitoring and reporting are presented in Section 5

3.4 Environmental training

All staff and contractors working on the site will require appropriate qualifications for the tasks they will perform. These qualifications will be checked against specific WMS's and at the time of the general project induction.

All personnel working on site will be required to undertake the general project induction as described in Section 3.4.1. The training program will be prepared under the direction of the Council's Management and with input from Council Environmental and Health Officers as needed. Records of attendance will be retained by the Council.

3.4.1 General Project Induction

A Site Induction procedure will be developed by Council to train personnel carrying out site works into the specific risks on this site. The induction will reinforce that it is the responsibility of all personnel to adhere to the requirements or the EMP. The Induction will, at a minimum, address:

- Community issues;
- Project contact details;
- Emergency response;
- Location of impacted soil;
- Health and environment protection controls;

A record of training attendance will be maintained by Council.

3.4.2 Subcontractor Control

Before undertaking any work on the site, all subcontractors will be required to prepare their own Work Method Statements including an environmental risk assessment which will be reviewed by the Council.

As part of their contract, all subcontractors will be required to comply with this EMP and relevant WMSs.

3.5 Complaints handling

Complaints handling will be in accordance with Councils procedures which can be found at www.canadabay.nsw.gov.au/customer-service-main-page.html.

The public can contact Council via the following methods:
Post: Locked Bag 1470, Drummoyne NSW 1470
Phone: 9911 6555
Fax: 9911 6550
Email: council@canadabay.nsw.gov.au

3.6 Emergency contacts and response

The following section outlines a list of pertinent contact details should a health-based or pollution incident occur.

TABLE 2 CONTACT DETAILS

Name	Position	Role	Organisation	Contact
Emergency response				
NSW Fire and Rescue	-	Emergency Response	-	000 or (02) 4224 2000
Police	-	Emergency Response	-	000 or (02) 4295 2699
Ambulance	-	Emergency Response	-	000 or 131 233
Environmental Hotline	-	Environmental reporting	NSW EPA	131 555 or (02) 9995 5555
Workcover NSW	-	Incident reporting	WorkCover NSW	13 10 50
Council contacts				
Stephen Ellul	Group Manager, City Services	Maintenance	CCBC	02 9911 6369
Peter Sheehan	Manager Parks and Gardens	Golf course and reserve maintenance	CCBC	02 9911 6368
Nigel Bertus	Manager Environmental Health	Compliance	CCBC	02 9911 6419
Josh Bradshaw	Environmental Health Office	Compliance	CCBC	02 9911 6417
General advice				
Environmental Earth Sciences	Central Region Manager	Environmental Advice	Environmental Earth Sciences NSW	(02) 9922 1777
Public Health Unit	Public Health Officer	Surveillance and public health response	NSW Health	1300 066 055

4 IMPLEMENTATION AND CONTROLS

4.1 Assessment of risks

A common method of assessing risk on contaminated sites is to consider:

- the source of contamination (source);
- who could potentially be exposed to those contaminants (receptors); and

- what possible mechanisms could exist whereby the receptor could come into contact with the contaminant (pathway).

This process is known as a Source/Pathway/Receptor analysis. Where there is no pathway, there is no risk. Where a pathway exists there is a level of risk and the magnitude of that risk will depend on various factors including the toxicity of the substance and the vulnerability of the receptor.

The objective of an EMP is to identify those pathways that need to be controlled to mitigate the risk of a pathway becoming established. The following table outlines the risk assessment for this site.

TABLE 3 SOURCE/PATHWAY/RECEPTOR ANALYSIS

Source	Potential Pathway	Receptor	Risk Level	Notes/mitigation measures
PAH or TPH impacted fill beneath the cap	Leaching of contamination to Saltwater Creek	Ecology of the creek	Negligible	The contaminants have been shown to be of very low leachability therefore they are unlikely to migrate to the creek
	Transport of contaminants in sediment run-off	Ecology of the creek	Low	This pathway could develop if site maintenance workers do not provide adequate sediment controls when disturbing ground beneath the cap.
	Direct human contact or ingestion during manual excavations	Workers	Low	The pathway will probably be created from time to time as maintenance workers need to install or work on services etc. The risk is low as workers should be undertaking works in accordance with work method statements designed to protect them from exposure to unknown contaminants in fill.
	Direct human contact or ingestion as a result of cap eroding or being tampered with	General public	Moderate	The pathway could potentially develop if the site is not maintained. It is unlikely to result in significant levels of exposure but should be controlled nevertheless.
Asbestos impacted soil at depth in the cap near BH8	Inhalation of contaminated dust	Workers or general public	High	In its current state there is no known pathway on the site. The risk becomes high if the overlying cap is removed by physical disturbance or erosion. Hence it is important that the site is routinely monitored and that workers understand the risk, minimise dust generation during their works, and restore the cap upon completion.

4.2 Protection of the general public

4.2.1 General park use

Based on the current understanding of the site conditions there is no risk to the general public using the site. This is because the cap that is present on the site forms a physical barrier to direct contact and will prevent dust from the contaminated layers being generated.

Risk, however, can develop if the cap is allowed to deteriorate, erodes or is tampered with, such as by workers not reinstating it correctly upon completion of excavation tasks. For this reason Council will instigate a program of monthly inspections, and post any intrusive contractor works to ensure that the integrity of the cap is maintained.

4.2.2 During maintenance activities

When contractors penetrate the cap during the course of their activities there exists a risk to the general public of direct contact or inhalation of impacted dust. It is therefore important that all contractors undertaking intrusive works (excavation through the cap):

1. Restrict public access to the work area, preferably through physical barriers;
2. Ensure dust is not generated during their works; and
3. Upon completion ensure the cap is reinstated with clean material.

4.3 Protection of site workers

This section only contains provisions relating to contaminants encountered. It is not intended as a full Work Health and Safety (WHS) plan for future works. The contents of this section should be incorporated into any future WHS Plan prepared for the site and enacted through work method statements (WMS) documents prepared by Council workers and contractors.

4.3.1 General legislation and guidance for WH&S

In addition to adhering to the environmental controls outlined in Section 4.4, any work that is carried out on site should ensure that they follow the current occupational health and safety regulations at the time (i.e. NSW Occupational Health and Safety Regulations, 2001).

A list of examples of relevant occupational health and safety documents that should be consulted in preparation of the work to be undertaken is included in Table 4

TABLE 4 EXAMPLES OF RELEVANT WH&S DOCUMENTS

Type	Governing body	Title of document
Legislation	WorkCover NSW	• Occupational Health and Safety Act 2000
	NSW EPA	• Contaminated Land Management (CLM) Act 1997
		• Protection of the Environment (Operations) Act 1997
Regulations	WorkCover NSW	• Occupational Health and Safety Regulation 2001
Codes of Practice		• Occupational Health & Safety Induction Training for Construction (1999) • Excavation (2000) • Cutting and Drilling Concrete and other Masonry Products (1997) • Moving Plant on Construction Sites (2004) • Noise Management and Protection of Hearing at Work (1997) • Guide to Working with Asbestos (2003)
	Work Safe Australia	• How to Safely Remove Asbestos – Code of Practice (2011)

Type	Governing body	Title of document
Standards	Australian Standards	• AS4482.1 – Guide to the sampling and investigation of potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds • AS4801 – Occupational health and safety management systems – Specification with guidance for use
Guidelines	NSW EPA	• Sampling Design Guidelines (1995) • Guidelines for Consultants Reporting on Contaminated Sites (1997) • Guidelines for the NSW Site Auditor Scheme (2006) • Waste Classification Guidelines. Part 1: Classifying Waste (2008)
	National Environment Protection Council	• National environmental protection (assessment of site contamination) measure (1999)
	NSW Government	• Occupational Health & Safety Management Systems Guidelines (2004) • Managing Urban Stormwater: Soils and Construction (2004), "Blue Book"
Training	WorkCover NSW	• Occupational Health and Safety Induction Course, "White Card"

4.3.2 Minimum general controls

In its undisturbed state the site is suitable for parks and open space use which is by default a more sensitive use than is required for general site maintenance worker activities. Therefore in carrying out routine site maintenance works on the surface (such as mowing, care of gardens etc) there is no increased risk or need for additional health or environment protection controls. In such situations personal protection equipment (PPE) consistent with a standard construction requirement is considered suitable such as:

- Hard hat and high visibility vest;
- long sleeved shirts;
- long pants;
- steel-toe safety shoes/boots.

However, in situations where potential for increased exposure is present, such as during excavation at or below 0.3 metres it is appropriate to ensure additional controls are in place to minimise the exposure to individuals working on the site. Additional recommended PPE includes:

- eye protection
- gloves; and
- a P2 mask

4.3.3 Personal hygiene

During site works personnel will be briefed on the requirements for personal site hygiene. In general, as there are contaminants in soil beneath the capping layer staff who are accessing soil should avoid hand to mouth and hand to face contact until they have washed (e.g. eating, drinking and/or smoking). Wash water and soap should be available during intrusive site works.

4.3.4 Air monitoring

This management plan is designed for interim management of the site where it is envisaged intrusive works, if any, will be minor and limited to services maintenance that would be completed within a few hours to a day. As such we do not consider that there is a need for asbestos air monitoring except where disturbance will be made in the vicinity of the known asbestos impact (BH8).

If large scale excavations are planned for the site, or specific remedial works are being carried out, then these should be conducted under a separate Construction Environment Management Plan (CEMP) and at that time it is recommended that Council conduct air monitoring to verify that asbestos fibres are not being released.

4.4 Environmental management activities and controls

The management activities and controls listed herein are generic controls and are intended to be employed at such times that the site requires ongoing maintenance and repair works, and/or landscaping (including minor excavation work for these purposes), they are not intended for implementation during any major excavation, development or remedial works which may occur at the site.

4.4.1 Excavation recommendations

The key environmental and contaminant health risks during excavation works include:

- release of asbestos fibres and PAH impacted dust to the atmosphere with subsequent inhalation either by workers or the general public. This risk is considered to be high if not controlled;
- dermal contact of PAH and TPH impacted soil by workers. This is a relatively low risk but important to manage nevertheless; and
- restoration works not being carried out appropriately thereby leaving impacted soil at the surface.

To mitigate these risks we recommend the following:

- if works are carried out in the vicinity of the asbestos impacted fill use contractors with appropriate asbestos removal licenses and consider air monitorong. The contractor must be licensed for friable asbestos removal;
- operators should take their time and be well supervised;
- wet down of the work area to reduce dust and keep a water trailer available during the works to keep the area moist;
- do not over wet the area or soil (thereby producing sediment runoff);
- cease work in windy conditions or if dust is being generated;
- provide contractors with appropriate PPE to protect them from asbestos dust and dermal contact with contaminated soil (see Section 4.3);
- ensure good site hygiene practices are maintained (no eating, drinking, smoking in the work area and provide hand wash facilities so workers can wash before having breaks); and
- segregate the upper 30 cm of topsoil fill (capping material) from deeper fill materials and ensure that once works are complete they are placed back into the hole such that

the capping material remains at the surface. If this is not possible then the upper 30cm should be replaced with verified clean material.

4.4.2 Stockpiling recommendations

With respect to stockpile formation the key risks are as follows:

- release of asbestos fibres to the atmosphere exposing workers or the general public to risk of inhalation. This risk is considered to be high if not controlled;
- washing of PAH impacted soil into local waterways through sediment migration. Leachability of PAHs has been shown to be low but these may migrate with sediment (if generated). The environmental risk could be moderate if uncontrolled and would also represent a commercial risk through fines or prosecution if allowed to occur;
- dermal contact leading to exposure to TPH and PAH impacted soil. Provided excavation works are controlled, and the stockpiles are only a temporary measure the risk is considered low; and
- until otherwise classified the soil shall be considered to be Hazardous Waste. Therefore materials are NOT to be moved to another site until classified. If so you would be technically storing Hazardous Waste on a site not licensed to do so and could face prosecution. This would not apply if you are storing the waste on the site where it has been generated.

In order to mitigate these risks we recommend the following:

- keep stockpiles on site until classified;
- provide temporary fencing around stockpiles to prevent public access;
- stockpiles should be formed on MDPE plastic sheeting to prevent vertical leaching and so that the stockpile footprints do not require validation upon removal;
- as the stockpile is formed it should be tamped down and the final surface sprayed with water;
- once a stockpile is formed the edges of the underlying MDPE should be raised up around the stockpile and pegged into place so that should a significant rainfall event occur, overland flow will be diverted around the stockpile without coming into contact with the contents;
- stockpiles should then be covered in MDPE plastic sheeting with sufficient overlap that soil does not become exposed at the join (e.g. 0.5 m overlap);
- plastic sheeting covering the stockpile should extend beyond the base of the stockpile so all water is shed away from the stockpile;
- the cover should be pegged in place to prevent it rising or blowing off in windy conditions; and
- a program of daily inspections should be implemented while the stockpile is onsite to ensure the condition of the cover is maintained.

4.4.3 Dust suppression

The objective of dust management is to minimise the effects of dust caused by excavation works on air quality. This is to protect the general community including immediate and distant residents outside the site. Works will be conducted in a manner as to not cause excessive dust on or beyond the site boundaries.

Potential sources of dust generation at the site include:

- minor excavation and landscaping works (service trenches, construction of amenities and footpaths etc) and subsequent stockpiling of soil;
- loading soil/mulch/gravels on or off trucks; and
- wind movement across stockpiled material and exposed soil areas.

All site works must be managed to ensure that dust is minimised and prevented from leaving the site.

General control measures and specific requirements

- Undertake regular dust inspections and/or dust monitoring program when site maintenance or excavation is occurring;
- ensure all exposed soil and any vehicle routes are regularly dampened to minimise dust generation;
- during maintenance works where stockpiles are made, or where bare earth is exposed, monitor the dust conditions within the site and along the site boundary; and
- if fences are erected for works, install shade cloth on all fence panels to minimise dust movement offsite;

Mitigation measures for dust:

- if strong wind conditions are expected, intensify dust monitoring and avoid high risk activities or reschedule them to fit better with prevailing and forecast weather conditions; and
- appropriate dust monitoring must be undertaken and a water cart or hose utilised to dampen all bare earth;
- personnel working in areas during potential dust generating works are to wear the appropriate personal protection equipment (PPE);

4.4.4 Sediment and erosion control

It is important that sediment and erosion is controlled during any site works. The following provides some guidance for management of erosion and sediment:

Runoff:

- Any drain on site and in the immediate vicinity of excavation works must be blocked or barricaded and silt fencing, sandbags and/or hay bales to prevent offsite sediment movement to ensure compliance with the Protection of the Environment Operations Act 1997 (POEO Act).
- Runoff water, including that due to rain, which has not been in contact with any contaminated material, is not of concern.
- Any surface water that comes into contact with contaminated soil must be collected for disposal.

Note: excavations at the site are best commenced if fine, dry weather is forecast for the next 48 hour working period, particularly as works carried out under this EMP are likely to be small scale and minimal excavations are expected.

Maintenance of surrounding roads:

- During the transportation of any soil from the site, care must be taken so that soil is not deposited on nearby roads.
- Haul roads out of the site are to be maintained in a clean manner at all times.
- Trucks should be loaded on sealed or clean surfaces where possible and covered before leaving the site.
- Contractors shall monitor the exit points from the site and any evidence of soil being transported offsite on truck tyres must be investigated immediately and corrective actions implemented.

Erosion and sediment control structures:

- Diversionary bunds should be created to direct stormwater away from the excavations and work area.
- Stockpiled soil which is awaiting reinstatement into the void should be covered as per Section 4.4.2 until reinstatement commences.

4.4.5 Soil material disposal

Any soil generated at the site which requires disposal should be stockpiled and subsequently classified by an appropriately qualified environmental consultant for disposal. Samples should, be collected at a rate of at least one sample per 25 m^3.

A qualified consultant shall prepare a waste classification letter for the receiving waste facility as per the NSW EPA (2009) *Waste Classification Guidelines Part 1: Classifying Waste.* Once classified, the material can be disposed of from the site only by appropriately licensed transportation contractors to an appropriately licensed facility.

At all stages appropriate documentation should be maintained including but not limited to:

- waste classification report;
- waste consignment documentation; and
- landfill disposal dockets.

4.4.6 Imported fill

If it is considered necessary to import fill the material is to be analysed to confirm it meets criteria for parks and open space land use as per the NEPM (1999). Only excavated natural material (ENM) or virgin excavated natural material (VENM) is to be used.

Should a certificate of analysis not be available from the borrow site, it is recommended that an appropriate number of samples dependant on quantity) of imported fill be collected for validation purposes. We anticipated one sample per 100 m^3 per source site of homogeneous VENM/ENM to be sufficient, however in order to have a statistically defensible classification a minimum of eight (8) samples per source site is required.

Testing of at least the following; total petroleum hydrocarbons (TPH) benzene, toluene, ethylbenzene, and xylene (BTEX), polyaromatic hydrocarbons (PAHs) organochlorine pesticides (OCPs), polychlorinated biphenyls (PCBs), heavy metals and asbestos is required.

4.5 Unexpected findings

An unexpected findings protocol (UFP) shall be developed for implementation during any excavation works which are undertaken as park of ongoing maintenance and repair of the site. The protocol will ensure appropriate management of soil and/or fill material contaminated with hazardous materials, should they be encountered during site works.

Any material that is uncovered during works deemed to be foreign should be scrutinised further to determine if contaminants are present. The main features to note are as follows:

- soil or fill material that differs from previously identified materials onsite;
- asbestos or suspected asbestos containing material;
- materials with visible fibres;
- materials with obvious unnatural odours or anthropogenic artefacts throughout; and
- materials noticeably stained or with unusual colours.

The purpose and importance of the UFP shall be discussed during any site inductions where excavation will be undertaken.

Material that is being managed under a UFP shall, until it's risk is known, be stockpiled separately, in accordance with the protocols provided in Section 4.4.2 and remain covered to reduce dust generation or leaching during rainfall events.

The UFP shall include instructions for validation of the resulting excavation and testing of the stockpiled substance to either confirm it's suitably to remain onsite or allow for appropriate waste classification. An example UFP is provided in Appendix B.

5 MONITORING AND REVIEW

5.1 Environmental monitoring

A key component of ensuring the site remains safe for public use is a robust program of monitoring the cap condition. This includes routine inspections and also inspections during and subsequent to intrusive works.

5.1.1 Routine site inspections

Council is to implement a program of monthly inspections on the site. The inspection is to be carried out by a trained Health and Environment Officer.

Objective:

- To ensure the cap integrity is maintained

Method:

- Site inspection and walkover on a 20 metre grid
- The following shall be noted:
    - condition of the surface;

- any deteriorations such as erosion gullies or holes forming or any manual excavations; and
- any bare soil that could begin to erode;

Report structure:

- A report structure to be agreed with Councils Management but is to include:
  - Date of inspection;
  - Personnel involved;
  - Findings of the routine inspection;
  - Provide a summary of any recommendations.

Reports are to be passed on to Council's Management for corrective action (if needed) or kept as a record of the site condition on the inspection date.

5.1.2 Additional inspections during intrusive site works

During any planned excavation works by Council it is important that the site also be inspected independently by a Council Health and Environment Officer. The inspection is to be carried out on a daily basis during extended works and at cessation of works:

The inspector shall note at least:

- Date and personnel onsite;
- Activities being undertaken;
- That works are being undertaken in accordance with an approved WMS;
- Level of compliance with the WMS;
- Condition of all environmental controls;

In the event of a non conformance this information will be fed back to Councils management and corrective actions implemented in a timely manner. Where no issues are identified the record should be kept for reference purposes.

5.1.3 Environmental Records

Environmental records, which will be collated by the Councils Management shall include the following:

- EMP distribution records;
- Training and induction records;
- Environmental incident reports;
- Environmental complaint records;
- Non-conformances and corrective and preventative action reports;
- Environmental site inspection monthly and unscheduled checklists and
- Environmental monitoring data and reports (e.g. any air monitoring results, waste classification reports etc);

5.1.4 Summary of Environmental Monitoring

A summary of monitoring requirements for the project is provided in Table 5 (following page).

TABLE 5 SUMMARY OF ENVIRONMENTAL MONITORING REQUIREMENTS

Issue	Location	Monitoring Parameter	Monitoring Frequency	Performance Criteria/Objective	Documentation
Status of the cap	Entire site	Visual inspections of erosion and sediment controls	Scheduled monthly inspections. Daily inspections during intrusive works	Suitable controls in place and in good condition	Environmental inspection checklist (Appendix C)
	Rehabilitated areas	Visual inspections of erosion and sediment controls	Daily and following storm events until re-vegetated	Suitable controls in place and in good condition	Environmental inspection checklist (Appendix C)
Contaminated soil	Stockpiles	Visual inspection of erosion and sediment controls and for evidence of erosion	Daily while stockpiles remain onsite	Suitable controls in place and in good condition	Environmental inspection checklist (Appendix C)
	Entire site	Imported fill materials to be tested free of contaminants or have certification	Certification or 1 sample per 100m^3	NSW EPA guidelines	Council tracking records
Waste disposal	Stockpiles	Stockpile classification for appropriate waste classification	1 sample per 25m^3	NSW EPA guidelines	Waste classification reports and Council material disposal tracking records.
Air quality	Site boundaries at selected locations	Asbestos air monitoring	Daily during excavation in vicinity of BH8	Safe Work Australia guidelines	Air monitoring reports
Traffic access and management	Access roads and pavements	Inspection of road surfaces for spoil or oil spillage	Daily	No offsite pollution	Environmental inspection checklist (Appendix C)

5.2 Corrective actions

Councils Management is responsible for ensuring the ongoing safe condition of the site.

An environmental non conformance will be detected through verification processes such as monitoring, inspections and receipt of complaints. The process for managing environmental issues are summarised as follows:

- when an environmental issue is detected, the details will be recorded;
- Council will then investigate the reasons for the issue and determine appropriate corrective or preventative actions and the responsibility and time for completion of the actions. The details of the discussion will be entered into an Environmental Incident and Action Register or similar;
- where the environmental issue is associated with an inspection or monitoring event, cross referencing to those results will be recorded;
- once an action is completed, the register will be updated to close the action including input of comments and completion date;
- the Environmental Incident and Action Register will be reviewed on a quarterly basis ensure actions are being completed effectively and on time;
- where an issue is of a more serious nature, has been identified repeatedly or exceeds regulatory obligations, the work on the identified operation will be stopped until action is taken to eliminate the environmental issue.

5.3 Environmental Management Review and Improvement

This section outlines the process that will be used to review this EMP so it remains relevant and up to date.

The EMP is a dynamic document which will be reviewed regularly so that it remains in line with the project should changes onsite occur. An review may be called for by Council's management team at any time to assess the performance of the EMP and to suggest changes.

The agenda for the management reviews will typically include:

- management effectiveness;
- adequacy of resources;
- results of the inspections and audits;
- critical non-conformance or repeated non-conformances;
- overall performance against benchmarks; and
- organisation changes.

Results of reviews should aim at continual improvement of the processes through:

- identifying areas where improvements to environmental management will lead to improved environmental performance;
- identifying causes of non-conformance;

- developing and implementing corrective and preventative actions to address reasons for non conformance;
- verifying and monitoring the effectiveness of the corrective and preventative actions; and
- documenting any process improvements.

Implementation of strategies/techniques to improve the EMP is the joint responsibility of all personnel involved with the site. Documenting the changes to the EMP will be the responsibility of Council.

6 LIMITATIONS

This report has been prepared by Environmental Earth Sciences NSW ABN 109 404 006 in response to and subject to the following limitations:

1. The specific instructions received from City of Canada Bay;
2. The specific scope of works set out in PO113055 issued by Environmental Earth Sciences NSW for and on behalf of the City of Canada Bay;
3. May not be relied upon by any third party not named in this report for any purpose except with the prior written consent of Environmental Earth Sciences NSW (which consent may or may not be given at the discretion of Environmental Earth Sciences NSW);
4. This report comprises the formal report, documentation sections, tables, figures and appendices as referred to in the index to this report and must not be released to any third party or copied in part without all the material included in this report for any reason;
5. The report only relates to the site referred to in the scope of works being located at Sanders Reserve, Sanders Parade, Concord NSW ("the site");
6. The report relates to the site as at the date of the report as conditions may change thereafter due to natural processes and/or site activities;
7. No warranty or guarantee is made in regard to any other use than as specified in the scope of works and only applies to the depth tested and reported in this report;
8. Fill, soil, groundwater and rock to the depth tested on the site may be fit for the use specified in this report. Unless it is expressly stated in this report, the fill, soil and/or rock may not be suitable for classification as clean fill if deposited off site; and
9. Our General Limitations set out at the back of the body of this report.

7 REFERENCES

Environmental Earth Sciences 2012, *Contamination assessment of a landfill cap at Sanders Reserve, Sanders Parade, Concord, NSW*. Report to City of Canada Bay, November 2012 (report number 112073).

Environmental Earth Sciences 2013, *Limited asbestos delineation at Sanders Reserve, Sanders Parade, Concord, NSW*. Report to City of Canada Bay, January 2013 (report number 112094).

National Environment Protection Council (NEPC) 1999, *National Environment Protection (Assessment of Site Contamination) Measure*

NSW Department of Infrastructure, Planning and Natural Resources (DIPNR) 2004, *Guideline for the Preparation of Environmental Management Plans*.

NSW Department of Environment and Conservation (DEC) 2006, *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme*.

NSW Environment Protection Authority (EPA) 2009, *Waste Classification Guidelines, Part 1: Classifying Waste*

ENVIRONMENTAL EARTH SCIENCES GENERAL LIMITATIONS

Scope of services

The work presented in this report is Environmental Earth Sciences response to the specific scope of works requested by, planned with and approved by the client. It cannot be relied on by any other third party for any purpose except with our prior written consent. Client may distribute this report to other parties and in doing so warrants that the report is suitable for the purpose it was intended for. However, any party wishing to rely on this report should contact us to determine the suitability of this report for their specific purpose.

Data should not be separated from the report

A report is provided inclusive of all documentation sections, limitations, tables, figures and appendices and should not be provided or copied in part without all supporting documentation for any reason, because misinterpretation may occur.

Subsurface conditions change

Understanding an environmental study will reduce exposure to the risk of the presence of contaminated soil and or groundwater. However, contaminants may be present in areas that were not investigated, or may migrate to other areas. Analysis cannot cover every type of contaminant that could possibly be present. When combined with field observations, field measurements and professional judgement, this approach increases the probability of identifying contaminated soil and or groundwater. Under no circumstances can it be considered that these findings represent the actual condition of the site at all points.

Environmental studies identify actual sub-surface conditions only at those points where samples are taken, when they are taken. Actual conditions between sampling locations differ from those inferred because no professional, no matter how qualified, and no sub-surface exploration program, no matter how comprehensive, can reveal what is hidden below the ground surface. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from that predicted. Nothing can be done to prevent the unanticipated. However, steps can be taken to help minimize the impact. For this reason, site owners should retain our services.

Problems with interpretation by others

Advice and interpretation is provided on the basis that subsequent work will be undertaken by Environmental Earth Sciences NSW. This will identify variances, maintain consistency in how data is interpreted, conduct additional tests that may be necessary and recommend solutions to problems encountered on site. Other parties may misinterpret our work and we cannot be responsible for how the information in this report is used. If further data is collected or comes to light we reserve the right to alter their conclusions.

Obtain regulatory approval

The investigation and remediation of contaminated sites is a field in which legislation and interpretation of legislation is changing rapidly. Our interpretation of the investigation findings should not be taken to be that of any other party. When approval from a statutory authority is required for a project, that approval should be directly sought by the client.

Limit of liability

This study has been carried out to a particular scope of works at a specified site and should not be used for any other purpose. This report is provided on the condition that Environmental Earth Sciences NSW disclaims all liability to any person or entity other than the client in respect of anything done or omitted to be done and of the consequence of anything done or omitted to be done by any such person in reliance, whether in whole or in part, on the contents of this report. Furthermore, Environmental Earth Sciences NSW disclaims all liability in respect of anything done or omitted to be done and of the consequence of anything done or omitted to be done by the client, or any such person in reliance, whether in whole or any part of the contents of this report of all matters not stated in the brief outlined in Environmental Earth Sciences NSW's proposal number and according to Environmental Earth Sciences general terms and conditions and special terms and conditions for contaminated sites.

To the maximum extent permitted by law, we exclude all liability of whatever nature, whether in contract, tort or otherwise, for the acts, omissions or default, whether negligent or otherwise for any loss or damage whatsoever that may arise in any way in connection with the supply of services. Under circumstances where liability cannot be excluded, such liability is limited to the value of the purchased service.

FIGURES

Source: UBD Australian City Streets (version 6)

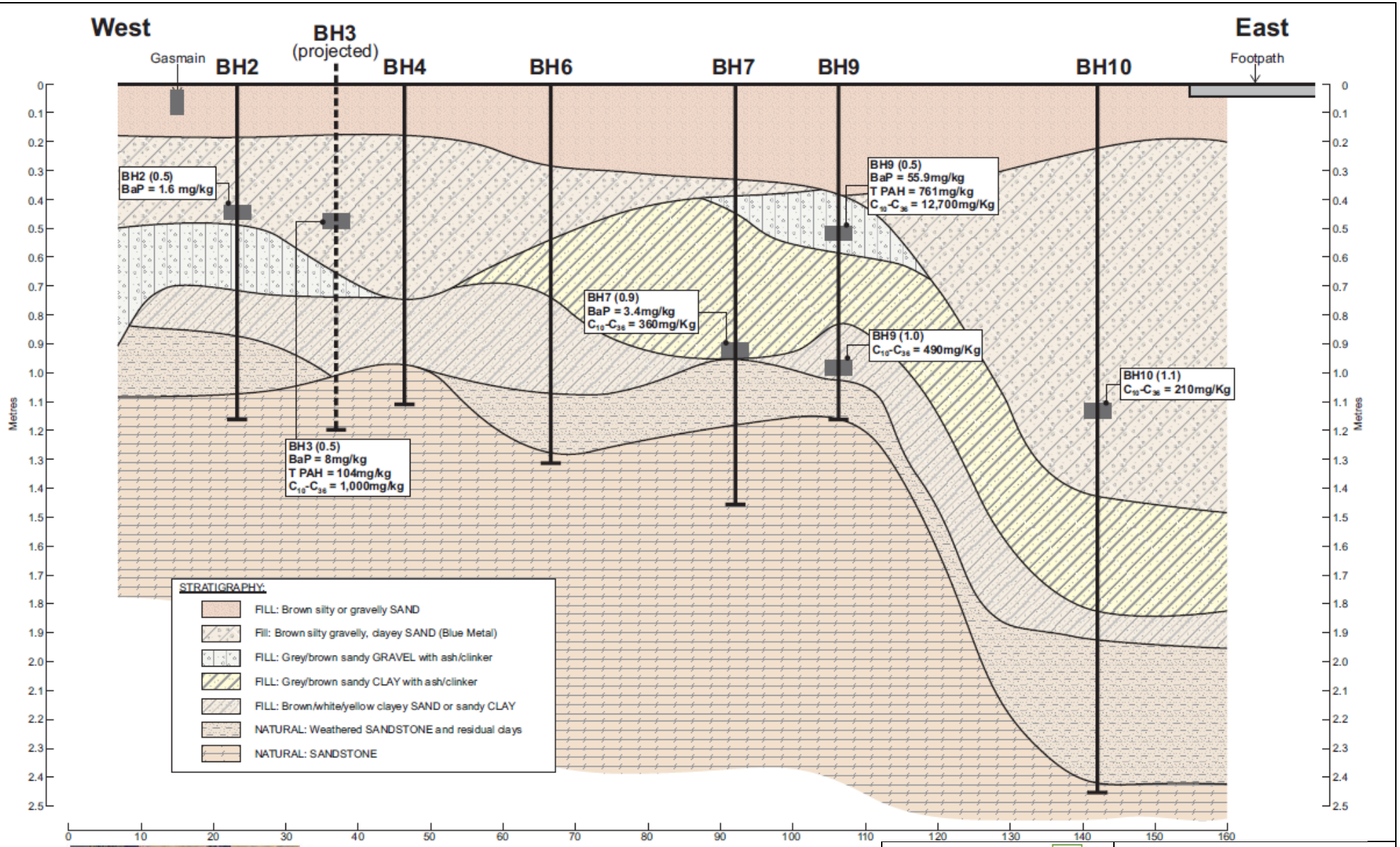
ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

Title: **Site Locality Map**		
Location: **Sanders Reserve, Concord, NSW**		
Client: **City of Canada Bay**		Job No: **112073**
Drawn By: **LB**	Scale: **As shown**	Source: **NearMap**
Proj Man: **AP**	Date: **Oct. 2012**	**Figure 1**

- Sampling locations (approximate) – sampled 26/09/2012
- Sampling locations (approximate) – sampled 09/12/2012 and 19/12/2012
- Asbestos hotspot area (approximate)

ENVIRONMENTAL EARTH SCIENCES

Title: **Sampling locations**		
Location: **Sanders Reserve, Concord**		
Client: **City of Canada Bay**		Job No: **112094**
Drawn By: **NC**	Scale: **As Shown**	Source: **Nearmap**
Proj Man: **CM**	Date: **Dec 2012**	**Figure 2**



CRITERIA: (mg/Kg)

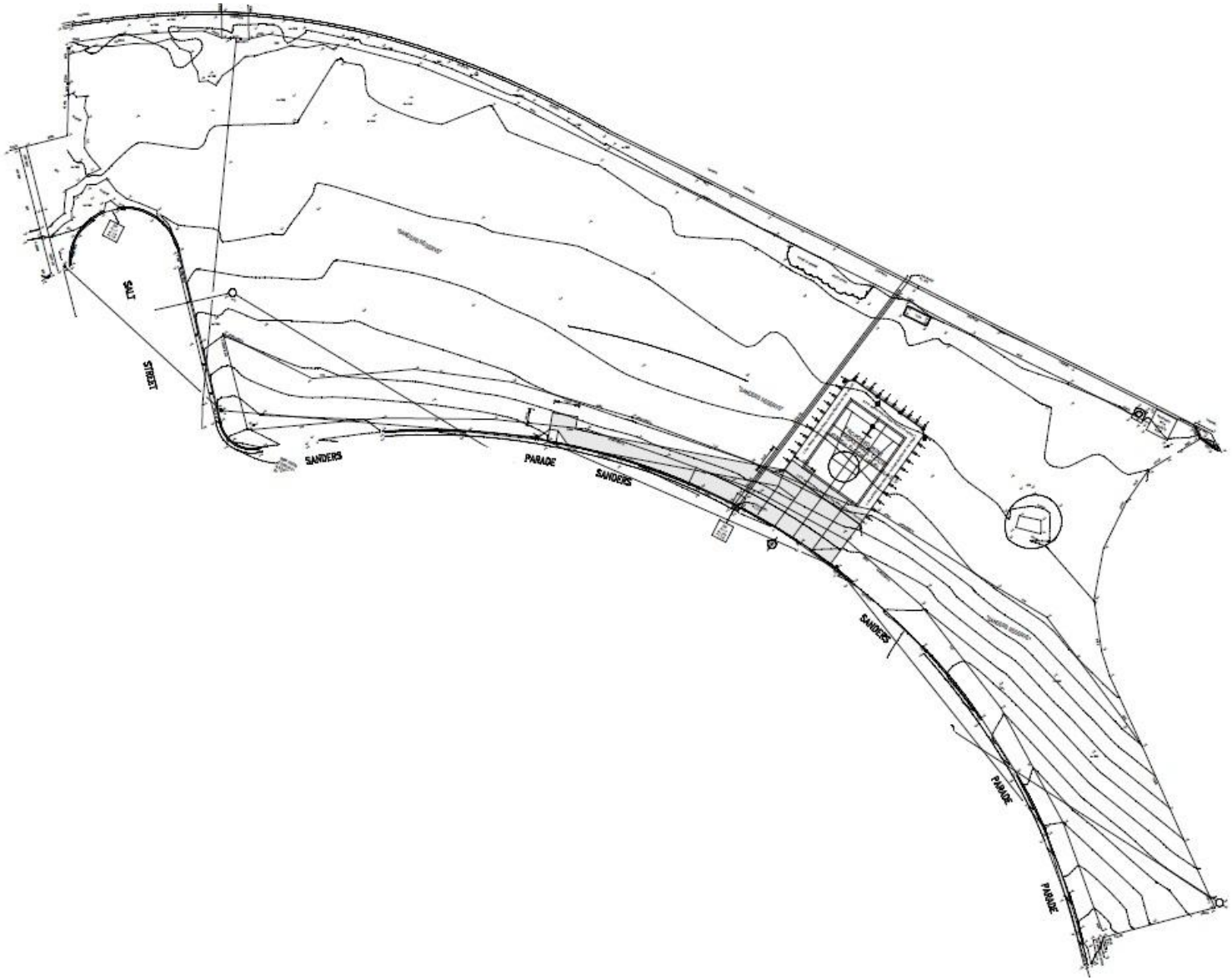
BaP	= 2	(DEC, 2006)	→ Col.3
T PAH	= 40	(DEC, 2006)	→ Col.3
C_6-C_9	= 65	(NSW EPA 1994)	
C_{10}-C_{36}	= 1000	(NSW EPA 1994)	

ENVIRONMENTAL EARTH SCIENCES

Title: **Cross Section**

Location: **Sanders Reserve, Sanders Pde, Concord**

Client: **Insert Clients Name**		Job No: **113030**
Drawn By: **LB**	Scale: **Schematic**	Source:
Proj Man: **CM**	Date: **Oct 2012**	**Figure 3**



ENVIRONMENTAL EARTH SCIENCES	Title: **Proposed Mini Basketball Court**	
	Location: **Sanders Reserve, Concord**	
Client: **City of Canada Bay**		Job No: **112094**
Drawn By: **Council**	Scale: **schematic**	Source: **Council**
Proj Man: **CM**	Date: **March 2013**	**Figure 4**

APPENDIX A BORELOGS

LOCATION: Sanders Reserve	JOB No. 112073	BOREHOLE LOG: BH1	LOGGED BY: C. Newland
EASTING:	DRILL TYPE: Push Tube		
NORTHING:	DATE STARTED: 26/09/2012	CLIENT: City of Canada Bay	APPROVED: A. Plioplis
ELEVATION:	DATE FINISHED: 26/09/2012		

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	FILL: brown, silty, fine SAND (topsoil); rootlets present; becoming yellow with depth			D				
.5				D		0.2		
.8	NATURAL: grey, weathered SANDSTONE Yellow at 0.85m Red/orange at 0.95m			D		1.1		
1	End of hole at 0.95m Refusal on sandstone							

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Sanders Reserve	JOB No. 112073	BOREHOLE LOG: BH2	LOGGED BY:
EASTING:	DRILL TYPE: Push Tube		C. Newland
NORTHING:	DATE STARTED: 26/09/2012	CLIENT: City of Canada Bay	APPROVED:
ELEVATION:	DATE FINISHED: 26/09/2012		A. Plioplis

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	FILL: Firm, brown, silty, firm SAND; rootlets present			D				
.1								
.2	FILL: Brown, gravelly silty SAND; gravel is fine grained, sub-angular to sub-rounded, mixed lithology (predominantly blue metal and sandstone)							
.3								
.4				D		0		
.5	FILL: Brown/grey, sandy clayey GRAVEL; gravel is fine grained, sub-angular to sub-rounded, predominantly sandstone							
.6								
.7	Thin ash/clinker layer			D		0.2		
.8	FILL: Brown, slightly clayey SAND			D				
.9	NATURAL: White/yellow weathered SANDSTONE							
1								
1.1	NATURAL: White/yellow SANDSTONE			D		0.4		
1.2	End of hole at 1.15m Refusal on sandstone			D				
1.3								
1.4								
1.5								
1.6								
1.7								
1.8								
1.9								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Sanders Reserve	JOB No. 112073	BOREHOLE LOG: BH3	LOGGED BY: C. Newland
EASTING:	DRILL TYPE: Push Tube		
NORTHING:	DATE STARTED: 26/09/2012	CLIENT: City of Canada Bay	APPROVED: A. Plioplis
ELEVATION:	DATE FINISHED: 26/09/2012		

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	FILL: Brown, silty SAND (topsoil); rootlets present			D				
.1								
.2	FILL: Grey/brown, very gravelly SAND; gravel fine to coarse grained, sub-angular to sub-rounded, predominantly blue metal			D				
.3	FILL: Brown, silty SAND; rootlest present							
.4				D				
.5	FILL: Grey/brown, very gravelly SAND; gravel fine to coarse grained, sub-angular to sub-rounded, predominantly blue metal			D	0.2			
.6								
.7	FILL: Brown/red, silty SAND; minor gravel of fine to coarse grained sandstone Layer of black ash/clinker at 0.7-0.75m			D	0.5			
.8								
.9								
1								
1.1	NATURAL: Weathered, white SANDSTONE			D	0.1			
1.2	End of hole at 1.2m Refusal on sandstone							
1.3								
1.4								
1.5								
1.6								
1.7								
1.8								
1.9								
2								

LOCATION: Sanders Reserve	JOB No. 112073	BOREHOLE LOG: BH4	LOGGED BY:
EASTING:	DRILL TYPE: Push Tube		C. Newland
NORTHING:	DATE STARTED: 26/09/2012	CLIENT: City of Canada Bay	APPROVED:
ELEVATION:	DATE FINISHED: 26/09/2012		A. Plioplis

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	FILL: Brown, silty SAND (topsoil); rootlets present			D				
.1								
.2	FILL: Brown/grey, very gravelly SAND; gravel is fine to coarse grained, angular to sub-angular blue metal			D		0.6		
.3								
.4	FILL: Brown, silty, gravely SAND; gravel is fine grained, predominantly blue metal and sandstone							
.5								
.6				D				
.7								
.8	FILL: Brown, slightly clayey, gravelly SAND; gravel is fine to medium grained, angular to sub-angular, predominantly blue metal and sandstone			M		0.9		
.9								
1	NATURAL: White SANDSTONE			D		0.9		
1.1	End of hole at 1.1m Refusal on sandstone							
1.2								
1.3								
1.4								
1.5								
1.6								
1.7								
1.8								
1.9								
2								

LOCATION: Sanders Reserve	JOB No. 112073	BOREHOLE LOG: BH5	LOGGED BY: C. Newland
EASTING:	DRILL TYPE: Push Tube		
NORTHING:	DATE STARTED: 26/09/2012	CLIENT: City of Canada Bay	APPROVED: A. Plioplis
ELEVATION:	DATE FINISHED: 26/09/2012		

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	FILL: Brown, silty SAND (topsoil); rootlets present			D		1.1		
.6	FILL: Red/brown SANDSTONE; highly weathered			D		0.4		
.9	FILL: Dark brown, silty, slightly clayey SAND; minor gravel, fine to coarse grained, predominantly blue metal			D				
1.1	NATURAL: White/ yellow, weathered SANDSTONE			D		0.1		
1.2	NATURAL: SANDSTONE			D				
1.3	End of hole at 1.25m Refusal on sandstone							
1.4								
1.5								
1.6								
1.7								
1.8								
1.9								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Sanders Reserve	JOB No. 112073	BOREHOLE LOG: BH6	LOGGED BY: C. Newland
EASTING:	DRILL TYPE: Push Tube		
NORTHING:	DATE STARTED: 26/09/2012	CLIENT: City of Canada Bay	APPROVED: A. Plioplis
ELEVATION:	DATE FINISHED: 26/09/2012		

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	FILL: Brown, silty SAND (topsoil); rootlets present			D				
.3	FILL: Grey/brown, very gravelly SAND; gravel is fine to coarse grained, angular to sub-angular blue metal			D		0.2		
.5	FILL: Firm, brown, gravelly, sandy CLAY; gravel is angular to sub-angular, fine to medium grained, blue metal and sandstone			D				
.7	NATURAL: White/yellow, clayey SAND; some weathered sandstone			M		0.3		
1.1	NATURAL: White/yellow, weathered SANDSTONE			D		0.1		
1.3	End of hole at 1.3m Refusal on sandstone							
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Sanders Reserve	JOB No. 112073	BOREHOLE LOG: BH7	LOGGED BY: C. Newland
EASTING:	DRILL TYPE: Push Tube and SFA		
NORTHING:	DATE STARTED: 26/09/2012	CLIENT: City of Canada Bay	APPROVED: A. Plioplis
ELEVATION:	DATE FINISHED: 26/09/2012		

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	FILL: Brown, silty SAND (topsoil); rootlets present			D				
.3	FILL: Grey/brown, very gravelly SAND; gravel is fine to coarse grained, angular to sub-angular blue metal			D		0.3		
.5	FILL: Firm, brown, gravelly, sandy CLAY; gravel is angular to sub-angular, fine to medium grained, blue metal and sandstone			D		0.2		
.9	NATURAL: White/yellow, clayey SAND; some weathered sandstone			M				
1.2	NATURAL: White/yellow SANDSTONE			D		0.2		Push tube to 1.2m Solid flight auger >1.2m
1.45	End of hole at 1.45m Refusal on sandstone							
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Sanders Reserve	JOB No. 112073	BOREHOLE LOG: BH8	LOGGED BY: C. Newland
EASTING:	DRILL TYPE: Push Tube & SFA		
NORTHING:	DATE STARTED: 26/09/2012	CLIENT: City of Canada Bay	APPROVED: A. Plioplis
ELEVATION:	DATE FINISHED: 26/09/2012		

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	FILL: Brown, silty gravelly SAND; gravel is fine to medium grained, angular to sub-angular blue metal			D		0		Rootlets in top 0.5m
.6	NATURAL: White/yellow, weathered SANDSTONE with minor clay			D		0		
1	NATURAL: White/yellow SANDSTONE							Push tube to 1.0m Solid flight auger >1.0m
1.4	End of hole at 1.4m Refusal on sandstone							
2								

LOCATION: Sanders Reserve	JOB No. 112073	BOREHOLE LOG: BH9	LOGGED BY:
EASTING:	DRILL TYPE: Push Tube		C. Newland
NORTHING:	DATE STARTED: 26/09/2012	CLIENT: City of Canada Bay	APPROVED:
ELEVATION:	DATE FINISHED: 26/09/2012		A. Plioplis

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

STRATIGRAPHY

Depth (metres)	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0							
.1	FILL: Brown, silty , gravelly SAND (topsoil); rootlets present; gravel is fine to coarse grained, angular to sub-angular blue metal		D				
.2							
.3			D		0.1		
.4	FILL: Grey/brown, sandy GRAVEL; sub-angular to angular, fine to coarse grained blue metal and slag						Faint hydrocarbon odour (0.45-0.5m)
.5	Black stain, ash clinker gravel at 0.45-0.5m		D		0.0		
.6							
.7							
.8	FILL: Stiff, brown, sandy gravelly CLAY;. minor gravel present						
.9			D				
1	FILL: Dark brown, slightly gravelly SAND; rootlets present		M		0.2		relict topsoil? (0.95-1.05m)
1.1	NATURAL: White/orange SANDSTONE		D				
1.2	End of hole at 1.15m Refusal on sandstone						
1.3							
1.4							
1.5							
1.6							
1.7							
1.8							
1.9							
2							

LOCATION: Sanders Reserve	JOB No. 112073	BOREHOLE LOG: BH10	LOGGED BY: C. Newland
EASTING:	DRILL TYPE: Push Tube & SFA		
NORTHING:	DATE STARTED: 26/09/2012	CLIENT: City of Canada Bay	APPROVED: A. Plioplis
ELEVATION:	DATE FINISHED: 26/09/2012		

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	FILL: Brown, silty SAND (topsoil); rootlest present							
.1				D				
.2	FILL: Dark brown, clayey, slightly gravelly SAND; gravel is fine to coarse grained, sub-angular blue metal							
.3								
.4								
.5				M		0		
.6								
.7								
.8								
.9								
1								
1.1				M		0.2		Solid flight auger to 1.1m Push tube >1.1m
1.2								
1.3								
1.4	FILL: Soft, dark brown/grey, sandy CLAY; minor fine to medium grained gravel & clinker			MS				
1.5	FILL: Soft to firm, light brown, sandy CLAY							
1.6								
1.7								
1.8				S		0.1		
1.9	NATURAL: Firm, white, silty sandy CLAY; weathered sandstone							
2	Orange/red layers at 2.0-2.1m, becoming stiff past 2.0m			M		1.2		

LOCATION: Sanders Reserve	JOB No. 112073	BOREHOLE LOG: BH10	LOGGED BY: C. Newland
EASTING:	DRILL TYPE: Push Tube & SFA		
NORTHING:	DATE STARTED: 26/09/2012	CLIENT: City of Canada Bay	APPROVED: A. Plioplis
ELEVATION:	DATE FINISHED: 26/09/2012		

Sample
Disturbed
Undisturbed
Moisture
M=Moist D=Dry S=Saturated

Groundwater
Water Strike
Standing Water Level

PAGE #: 2/2

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
2.1								
2.2	NATURAL: White/yellow SANDSTONE							
2.3								
2.4	End of hole at 2.4m Refusal on sandstone							
2.5								
2.6								
2.7								
2.8								
2.9								
3.								
3.1								
3.2								
3.3								
3.4								
3.5								
3.6								
3.7								
3.8								
3.9								
4.								
4.1								

LOCATION: Sanders Reserve	JOB No. 112073	BOREHOLE LOG: BH11	LOGGED BY: C. Newland
EASTING:	DRILL TYPE: Push Tube		
NORTHING:	DATE STARTED: 26/09/2012	CLIENT: City of Canada Bay	APPROVED: A. Plioplis
ELEVATION:	DATE FINISHED: 26/09/2012		

Sample: Disturbed, Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike, Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	FILL: Brown, clayey, gravelly SAND (topsoil)			D		0.3		
.3	FILL: Dark grey/black, sandy GRAVEL consisting of blue metal, coal fragments, ash			D		0.2		Small cobble of slag
.5	FILL: Brown/red, compact sandy GRAVEL consisting of crushed sandstone, fine to coarse grained, angular to sub-angular			D				Small cobble of slag
.9	FILL: Stiff, brown sandy, gravelly CLAY			D				
1	FILL: Dark brown. slightly gravelly SAND; rootlets present			M		0		
1.2	NATURAL: Weathered sandstone with stiff white/orange, sandy CLAY							
1.3	NATURAL: SANDSTONE							
	End of hole at 1.3m Refusal on sandstone							

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Sanders Reserve	JOB No. 112073	BOREHOLE LOG: Surface Samples BH2-BH7	LOGGED BY:
EASTING:	DRILL TYPE: Shovel		A. Plioplis
NORTHING:	DATE STARTED: 10/10/2012	CLIENT: City of Canada Bay	APPROVED:
ELEVATION:	DATE FINISHED: 10/10/2012		A. Plioplis

Sample: Disturbed; Undisturbed

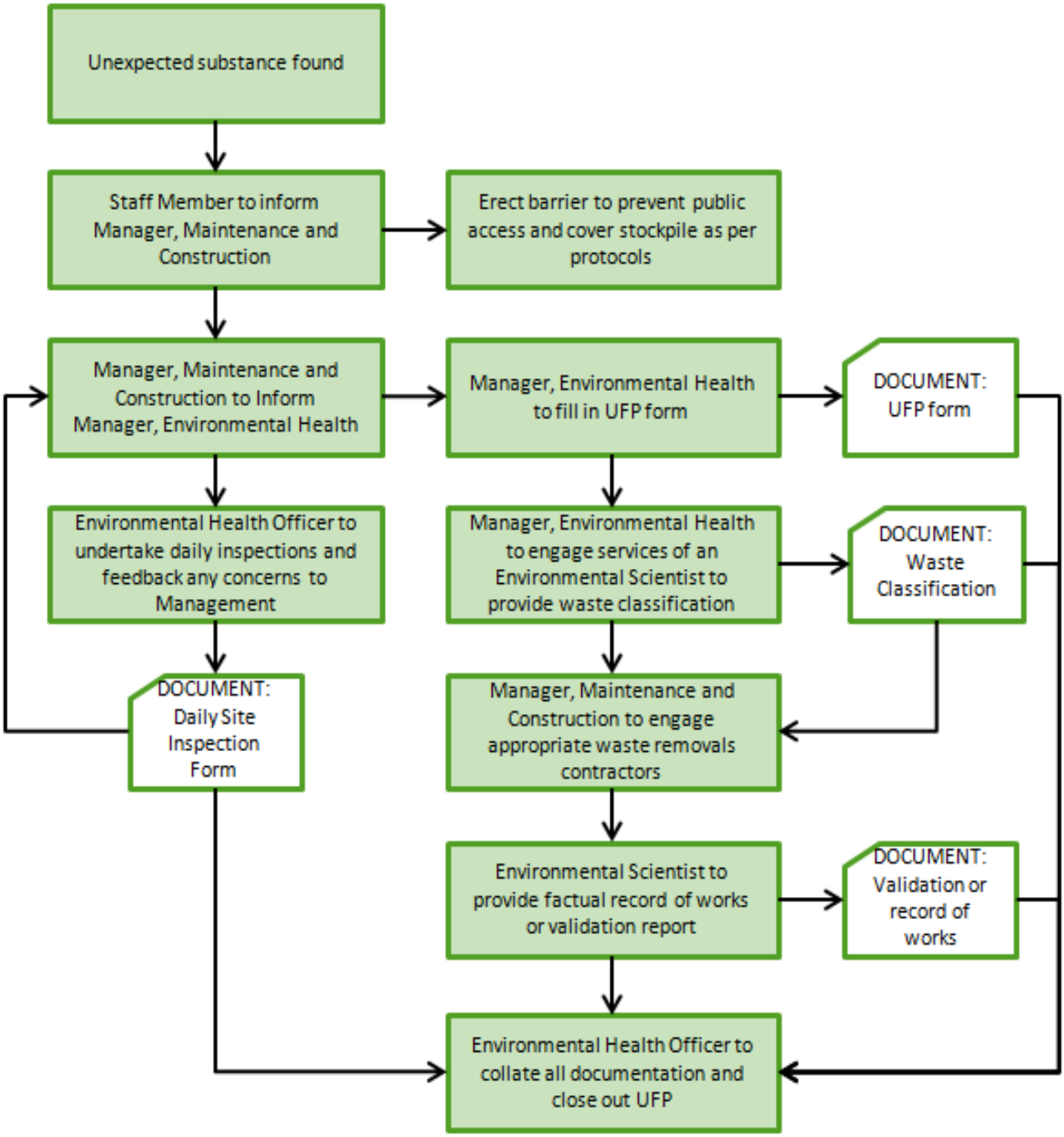
Moisture: M=Moist D=Dry S=Saturated

Groundwater: Water Strike; Standing Water Level

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	BH2 (0.0-0.2m) FILL: Firm/crumbly, dark brown, silty CLAY; rootlets present, minor sand, sub angular <5mm (5%)			D	7.5	1.4		No odour throughout
	BH3 (0.0-0.2m) FILL: Firm, dark brown, silty CLAY; rootlets present, minor gravel, oblate/platy, dark grey <10mm (5%)			D	7	1.5		
	BH4 (0.1-0.2m) FILL: Firm, dark brown, silty CLAY & firm, white/red clay (20%); rootlets present, minor gravel			D	6.5	1.3		
	BH5 (0.0-0.2m) FILL: Loose to firm, dark brown, silty CLAY; rootlets present			D	7	1.5		
	BH6 (0.1-0.2m) FILL: Loose to firm, dark brown, silty CLAY; rootlets present			D	7	0.5		
	BH7 (0.15-0.2m) FILL: Loose to firm, dark brown, silty CLAY; blue metal gravel, angular <5mm (5-10%), rootlets and one earthworm present			D	6.5	1.1		

APPENDIX B UNEXPECTED FINDINGS PROTOCOL

Unexpected Findings Protocol



Unexpected Findings Protocol Form

(To be completed by the site controller/environmental representative)

Site: Sanders Reserve, Sanders Parade, Concord

Personnel Onsite: _____ **Date:** _____

1. Suspect material encountered during daily activities: Yes ☐ No ☐
   (if yes compete 2 - 8).
2. Council Management contacted: Yes ☐ No ☐
3. UFP reference number (label occurrences sequentially 1, 2, 3, etc).
   _____

Description of material encountered:

4. Asbestos or suspected asbestos containing material present: Yes ☐ No ☐
5. **If No to 4** is there an obvious odour present (Note: **Do Not** sniff soil): Yes ☐ No ☐
6. Visible staining: Yes ☐ No ☐
7. Brief written description of material:

8. Material quarantined: Yes ☐ No ☐
9. Location of contaminated material (include field sketch/map on back of this page if required):
   _____
10. Photographs taken: Yes ☐ No ☐

Name:_____ **Signature:**_____

APPENDIX C SITE INSPECTION CHECKLIST

DAILY SITE INSPECTION

Date:	
Weather:	
Inspector:	
Site Personnel	

Tool box meeting (Discuss OH&S issues, today's activities, hazard assessments undertaken and confirm safe work methods proposed are appropriate)

EMP compliance

Item	Y/N	Comments
Are intrusive works been undertaken		If yes then…
Has the WMP being prepared with reference to the EMP		If no cease work and rectify
Are personnel complying with the WMS		

Environmental Conditions

Item	Y/N	Comments
Are there any areas of bare soil		If yes to any of these items; • photograph incidence; • note locations on a site plan; and • notify Council Management
Were there any holes in the capping layer noted		
Are there areas of erosion developing on the site		
Works areas appropriately fenced		
Are sediment controls in place and in good condition		
Are stockpiles covered appropriately		
Is there evidence of vehicles tracking sediment offsite		
Are restored surfaces in good condition		

Additional Notes