RESPONSE TO SUBMISSIONS TO PROPOSED GLASS BENEFICIATION PLANT ENVIRONMENTAL IMPACT STATEMENT 126 ANDREWS ROAD, PENRITH

Prepared for: GLASS RECOVERY SERVICES
DEPARTMENT OF PLANNING & INFRASTRUCTURE

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CONTENTS PAGE

TABLES PAGE

ATTACHMENTS

1. INTRODUCTION

Benbow Environmental were commissioned to prepare an Environmental Impact Statement for Glass Recovery Services for the proposed development of a glass beneficiation plant at 126 Andrews Road, Penrith in November 2011. At the time of commissioning, the site was vacant and a site investigation was undertaken by Benbow Environmental consultants confirming that no activities were being undertaken at the site. Further site inspections were undertaken in late 2011 and early 2012 with the site remaining vacant. The EIS was prepared on this basis.

This report has been prepared for the Department of Planning and Infrastructure in response to submissions to the Environmental Impact Statement (EIS) prepared for Glass Recovery Services for the proposed glass beneficiation plant at 126 Andrews Road, Penrith.

Seven submissions in total were received during the exhibition period between 7 June 2013 and 22 July 2013. Response to the relevant items within these submissions is provided in the following sub-sections.

Submission comments have been presented within clearly highlighted text boxes. The response to these is provided in the text below each comment.

2. COMMUNITY SUBMISSIONS

There were two submissions from members of the community. These are addressed in this section.

2.1 CONVEYOR TO TRANSPORT CULLET

Address: Glenmore Park, NSW 2745

I believe that insufficient attention has been paid to the use of an elevated covered conveyor to transport the cullet between the two sites. This would avoid the use of heavy trucks using Andrews Rd with their environmental and traffic effects.

Being elevated it would have minimal interference to ground level operations.

Being covered it should have no environmental impact.

A conveyor is virtually soundless and thus will not have any audible impact if the plant operates 24/7 as proposed.

As the cullet is stored in bins at either location in can be collected and delivered by means of gates and feeder conveyors.

Although a conveyor will have a higher capital cost than trucks, the running costs are considerably less and will not require the public to fund ongoing road maintenance due to the use of trucks on Andrews Rd.

The elevated covered conveyor is being considered and will likely form a later stage in a separate development application. However, as the elevator crosses flood plain land and protected vegetation this suggestion needs detailed design and close consultation with all relevant authorities to protect what is acknowledged as a sensitive area. This will be longer term strategy.

2.2 UPGRADE OF ACCESS ROAD

Address: St Mary's, NSW 2760

> The application appears to be flawed in as much as Penrith City Council have previously made provision to have the access road to126 Andrews Road, Penrith upgraded. That road which crosses Lot 3 DP747153 has not been addressed in the schedule of works indicating it is current and satisfactory for the development.
>
> If the upgrade of the crossing is a continuing requirement of Council then the upgrade should be specified in the Schedule of Works.

Penrith City Council holds a bond in the form of a Bank Guarantee for works to this area from a previous landholder which they have not spent on the proposed works. The bond is held in respect of a previous Consent and land-use (Paton's Fertilisers) which is now voided by the present application.

It is our understanding from Council that the bond held by them is specifically in respect of 'drainage works' in order to improve flood passage below the driveway and not directly related to traffic issues.

In any respect the matter is at the discretion of Penrith Council and can be conditioned accordingly.

3. PENRITH CITY COUNCIL

Submission from Penrith City Council raised a number of issues relating to:

- Scope of proposed works;
- Permissibility;
- LEP considerations;
- DCP considerations;
- Environmental considerations;
- Biodiversity considerations;
- Traffic management; and
- Waterway / Flood management considerations.

Response to these issues has been provided in the following sub-sections.

3.1 SCOPE OF PROPOSED WORKS

Scope of Proposed Works

- The majority of site and landscape plans submitted with the subject Development Application are the same plans as that submitted in support of Development Application 12/0539 and stamped approved with the issued consent. In this regards, the scope of works of the current application should be confirmed given that a significant portion of works have already been issued consent under a separate application.

- If the proposed works are inclusive of the works approved under the above consent, the above consent should be surrendered or the same conditions of consent imposed by the Department for consistency.

The application is for the occupation and use of the existing building and the erection of bunkers on the already approved concrete hardstand area. We understand that a Construction Certificate application is pending for the hardstand and that this work will commence shortly. It would seem appropriate therefore to include the same Conditions of Consent.

The scope is clearly described within Section 3.2.1 of the EIS. In summary the scope includes:

- Minor changes to the existing building including new roller doors on the eastern wall of the building;
- The installation of ten (10) external bunkers for storage of the crushed cullet on the southern and eastern sides of the existing building;
- Widening of the existing channel along the eastern boundary of the site to provide a water quality wetland that stormwater from the bunkers would drain to;
- Removal of a shed located in the rear yard area;
    - Installation of a 2000L self-bunded diesel fuel storage tank in an existing storage room designed for flammable liquid storage on the eastern side of the building.

The landscaping plans that have been approved with the separate DA have been used in this EIS to demonstrate compliance with requirements and to describe how the land will be managed. The landscaping plans that were approved as part of the Consent issued by Penrith City Council DA No. DA12/0539 dated 23 April 2013 were proposed plans and the same plans issued with the EIS can be assumed to be existing.

3.2 PERMISSIBILITY

Permissibility

The Environmental Impact Statement indicates that the proposal could be considered as a permissible use under the definition of 'industry' within the IN1 zone pursuant to Penrith Local Environmental Plan 2010. The industry definition within the LEP is not the most appropriate definition as a 'waste or resource management facility' is specifically elsewhere defined within the LEP. As a result this definition is the applicable definition for consideration.

Pursuant to the LEP a 'waste or resource management facility' is not a permissible land use in the IN1 zone and as such permissibility of the proposal can only be established subject to compliance with another EPI. The classification of 'state significant development' is also dependent upon the proposed use being a permissible form of development under an EPI (Clause 8 of SEPP (State and Regional Development) 2011.

As such the permissibility of the proposal must be established under the provisions of SEPP (Infrastructure) 2007. Division 23 of SEPP (Infrastructure) 2007 does permit such a use within a prescribed zone (being the IN1 zone) and as such the proposal (without reliance on PLEP 2010) is deemed to be a permissible land use subject to consent from the Department.

In relation to the permissibility of the proposed development, Rhodes Haskew & Associates advise following:

- Page iv of the EIS – second line under "Justification" indicates that the operation is an "industrial activity". It would be better describes as a "resource recovery facility/activity".

- Page vi of the EIS under "Land Use Zoning". It is noted that "The land is zoned as IN1 (General Industrial) and the development as proposed is permissible with consent" under the provisions of SEPP (Infrastructure) 2007.

- Table 2-1: Matters for Consideration Pursuant to Section 79c of the Act indicates the proposed development would be permissible as an "industry" or as a "resource recovery facility" and then refers to a following comments. Table 2-2: State and Regional Environmental Planning Policies deals with the various SEPPs. The Infrastructure SEPP is dealt with via Note 1 on page 2-14. That note clearly sets out the position being that the proposed use is permissible with consent under the SEPP. Section 2.1.3.2.6 of the EIS deals with local planning controls and makes reference to the SEPP prevailing. For the sake of completeness the LEP Land Use Table is considered. Reference is made to the LEP definition of "waste or resource management facility" being defined in the LEP but not listed as permissible under the IN1 zone. It then states that the SEPP prevails.

It is therefore advised that the application is submitted under these provisions.

3.3 LEP CONSIDERATIONS

LEP Considerations

Clause 5.9 – Preservation of Trees or Vegetation provides that the removal of trees or other DCP prescribed vegetation requires consent from Council (or the applicable determining authority). The application includes the removal of six (6) trees which is considered satisfactory subject to adherence to the proposed landscape plan and the provision of endemic replacement landscaping species.

Response from Biodesign & Associates in relation to LEP considerations:

> *The approved Landscape Plan will be amended to accommodate the approved redesign of the stormwater detention/drainage system (Consent # DA 12-0539). The new landscape design is essentially the same with regard to the retention of significant trees on the site and the establishment of new tree plantings, but due to the realignment of the stormwater flow path, three clumps of small Casuarina glauca along the northern boundary will need to be removed. They are to be replaced with new tree plantings on the mounds that are to be installed in this location. No additional tree removals are proposed under this application.*

The full response from Biodesign & Associates is provided in a letter report which is provided as Attachment 1.

3.4 DCP CONSIDERATIONS

DCP Considerations

- Clause 4.5 of Penrith Development Control Plan 2010 (Part D – Industrial Development) outlines specific requirements for the storage of materials and chemicals. The proposed external storage bunkers should be appropriately designed to minimise their visual presentation with conditions of consent requested to be imposed regarding external finishes and landscaping treatments.
- It is requested that all lighting be conditioned to comply with Australian Standard AS4282. As the premise is to be used outside daylight hours, the car parks and entrances should be adequately illuminated to address safety issues for entry and exit from the facility.
- Landscaping proposed for the site should also be endemic to the area noting the likely existence of endangered ecological community as outlined in the Biodiversity comments below.
- There is no advertising signage detailed within the application. Any proposed signage should be included within the proposal and should address the requirements of the DCP and SEPP 64 – Advertising Signage.

In response to the above comments:

- The proponent will ensure that the external storage bunkers will comply with all conditions of consent imposed upon the site. Furthermore, Biodesign and Associates have indicated in their letter response in Attachment 1 that:

  Landscaping is proposed along the interface with the area. It includes dense plantings of trees and shrubs that will screen views of the hardstand from the sports fields to the east and south east, and from the properties south and west of the site. Andrews Road is screened with existing plantings along the northern boundary.

- All lighting would comply with AS4282 at the premises, in car parks and at entrances.
- In response to proposed landscaping, Biodesign note the following:

  All plant species proposed in the landscape are selected on the basis of their ecological association with the locality and the site conditions. The Landscape Plan provides for plantings of species from Alluvial Woodland and Riparian ecological communities associated with the Fluvial Landscape Richmond Soils of the Cumberland Plain. Weeds are to be controlled.

The full response from Biodesign & Associates is provided in Attachment 1.

- Photographs of the advertising signage at the site was provided by the proponent as follows:

Photograph 1: Signage located on the fascia of the building. The sign content includes the name (company logo) address and phone contact number of the company. It measures 2400mm long by 600mm high and is a non-illuminated painted signboard on metal and fixed to the building façade.

Photograph 2: Signage located at the entrance to the car park of the facility. This is a safety sign and indicates the personal protection equipment required to be worn whilst visiting the site. The company logo is located at the top of the sign. The sign measures 1200mm long by 600mm high and is a painted hardboard, non-illuminated sign.

Photograph 3A: Signage located at the end of the driveway entry from Andrews Road. The content includes the name (company logo) address and phone contact number of the company. It measures 900mm long by 450mm high and is a painted hardboard, non-illuminated sign.

Photograph 3B: View from the site entrance of the signage described in Photograph 3A above.

Under the Penrith City Council Development Control Plan, 2010 (Penrith DCP), Advertising and Signage is addressed in C9.

The following table provides compliance of the site signage with the requirements of the Penrith DCP.

Table 3-1: Compliance of Site Signage with Penrith DCP

DCP Requirement	Comment	Complies (Y/N)
General Objectives		
a) Permit the appropriate display of information concerning the identification of premises, name of the occupier and the activity conducted on the land;	The signage provides the company name, address and contact phone number.	Y
b) Ensure that all advertising achieves a very high level of design quality in terms of graphic design, its relationship to the architectural design of buildings and the character of streetscapes, landscapes and vistas.	The design of the signage is clear and concise, of high quality and suits the buildings and character of the area.	Y
Other Relevant Instruments		
Aims of SEPP 64 that relate to the site:		
a) to ensure that signage (including advertising):		
(i) is compatible with the desired amenity and visual character of an area, and (ii) provides effective communication in suitable locations, and (iii) is of high quality design and finish.	There are three (3) signs that readily achieve the aims of SEPP 64.	Y
Suitability of the proposal in relation to:		Y
• The character of the area;	The area zoning is industrial	
• Special areas (e.g. heritage areas, environmentally sensitive areas);	N/A	
• Views and vistas;	Signage has minimal presentation to the streetscape. Signage is simple, clear and concise and suits the nature of the business, the site and the area.	
• Streetscape, setting or landscape;		
• Site and building;		
• Associated devices and logos with advertisements and advertising structures;	N/A	
• Illumination; and	Safety signage is provided detailing the PPE required whilst working on site.	
• Safety		

Table 3-1: Compliance of Site Signage with Penrith DCP

DCP Requirement	Comment	Complies (Y/N)
9.1 General requirements for signs Objectives a) Recognise the legitimate need for clear business identification and promotion through appropriate advertising signs; b) Limit the overall amount of advertising through the provision of fewer, more effective signs, to avoid the creation of visual; c) clutter on buildings and streetscapes; d) Promote signs that add character to the streetscape and assist with direction and the pedestrian useability of the City; e) Consider the amenity of residential development and the visual quality of the public domain; f) Promote signs, including corporate logos and colours, that achieve a high degree of compatibility with the architectural features, colour scheme and external finish of the building; and g) Ensure that the location and design of signs are consistent with road safety principles. Controls 1. General a) Signs are to be designed and located to: i) Relate to the use of the building; ii) Be visually interesting and exhibit a high level of design quality; iii) Be constructed of high quality, durable materials; iv) Be wholly contained within the property; v) Have only a minimal projection from the building; vi) Be integrated and achieve a high degree of compatibility with the architectural design of the supporting building having regard to its composition, fenestration, materials, finishes and colours, and ensure that architectural features of the building are not obscured;	The three (3) signs on site are located on the fascia of the building, at the end of the entry driveway and at the entrance of the carpark. These provide the company logo, name, address and contact phone number. One is a safety sign that details the PPE required whilst working on site. The signs are clear, simple and concise and suit the site, activity and area. All 3 signs are white with the company logo in green and yellow. The design and location of the signs as described above are believed to comply with all general requirements in 9.1 of the DCP.	Y Y

Table 3-1: Compliance of Site Signage with Penrith DCP

DCP Requirement	Comment	Complies (Y/N)
vii) Have regard to the view of the sign and any supporting structure, cabling and conduit from all angles, including visibility from the street level and nearby higher buildings and against the skyline; and viii) Be sympathetic to the existing character of the area and the particular architectural/urban design utilised in any improvements scheme.		
b) Signs that contain additional advertising promoting products or services not related to the approved use of the premises or site (such as the logos or brands of products; e.g. soft drinks, brewers, photographic film, etc) are not permitted.	Signs of this nature are not located at the site.	Y
c) Corporate colours, logos and other graphics are encouraged to achieve a very high degree of compatibility with the architecture, materials, finishes and colours of the building and the streetscape.	The signs as described above comply with this requirement.	Y
d) Flat standing signs are only permissible where the main building is set back 3 metres or more from the street alignment.	There are two flat standing signs. The building is set back well more than 3 metres from the street alignment. Therefore the signage complies with this requirement.	Y
e) In considering applications for new signs, Council must have regard to the number of existing signs on the site and in its vicinity; whether that signage is consistent with the provisions of this section; and whether the cumulative impact gives rise to visual clutter.	There are a total of three (3) signs provided as described above. These are consistent with the provisions of the DCP and would not give rise to visual clutter.	Y

Table 3-1: Compliance of Site Signage with Penrith DCP

DCP Requirement	Comment	Complies (Y/N)
f) Signs must not involve damage, removal or pruning to trees or other vegetation and must not result in pruning or removal for visibility purposes.	The signs are located such that they do not involve damage, removal or pruning to trees or other vegetation and would not result in pruning or removal for visibility purposes. The signage as described above complies with the requirements of 9.1 (2) Signs and Road Safety.	Y
2. Signs and Road Safety		Y
a) Signs are regarded as prejudicial to the safety of the travelling public and are therefore prohibited if they: i) Obscure or interfere with road traffic signs and signals or with the view of oncoming vehicles or pedestrians; ii) Obscure or interfere with the view of a road hazard or an obstruction which should be visible to drivers or other road users; iii) Give instructions to traffic by use of the word 'stop' or other directions, which could be confused with traffic signs; iv) Include variable messages or intensity of lighting sufficient to impair drivers' vision or distract drivers' attention; or v) Are located in places where drivers' require greater concentration, such as at major intersections or merging and diverging lanes.	The signs are not inappropriate.	
3. Inappropriate Signs	Signage provided is desirable in accordance with 9.1 (4) of this DCP.	Y
4. Desirable Signage Design		Y
9.2 Signs in the vicinity of heritage items	There are no heritage items in the vicinity of the site or signage for the site.	Y
9.3 Residential, Rural and Environmental Zones (E3 and E4)	N/A	Y
9.4 Commercial, Mixed Use and Industrial Zones		

Table 3-1: Compliance of Site Signage with Penrith DCP		
DCP Requirement	Comment	Complies (Y/N)
a) Signs should generally be confined to the ground level of the building, awning or fascia, unless it can be demonstrated that the building is of a scale, architectural style and in a location that would be enhanced by signage at different elevations. b) (Relates to multiple occupancies) c) Illuminated signs	The building is of a scale and architectural style that enhances the signage on the fascia of the building, as shown in the photographs. N/A N/A	Y
9.5 Open Space Zones (Public and Private Recreation)	N/A	Y
9.6 Special Event Advertising	N/A	Y

3.5 ENVIRONMENTAL CONSIDERATIONS

> The Department is requested to ensure that suitable mechanisms will be put in place to manage any unexpected putrescible waste that may be brought onto the site. This waste may have a significant impact in terms of odour, and this has not been assessed as a part of the application.

In response to the above comment, we note the following:

Section 5.6.3, page 5-185:

Further, the facility would have stringent inspection procedures that would ensure that only clean glass would be allowed onto the site, thereby generating only minimal waste quantities.

Section 5.6.5, page 5-187:

To further manage their waste on site the following needs to be considered:

- *Adopting an incoming raw material inspection to ensure that waste materials brought onto site with incoming loads can be minimised;*

Section 3.2.3, page 3-22:

> *The raw materials would consist of incoming used glass bottles and other used glass products. The glass accepted onto site as a raw material has been pre-sorted and pre-processed at MRF's prior to arrival on site. The material from the MRF's is trucked to the site as broken bottles, generally <80 mm fragments. Thus there is no liquid contained in the source material. Only pre-processed glass would be accepted from MRFs. Thus contaminant levels in the raw materials would be low.*
>
> *When the glass material is delivered it is unloaded directly into the building. The incoming glass would be stored in bays within the factory building. The maximum volume of glass that could be accepted and stored within the building at any one time would be no more than 2,000m^3.*
>
> *This glass is considered clean when it arrives on site and then undergoes a rigorous sorting and decontamination process. This includes air sorting for paper and plastics, removal of organics, a magnetic system for ferrous metals and a separate system for non-ferrous metals to produce "cullet". It is a specific technical requirement of the specialised processing equipment that the glass is clean before entering the processing line. If the glass is not clean it cannot be processed.*

As stated in the EIS, only clean raw material would be accepted at the site. All incoming loads would be inspected and any non-conforming raw material (unclean or contaminated) would immediately be returned to the supplier. Because all raw materials are sourced from MRFs where the material has already been put through a number of processes, it is unlikely that loads would contain putrescible waste. The cleanliness of the raw material will be further addressed in an EMP which will be produced as part of the Conditions of Consent. A procedure would be put in place to manage this issue as stated in Section 5.6.5 (page 5-187).

It is noted that the development does not comply with the relevant criteria for PM10 unless water sprays are utilised. Importantly, even when the use of these sprays has been modelled, there still appears to be a significant impact south of the site, as shown in Figure 5-27. Although there are no identified receivers in this area (and no receivers assessed), it is not clear how far this plume extends to the south (the figure does not show where the area of impact ends), and there are residents and recreational facilities located in this direction. It needs to be considered whether such a large area of affectation is appropriate.

The response to submissions relating to the air quality assessment undertaken for the EIS is provided as a separate letter report (an addendum to the Air Quality Assessment in the EIS) in Attachment 2.

In summary, the scenarios were remodelled and the following is noted:

- Results for Stage 1 provided in the original EIS remain to apply, given that the assumptions listed above do not affect the parameters used for the Stage 1 air dispersion modelling.

- The PM_{10} 24-hour impacts of the Stage 2 development as shown in the Figure 1 of Attachment 2 do not reach or extend to areas where residential premises are located. The 0.05 mg/m^3 criteria line is depicted by the contour that separates the purple line from the blue line in the figure. It is however acknowledged that the 0.05 mg/m^3 contour line is seen to be present at a reasonable distance away south of the site.

- This therefore concludes that with the PM_{10} 24-hour averaging period impact results, no exceedances are expected to occur as part of the activities.

Although mitigation measures have been recommended to address the acoustic impacts associated with the development, it is recognised that this in part relies on operational measures and this may be difficult to enforce from a compliance perspective. For example, it would be difficult to ensure trucks only travel half the length of the warehouse at night. This is not considered to be an appropriate method of regulating the activities on the site and as such further acoustic mitigation measures should be pursued without reliance on human behaviour.

A detailed response to submissions relating to the noise impact assessment has been provided as a letter report in Attachment 3.

Specifically, we note:

> *Benbow Environmental understands Council's concern and therefore noise compliance does not rely on restrictions associated with the travel length of trucks.*

The acoustic modelling undertaken has demonstrated that there will be some exceedances in the noise criteria at some of the receiver locations, particularly R3. It needs to be determined whether it is appropriate for residents to potentially experience these noise impacts in the long term as a result of the development.

A detailed response to submissions relating to the noise impact assessment has been provided as a letter report in Attachment 3.

Specifically, we note:

> *Further noise calculations were undertaken specifically at receiver location R3 against the intrusive criterion. Several assumptions and recommendations have been considered in the new set of calculations. As shown in Tables 2 and 3, the Project Specific Noise Level has been achieved at receiver location R3.*

The Phase 1 Contamination Assessment concludes that further contamination investigations are not warranted, however it was also identified that this investigation has already historically been undertaken. The report associated with this investigation needs to be reviewed to ensure that the site is suitable for the proposed use.

A limited Phase II investigation was undertaken at the site in November 2009. This report is entitled "Targeted Environmental Site Assessment" and was prepared by Aargus Pty Ltd and is provided as Attachment 4. This report has been attached. The report found that there was no presence of contamination at levels of concern for commercial/industrial land use.

The EIS outlines that the historic use of the premises suggests that the site is not contaminated, however Council considers that insufficient information has been provided regarding the use of the premises as a fertiliser storage facility. This use may warrant further investigation (such as to outline types of fertilisers and whether solids or liquids, and identify storage locations in case of spills, for example), and some preliminary sampling may need to be undertaken to confirm that no contamination of soils has occurred.

Section 5.3.7, page 5-166 of the EIS provides the following information:

> *Aargus undertook a limited Phase II environmental site assessment in October 2009 releasing the report in November 2009. This study was undertaken for Wallaroo Pty Limited. Eight Boreholes were drilled to a depth of 1.8 m.*
>
> *The findings were no presence of contamination at levels of concern for commercial/industrial land use.*

As previously stated, the Aargus report has been provided as Attachment 4.

3.6 BIODIVERSITY CONSIDERATIONS

The level of ecological assessment is not considered to be adequate. A complete flora and fauna survey has not been undertaken on the site. The Director General's Requirements specify the need for a field survey and assessment of threatened species. This was not undertaken for vegetation at the back of the site (southern boundary) and along the western boundary of the site. It is therefore unclear if this remnant vegetation and wetland areas constitute an Endangered Ecological Community (EEC) under the TSC Act. It is expected that the wetland areas at least would fit the description of the EEC: Freshwater Wetlands on Coastal Floodplains.

Despite the lack of a full ecological assessment, the expected impact of the development on the vegetation on site is considered low. A total of 6 trees will be removed for the development – three of which were planted previously (and are not endemic), and two of which are remnant. The development proposes to replace these with locally endemic species at the rear of the site.

To mitigate any impacts associated with the development, detailed landscape plans have been prepared identifying areas for planting, weed management and other activities (Figure 5-45: Landscape Concept Plan and Figure 5-46: Landscape Planting plan). These should be adhered to in their entirety. It is recommended that the Department require annual reports on the implementation of the Landscape Plan to be provided at 12 and 24 month intervals.

Further to the Landscape Plan, it is recommended that the Department require the following be implemented during construction:

- *No trees or other vegetation (including understory species) should be removed, ringbarked, cut, topped or lopped or wilfully destroyed (other than those within the Landscape Plans Figures 5-44, 5-45, 5-46) without prior consent.*

Biodesign have indicated in their letter response in Attachment 1:

> *The approved Landscape Plan will be amended to accommodate the approved redesign of the stormwater detention/drainage system. The new landscape design is essentially the same with regard to the retention of significant trees on the site and the establishment of new tree plantings, but due to the realignment of the stormwater flow path, three clumps of small Casuarina glauca along the northern boundary will need to be removed. They are to be replaced with new tree plantings on the mounds that are to be installed in this location. No additional tree removals are proposed under this application.*

We also rely upon the assessment of Biodesign in their Ecological Statement of 11 May 2012 noting that due to the highly degraded nature of the site a complete flora and fauna survey is unwarranted. This is provided as Attachment 8.

- *No works should be undertaken outside of the proposed building envelope identified on the plans provided.*

Any conditions of consent would be adhered to as advised by the department.

- *No fill, machinery, or materials should be placed or stored within the drip-line of any tree.*

Biodesign have indicated in their letter response in Attachment 1:

> *A Tree and Landscape Protection Plan forms part of the approved Landscape Plan (CONSENT # DA12-0539) for the site. It is expected that conditions of consent will be imposed to ensure trees are protected in accordance with this requirement.*

- *Where possible all fallen trees, logs, leaf litter, rocks and other debris should be retained on site as habitat and to maintain soil stability and structure.*

Biodesign have indicated in their letter response in Attachment 1:

> *No felling of trees is proposed under this application. The approved Landscape Plan (CONSENT # DA12-0539) includes the retention to a large felled tree for habitat in the landscape. The landscape is to be managed as a "bushland" site that provides habitat in the form required by this condition.*

3.7 TRAFFIC MANAGEMENT CONSIDERATIONS

The response to traffic management considerations was prepared by Transport and Urban Planning and is provided as Attachment 5.

- It is requested that the Department ensure that all car parking and manoeuvring is in accordance with AS2890.1-2004 and AS2890.6-2009 with all vehicles required to enter and exit in a forward direction.

Transport and Urban Planning note that:

> *The proposal includes a large car park adjacent to the site entrance on the northern boundary, with parking for up to 106 cars. This area is ideally suited to a car park and can easily accommodate all the requirements of current Australian Standards for off street parking including manoeuvring and access. It is agreed that detail design of car parking should meet the requirements of AS2890.1 and AS2890.6 and there is no objection with this being required as a condition of approval.*

- The required sight lines around the driveway entrances are not to be compromised by street trees, landscaping or fencing.

Transport and Urban Planning note that:

> *It is agreed that the detail design of the access driveway should ensure that fences and landscaping will not restrict sight distances. There is no objection with this being required as a condition of approval.*

- It is expected that the proposal will have moderate additional traffic impact due to a peak increase of some 42 trips per hour on Andrews Road. However due to the number and size of trucks in operation the applicant is required to adequately address heavy vehicle layover and turning manoeuvres on Andrews Road at the access driveway in this regard.

Transport and Urban Planning note that:

The planned operation of the site does not involve layover parking of heavy vehicles. See attached advice from Glass Recovery Services Plant Manager, Adam Davies, regarding management of trucks entering the site, which confirms that there is no risk of trucks queuing on street.

There will be no difficulty providing adequate on site space for trucks entering the site, using the weighbridges and loading/unloading. Future detailed design will identify appropriate operation and areas for trucks servicing the site. There is no objection to a condition of approval that requires all truck parking to be accommodated on site.

Regarding truck turning and manoeuvring at the access driveway, it is acknowledged that improvements are required on Andrews Road to facilitate the planned use of trucks up to the size of B-doubles. This is addressed further in response to the following point.

- The traffic report indicates that a 'Rural TYPE C intersection' is to be provided however this would not be sufficient in this regard as Andrews Road is an Urban Regional road with substantial traffic growth from key developments such as Waterside and Jordan Springs taking place. As such it is recommended that a type CHR – Protected Turn treatment be provided in order to adequately store heavy vehicles on Andrews Road. In conjunction with the CHR a deceleration lane and adequate taper should be provided on Andrews Road for the Westbound left turn into the property.

Transport and Urban Planning note that:

Council's suggestion for the intersection treatment on Andrews Road at the driveway to the site to be a type CHR-Protected Turn with a deceleration lane and taper for left turns into the property is acknowledged and agreed. The design of this intersection will take into account the potential for use by B-double trucks. There is no objection with this being required as a condition of approval.

3.8 WATERWAY / FLOOD MANAGEMENT CONSIDERATIONS

Brown Consulting have prepared a letter report in response to submissions and this addresses all concerns raised by Penrith City Council in relation to Waterway / Flood Management Considerations. This report has been provided as Attachment 6.

- There is an unnamed waterway adjacent to the western boundary of the site. The EIS states that this waterway is a second order stream. Should any works occur within waterfront land (within 40m of this waterway) a controlled activity approval is required from the NSW Office of Water, prior to the commencement of any works. The integrity of the riparian corridor is to be preserved and maintained in line with the Office of Water's guidelines and objectives for riparian corridor management.

It is proposed that weeds be controlled in this area and natural regeneration of indigenous vegetation supported. There is no proposed works to be undertaken within waterfront land.

Brown Consulting comments:

Noted, a controlled activity will be applied for.

- The development includes a substantial increase to the hard surface area as part of the proposal (including hardstand, driveways, parking areas, loading bays, covered storage areas, etc). A water management plan should be submitted to include an investigation into the feasibility of installing rainwater tanks, and/or stormwater detention systems on the site. Maintaining the natural water balance through such measures, especially for flows to the significant wetland, should be promoted. If any such measures were unable to be implemented the reasons why should be explained and justified. The Environmental Impact Statement (EIS) outlines that potable water (22,300.3ML) will be used for dust suppression on site through water foggers and water sprays. Harvested rainwater from the site could potentially be used to satisfy this purpose.

Brown Consulting note that:

The areas of the site where the proposed new hardstand areas are to be located are currently within the existing operating zone of the site. These areas currently are of compacted, hard packed earth and not a suitable all weather surface. Replacing these areas with concrete would result in a minimal impact as the existing surface currently behaves in an impervious manner. Any rainwater tank would need to collect runoff from roof areas of the existing building. The size of rainwater tanks would also be restricted by finding a suitable location that isn't restricted by heavy vehicle movements. A smaller tank could be provided to capture some of the flows to provide a portion of mains reduction.

- It is noted that all water quality modelling performed assumes that the glass cullet material was sufficiently cleaned prior to storage in the outdoors bunkers. This assumption does not appear to have been suitably justified within the EIS, and will affect the MUSIC modelling results informing the sizing of the wetland and GPTs proposed to be installed to treat the stormwater runoff from the site. In order to be completely satisfied that the pollution reduction targets will be achieved, the MUSIC model needs to include a report clearly identifying catchment breakup, splitting of surface types and all other assumptions that have been made in the model. Modelling parameters for the determination of the size and configuration of WSUD elements must be in accordance with MUSIC Modelling Guidelines for New South Wales. Electronic copies of the modelling should also be submitted to the department for interrogation and review.

This issue has been addressed by Brown Consulting in Attachment 6. Brown Consulting advise that:

> *A MUSIC model and report can be submitted conforming to the above. A MUSIC model has been prepared as part of Construction Certificate documentation. It should be noted that the glass cullet CANNOT be directly modelled in MUSIC, so whether it is clean or not is academic. The only consideration is that the cullet will behave firstly as a gross pollutant for the larger size component and the as a suspended solid for the further portion.*

- As the development could result in water quality impacts in the nearby regionally significant wetland, the water quality at that wetland should be monitored for pollutants prior to the commencement of works, and at regular intervals during construction and/or operation. Section 5.3.9 of the EIS states that a water monitoring program will be implemented, to ensure that the treatment of stormwater from the site will achieve the desired results in terms of water quality leaving the site, however no details on this program have been provided. A detailed water monitoring program, including procedures and implementation responsibilities, is to be established for the site prior to the commencement of works. All monitoring is to be undertaken in accordance with any relevant guidelines of the Office of Environment and Heritage (or any other applicable guidelines).

A water monitoring program will be prepared as part of the EMP.

- No details have been provided on the design parameters of the constructed wetland, such as depth or where macrophyte zones are located. BioDesign's landscape planting plan shows generic detail only. Best practice wetland design incorporates benching or bands of shallow and deep water macrophytes perpendicular to the direction of flow to guarantee contact time with the vegetation. The wetland layout needs to demonstrate that it is fit for purpose and results in biological treatment as well as physical treatment. A comprehensive monitoring regime must also be developed and implemented for the commissioning and ongoing functioning of the wetland to ensure water quality objectives are achieved.

A response to submissions from Biodesign & Associates addresses the above concern. It is noted that:

> *The landscape plans will be documented as conditions of consent as part of the approved consent and developed with the engineering construction plans (documented by Brown Consulting). These will incorporate best practice wetland design including bands of shallow and deep water macrophytes.*

The full letter report is provided as Attachment 1.

Brown Consulting note in their response in Attachment 6:

> *Further details on wetland depths were intended to be presented in Construction Certificate documentation, planting details are proposed by the landscape architect.*

- Specification and installation details of the GPTs and a comprehensive operation and maintenance manual / schedule for all proposed devices and treatment measures are to be submitted prior to the commencement of construction works. This should include the operational capacity criteria that will trigger clean out, location and access details, and inspection and cleaning responsibilities, frequency schedules and checklists. For example, the fabric filters proposed on the stormwater pits will fill quickly with sediment and require a regular monitoring and cleaning regime.

Brown Consulting note:

> *Noted, this is will be provided, such detail was intended to be provided with Construction Certificate documentation once a detailed assessment of stormwater flows was carried out as the size of GPT's is largely dependent on the size of stormwater pipes.*

- Further details on the swales must be provided with regards to their design parameters. The design parameters should be based on the numeric modelling to demonstrate water quality treatment functionality. The swales should incorporate filter media that meets the current specifications of the Bioretention Filter Media Guidelines produced by the Facility for Advancing Water Filtration or demonstrated equivalent and verified by a soil laboratory registered by the National Association of Testing Authorities. The swale design must also consider access for cleaning and maintenance. Access requirements should include hard access to base; ease of access to inlet area and adequate access to reach flush points.

Brown Consulting advise:

Swales proposed were intended to form part of the wetland and as such are included as part of the wetland detail.

- Outlets from the GPTs, treatment wetland and swales shall be treated with appropriate measures to dissipate stormwater velocity and prevent erosion.

Brown Consulting advise:

Inlet pools to the wetland are to be provided at the GPT outlet locations to dissipate velocities, the outlet for the wetland is also to be provided with scour protection. This is a detailed design consideration not for DA.

- The level of ecological assessment for the proposal does not appear to have adequately considered the function of the regionally significant wetland, given the likely impacts of the development on the wetland habitat, hydrological regime, water quality regime, and substratum, organic matter cycling or other characteristics. The Director General's Requirements specify the need to describe the state of the receiving waters in relation to relevant water quality and flow objectives. This has not been adequately achieved.

A hardstand DA application and associated landscape plans detailing the above information has been approved by Penrith City Council (DA12/0539 dated 23 April 2013). These plans were also considered and approved by the NSW Office of Water. The plans are essentially identical and used in the EIS to demonstrate how the wetland area would be managed.

The following is noted:

- Section 4.6.2.2 of the EIS stated the Water Quality and River Flow Objectives:

  "The ambient Water Quality and River Flow Objectives for the receiving waters have been investigated for the site. The NSW Water Quality Objectives identify the agreed environmental values and long-term goals for NSW's surface waters.

  These objectives set out:

  The community's values and uses for our rivers, creeks, estuaries and lakes (i.e. healthy aquatic life, water suitable for recreational activities like swimming and boating, and drinking water); and

  A range of water quality indicators to help us assess whether the current condition of our waterways supports those values and uses.

  However, the NSW Water Quality Objectives does not provide objectives for the Hawkesbury-Nepean catchment area. Public enquiries for this catchment had been completed or substantially completed by the Healthy Rivers Commission (HRC). "

- Section 4.6.2.3 of the EIS discussed the Healthy Rivers Commission:

  "The Healthy Rivers Commission was discontinued in 2004 and replaced by the Natural Resources Commission (NRC). Outstanding Healthy Rivers Commission recommendations have been incorporated by the NRC into Catchment Action Plans and Government programs. "

- Section 4.6.2.4 provided information on the Catchment Action Plan:

  "A Catchment Action Plan has been developed by NRC for the Hawkesbury-Nepean Catchment and is available on the Hawkesbury-Nepean Catchment Management Authority website. The NSW Government have endorsed state-wide targets from the recommendations of the NRC.

  The targets for water include:

  Macro-environmental targets consist of:
  - *By 2015 there is an improvement in the condition of riverine ecosystems;*
  - *By 2015 there is an improvement in the ability of groundwater systems to support groundwater-dependent ecosystems and designated beneficial uses; and*
  - *By 2015 there is no decline in the condition of marine waters and ecosystems.*

  Specific priorities include:
  - *By 2015 there is an improvement in the condition of important wetlands and the extent of those wetlands is maintained; and*
  - *By 2015 there is an improvement in the conditions of estuaries and coastal lake systems.*

- The condition of the wetland is described in Section 5.3.1.5 of the EIS as being "in poor condition and contain low to moderate weeds."

- The Ecological Statement undertaken by Biodesign & Associates in May 2012 indicates that the wetland will be improved with the implementation of the landscape plan. This report is provided as Attachment 8.

- In relation to this concern, Brown Consulting note in their report in Attachment 6:

  Noted, the development proposes no modification to the existing wetland. The development proposes to meet water quality reduction targets through a proposed wetland.

- The flood assessment undertaken has not addressed the flood runner associated with mainstream flooding in the Nepean River where it backs up Boundary Creek, overtops the bank heading northwards toward this site and beyond. The impact of the proposed development on the flood runner needs to be considered for all events up to the PMF. In this regard the consultant's assertion that the property is not 'floodway' has not been sufficiently demonstrated.

Brown Consulting advise:

Brown Consulting have used the existing 100 year flood level given issued by Council of RL 25.4 which we believe should account for any local flow which contribute to this level. A flood assessment has only been performed in areas where works are proposed which would alter flood storage volumes. No PMF information was supplied by Council when flood level information was requested. Why is this an issue now?

- The flood assessment has discussed local flooding being directed along the western boundary to the south to Boundary Creek. Information available to Council indicates that part of the local flooding regime will be directed to Farrell's creek to the North along the drainage channel in Andrews Road. The flood assessment will need to be revised accordingly to consider this aspect.

Brown Consulting note:

See above, the current development proposes no work to the western boundary hence now assessment has been performed in this area as no changes to flood storage volumes are to occur.

- The Brown Smart Consulting Report has discussed the need to upgrade culverts beneath the driveway to the proposed development to provide flood free access and prevent future flooding of the property. Council agrees with this assessment and notes that as this work is in Council's drainage reserve owners consent and a Section 68 Local Government Act approval will be required before the commencement of any works. It should also be noted that Council holds an outstanding works bond for similar work on the previous owner as a result of the original development of the site.

Penrith City Council holds a bond for works to this area from a previous landholder which they have not spent on the proposed works. The matter is at the discretion of Penrith Council and can be conditioned accordingly.

Brown Consulting also note:

> *Noted, however the current development application does not propose any upgrade to these culverts as part of the internal works. A separate construction approval will be sort for these works at a future date.*

- The building should be flood proofed up to the flood planning level in accordance with Council's DCP.

Brown Consulting advise that:

> *The building is existing and currently sits 40mm above the existing flood level of RL 25.4 under existing approvals. No works is proposed on the buildings structure.*

- As the storage bunkers are below the 100 year flood level measures must be proposed to ensure that stored glass products or other stored materials are not transported away from the site during the relevant flood events.

This is addressed in Attachment 7 and in the EIS in Section 5.3.6 as follows:

> *The external storage bunkers would be used for storage of the processed glass cullet. This glass cullet is clean and uncontaminated once it leaves the production line and is stored within the bunkers.*
>
> *The existing building floor level is set at RL 25.44m AHD, just above the 100 year flood level and the existing pavement is flat (ranges between RL 25.41 to 25.46m AHD). The storage bunkers have been positioned below the 100 year ARI flood level of RL 25.4m AHD to ensure that the pavements be directed away from the building to reduce the possibility of nuisance flooding of the building in the smaller more frequent rainfall events.*
>
> *The area is essentially bunded by the storage bins with all the runoff being directed to 2 sag points on either side of the bin on the eastern side of the site. Before the water is discharged from the paved areas the plan shows that there is a gross pollutant trap (GPT) located at each of the low points. All water from this paved area has to pass through the GPTs. Once the water has passed through the GPT it will then be treated by the wetland proposed on the site along the eastern boundary.*
>
> *Given that the bins will only be inundated in the larger storm events (greater than the 20 year ARI) the above approach is a suitable treatment, given the site constraints with the existing building.*

Brown Consulting also note:

> *Walls are proposed around the perimeter of the concrete hardstand/storage bunker areas to a level 100mm above the 100 year ARI flood level, as such these areas are bounded and the direction of stormwater flow in areas bounded by the walls are directed to GPT's which are capture any glass material before flows exit the site.*

4. NSW OFFICE OF WATER

Submission from NSW Office of Water raised a number of issues relating to:

- SREP20 Wetland Buffer;
- Watercourses and Riparian Land; and
- Stormwater.

Response to these issues has been provided in the following sub-sections.

4.1 SREP20 WETLAND BUFFER

The NSW Office of Water (Office of Water) in its submission on draft Environmental Impact Statement (EIS) (II) recommended that the EIS confirm the riparian corridor that is proposed to be established along the wetland is consistent with the General Terms of Approval (GTAs) issues for the integrated development referral for the subject site in relation to the proposed hardstand area and drainage works. Section 5.3.5 of the EIS states the riparian corridor is consistent with Condition 23 of the NSW Office of Water's General Terms of Approval (page 5-159).

No response required.

4.2 WATERCOURSES AND RIPARIAN LAND

In the DGR submission of 9 May 2012, the Office of Water advised it has issued a Controlled Activity Approval for the Waterside Green site which is located to the north-west of the site on the northern side of Andrews Road. At the Waterside Green site, the Office of Water required that a minimum 20 m riparian setback is rehabilitated either side of the constructed lakes system.

The Office of Water recommended that the EIS for the SSD proposal provide details as to whether a watercourse is located on, or adjacent to the western side of the site and for the EIS to identify where the water flows and how it is connected to the Waterside Green site. The Office of Water recommended if the watercourse is connected to the Waterside Green site a riparian corridor is established along the watercourse consistent with the riparian setbacks at the Waterside Green site.

The EIS confirms an unnamed watercourse is located on the western boundary of the site with flows coming from the catchment areas to the north. The EIS implies the flows in the unnamed watercourse are connected to the Waterside Green site which is located upstream of the site. It notes the flows coming from the catchment areas to the north drain eastward before turning southward and the watercourse also has flows coming from the east of the site which drain through the drainage reserve on the northern boundary and that both flows meet before flowing southward down the unnamed watercourse before discharging to the SREP20 wetland on the southern boundary of the site and then to Boundary Creek and the Nepean River (page 4-14).

In the submission on draft EIS (II) the Office of Water recommended the EIS include a scaled plan which shows the location of the watercourse on the western side of the site, the riparian zone, the proposed development and the boundary of the site. While the Landscape Plan (Figure 5-44) does not show the location of the watercourse on the western side of the western boundary of the site, it shows that *Casurina gluca* groves adjoin the western boundary of the existing concrete hardstand area and this vegetated area adjoins the wetland. Section 4.3 of the EIS notes the wetland along the western side contains casurina groves and *Eucalyptus amplifolia*.

A revised Landscape Plan (sheet 1/3) showing the boundary is provided as Attachment 9 (in A4 format). The existing wetland is graphically shown in the plan with the Eucalyptus amplifolia and Casuarina groves.

Brown Consulting have provided a flow plan and this is available as Attachment 10. The flow plan indicates the direction of local overland flow paths adjacent to the site. Water runs along Andrews Road to the north to the lake system to the northwest of the site. There is no overland flow path along the western boundary.

The EIS makes reference to an existing channel located on the eastern boundary of the site where a water quality treatment wetland is proposed to be located. The EIS does not specify if the channel is a natural watercourse or an artificial feature. Clarification is required on this as the Office of Water has advised Council that there should be no online water quality treatment, and it is unclear how drainage from the bunkers will be treated.

BioDesign has indicated in their response in Attachment 1 that the existing channel on the eastern side is part of the flood overflow zone and is rectangular in shape so is likely to have been engineered at some time in the past.

Treatment of drainage from the bunkers is addressed in the letter report prepared by Brown Consulting in Attachment 7.

Section 5.3.1.5 of the EIS notes the existing wetland areas are in poor condition and contain low to moderate weeds (page 5-148). It is noted a weed control program shall be implemented over the entire site, including the existing wetland area on the western side of the site. The Office of Water supports weed control being undertaken within the riparian/wetland area on the site. The Landscape Concept Plan does not indicate native plants are proposed to be planted within the wetland area on the western side of the site. It is recommended the riparian/wetland area is rehabilitated to mimic a natural system. The rehabilitation should include the establishment of local native riparian plant species endemic of the local vegetation community to improve the riparian/wetland area.

Biodesign & Associates note in their letter response in Attachment 1:

> *The approved Landscape Concept Plan (CONSENT # DA12-0539) provided for the rehabilitation of the riparian area along the western boundary outside the works zone through weed control and support for natural regeneration. This application will not involve new works that will impinge on this area. The approved Landscape Plan (CONSENT # DA12-0539) specifies a minimum maintenance period of 24months for the entire landscape.*

It is recommended a monitoring and maintenance program is undertaken for the rehabilitation of native riparian vegetation. A minimum maintenance period of 2 years is recommended after final planting.

This will be addressed as a standard Condition of consent.

4.3 STORMWATER

The EIS clarifies that all surface drainage on the proposed hardstand concrete areas and bunker locations are to be directed to GTAs prior to discharge into the proposed wetland for further treatment (Section 5.3.6.2, page 5-161).

Section 5.3.5 indicates water quality swales would be installed in this area and it would be planted with various indigenous species. Section 5.3.1.3 indicates the swales would be grassed to aid deposition of solids washed off the hardstand area (page 5-147). It is recommended the water quality treatment wetland and swales are planted with local native plant species from the appropriate local vegetation communities.

This will be addressed as a standard Condition of consent.

5. ROADS AND MARITIME SERVICES

Submission was received from the Roads and Maritime Services relating to a Construction Traffic Management Plan.

RMS has reviewed the application and requires the following comment to be included in any conditions of approval:

1. A Construction Traffic Management Plan detailing construction vehicle routes, number of trucks, hours of operation, access arrangements and traffic control should be submitted to Council prior to the issue of a Construction Certificate.

In accordance with State Environmental Planning Policy Infrastructure, the consent authority must give RMS a copy of the determination of application within 7 days after the determination is made.

This will be addressed as a standard Condition of consent.

6. NSW EPA

Submission from NSW EPA provided a number of recommendations that are addressed in this section.

Recommendation: The EPA recommends that the applicant be required to revise its assessment to accurately describe current onsite conditions and activities and to revise any related technical assessments to ensure they include current, relevant details, as outlined below:

In response to this recommendation, we note:

Benbow Environmental were commissioned to prepare an Environmental Impact Statement for Glass Recovery Services for the proposed development of a glass beneficiation plant at 126 Andrews Road, Penrith in November 2011. At the time of commissioning, the site was vacant and a site investigation was undertaken by Benbow Environmental consultants confirming that no activities were being undertaken at the site. Further site inspections were undertaken in late 2011 and early 2012 with the site remaining vacant. The EIS was prepared on the basis of being a proposed activity.

The first draft issue of the EIS was provided to the department in July 2012. Several revisions of the EIS and technical assessments have been subsequently undertaken, none of which caused Benbow Environmental consultants to re-visit the site and thus, to the best of our knowledge, the proposed activity remains accurately described.

If the commercial realities of the proponent have caused works to be undertaken on the site during the assessment period then this is ultimately at the discretion of the proponent and not Benbow Environmental.

We also note that, to the best of our knowledge the first time anyone from The Dept of Planning or the EPA actually undertook a physical inspection of the subject site was in December 2012, some seven (7) months after having been provided with the EIS for assessment purposes.

The EIS was prepared on the basis of plant and equipment to be installed into an existing building, the parameters of which were well known and modelled by us in the EIS on the basis of the 'proposed facility'. We are informed that the plant and equipment subsequently installed into the plant is identical to that proposed, thus the conclusions reached in the EIS remain valid. No further modelling for the 'current condition' is required on the basis that this is identical to the 'proposed condition' of the plant upon which the EIS is based. We have no objection to a Condition of Consent that the plant operates on the basis if the original assessment of the EIS.

The recommendations within NSW EPAs submission have been addressed separately below.

Noise Impact Assessment

The EPA has reviewed the Noise Impact Assessment (NIA) contained within the EIS. The predicted daytime noise level of 49dBA is 3dB above the Project Specific Noise Level (PSNL) of 46dBA at location R3 6 Koala Glen, Cranebrook. The NIA does not appear to include justification that the residual level of impact at R3 is acceptable in accordance with Chapters 8 and 9 of the INP. The EPA understands that in the recent *Bulga Milbroda/e Progress Association Inc v Minister for Planning and Infrastructure and Warkworth Mining Limited [2013] NSWLEC 48*, one of the issues which lead to the appeal being upheld was that impacts above the PSNL were predicted, but that in giving approval to the project the Department of Planning and Infrastructure did not consider the acceptability of the impacts in accordance with Chapters 8 and 9 of the INP.

Recommendation: The EPA is not able to licence noise levels above the PSNL as requested unless the applicant has justified the acceptability of this by addressing the items in Section 8.2.1 of the INP. The EPA recommends the applicant revise the NIA to include further mitigation works so as to meet the PSNL or justify the acceptability of the exceedance by addressing the items in Section 8.2.1 of the INP. The EPA will not be able to provide noise specific conditions of consent until a revised NIA is provided.

This recommendation is addressed in a letter report relating to the Noise Impact Assessment and is provided in Attachment 3.

The following is noted:

> *Further calculations were undertaken resulting in noise compliance with the Project Specific Noise Levels.*

Interim additional noise recommendations

The dust baghouse is currently installed externally.

Recommendation: As the NIA modelling includes the dust baghouse being installed internally, this should be moved in to the factory.

A detailed response to noise related issues is provided in Attachment 3. We note that:

> *Noise control measures have been recommend in order to ensure that the noise impact associated with the noise emissions from the baghouse is negligible at all the considered receiver locations.*

The dust extractor will remain external. The noise letter report in Attachment 3 has recommended that a silencer and a noise wall be installed to ensure that the noise targets are met.

Hours of Operation

The applicant requests approval to operate 24 hours a day and 7 days per week. The facility would operate on a three (3) shift basis as follows:

Day Shift: 7:00am to 3:00pm
Afternoon Shift: 3:00pm to 11:OOpm
Night Shift: 11:OOpm to 7:00am

The EIS recommends noise compliance testing prior to night time operations commencing to ensure the project specific night time noise limits are satisfied.

The EIS recommends night-time vehicle movement restrictions and that factory doors remain closed at night to meet PSNL's.

Air emission modelling (s 5.1.8.1 of the EIS) was calculated based on truck movements between 6am to 6pm. Handling of external stockpiles was modelled for 4pm to 6pm. The applicant has not satisfactorily justified the need for operating hours extending in to the night for external plant and heavy vehicle activity

Recommendation: The EPA recommends the following operating hours:

- External operational activity including plant and heavy vehicle movements may be conducted between 6am and 6pm; and
- Internal activity may be conducted 24 hours, dependent upon noise validation. The EPA notes that as the facility is currently operating (without approval), this validation could be conditioned prior to receiving operational approval.

Note: these recommendations may be modified following a review of a revised noise assessment.

A detailed response to noise related issues is provided in Attachment 3. In this response, we note:

As recommended by EPA, the hours of operation have been restricted to:

- *Internal activity conducted 24 hours;*
- *External operational activity including plant and heavy truck movements will be conducted between 6am and 6pm.*

Attachment 2 provides an addendum to the Air Quality Assessment component of the EIS prepared for Glass Recovery Services. This addendum mainly provides the results to account for the following changes (to satisfy the comments from NSW EPA relating to air emissions modelling):

- Operations carried out within the building would be the only operations that would remain to operate during the night-time period as part of the development.
- Operations carried out external to the building would only be conducted during the day, and hence the assumptions regarding active hours of emission sources for these activities remain consistent with the original statements in the EIS.

Operations carried out within the building have been outlined as emission sources S1, S2, and S3. Details of these sources have been reproduced in the addendum for your convenience.

Ground level concentration isopleth diagram for the 24 hour averaging period has been included in the addendum. This now includes the effects of depletion, which includes the effects of scavenging and deposition, thus realistically describes the dispersion of dust and particulate from the subject site.

As outlined in the addendum, compliance to the NSW EPA air quality assessment criteria is still achieved.

Air emissions

The EPA has reviewed the Air Quality component of the *Environmental Impact Statement for Glass Recovery Service Ply Ltd 123 Andrews Road, Penrith* (the assessment). The assessment has been conducted with reference to the *Approved Methods for Modelling and Assessment of Air Pollutants in NSW.* The assessment contains numerous small deficiencies however these are unlikely to significantly affect the reported results. Hence, the assessment is generally adequate.

The assessment predicts no exceedances of the EPA's applicable ground level concentration impact assessment criteria for PM10, TSP and deposited dust.

Recommendation: The assessment is based on the application of significant dust controls which should be required under any recommended conditions of consent.

This recommendation would be addressed as a condition of consent.

Stormwater

Floodwater
The external storage bays are proposed to be constructed within a floodplain. To maintain flood storage volume the proposal has designed 1 in 100 floodwaters to surcharge back in to these external bunkers.

During the review of the draft EIS, the EPA expressed concerns that glass cullet could potentially be carried out of the storage bays during flooding. The applicant subsequently provided the EPA with correspondence entitled *Brown Smart Consulting X11354 EPA letter Rev01 17 May, 2013* that committed to the installation of floodwater containment bunds around the storage bay area, in order to ensure that all water would discharge from this area via the CDS interceptors. This correspondence was provided as a revision of the *Brown Smart Consulting X11354.W* referred to in the EIS.

Recommendation: The EPA requests the assessment be updated to include the advice of 17 May 2013. The EPA will require the installation and maintenance of floodwater containment bunds around the storage bay areas to ensure that all water, including floodwaters would discharge via the CDS interceptors.

The requested advice of 17 May 2013 was included in Section 5.3.6, Section 5.3.7 and Section 5.3.8 of the EIS. The original correspondence from Brown Consulting, *Brown Smart Consulting X11354 EPA letter Rev01 17 May, 2013* is provided in Attachment 7 of this report.

Monitoring and Maintenance

The proposal states at page 5-161 that *"all water quality monitoring was performed on the basis that the glass cullet material was sufficiently cleaned prior to storage in the outdoor bunkers therefore no specific modelling parameters were introduced."*

Recommendation: The EPA will include conditions in the relevant EPL requiring that discharge from the onsite stormwater treatment system be monitored for nutrient and TSS levels comparable to those in the ANZECC 2000 guidelines and that only finished glass cullet that is free of contaminants be permitted to be stored externally.

Recommendation: CDS in-line stormwater treatment devices or similar must be installed. Where CDS in- line stormwater treatment devices are not installed, the applicant should install devices that will achieve the same or better performance criteria. These should also be routinely inspected and maintained so as to operate within design parameters.

These recommendations would be complied with as a condition of the EPL. An Environmental Management Plan (EMP) is in the process of being prepared for the site and this document addresses these issues. The EMP will be provided in accordance with the standard conditions of Consent.

Housekeeping

During the inspection of the 11 July 2013 the EPA observed that a layer of crushed glass cullet that may have been mixed with contaminants (eg. dirt) covered the external concrete hardstand. This material may result in an increase of emissions of dust and odour and the material may be washed into the stormwater. The EPA also observed that the internal factory floor was covered in a layer of crushed glass material and that a significant layer of dust covered the plant and other surfaces.

Recommendation: All external surfaces are kept free of contaminants including crushed glass including the external concrete hardstand areas. Note this condition would not be applied to the area immediately contained within the external storage bays.

Recommendation: The operator is required to maintain and clean the internal surfaces of the Premises to ensure operating conditions inside the facility minimise the potential to generate odour, dust and the carriage of waste outside the factory.

Recommendation: Finished glass cullet stockpiles are to be maintained below the 3m height of the bunkers at all times, to ensure the effective containment of finished glass cullet and to reduce the potential to generate wind born dust.

These recommendations would be complied with as a condition of the EPL and addressed in an Environmental Management Plan.

Land application of waste

Penrith City Council recently issued a clean up notice to address land contamination, specifically glass waste contaminating the rear of the property. During the inspection of the 11 July 2013 it appeared that not all the material required to be removed by Penrith City Council had been removed.

Recommendation: Prior to the commencement of operation, the applicant is required to: remove all waste contamination from the property (including all crushed glass that is not stored inside the factory or in the approved storage bays) as required by Penrith City Council; and the applicant is to engage a suitably qualified and experienced consultant to assess and submit a report on the effectiveness of works to remove all waste contamination from the property.

Factory Doors

During the inspection of the 11 July 2013 the EPA observed potential risks emanating from the inside of the building that would need to be mitigated including:

- Internal surfaces were highly impacted with dust;
- Crushed glass material issuing from within the building to outside surfaces;
- Putrescible waste odour around the eastern external pad area emanating either from the open factory door or the vent baghouse; and
- Dust coating surfaces around the eastern external pad area.

The noise impact modelling specifies the need for factory doors to remain closed at night to comply with the PSNL's.

Recommendation: the facility should install auto-closing doors, prior to the commencement of operation, to reduce the potential for dust, noise, odour and crushed glass to pass outside the facility building and to ensure factory doors are not left open at inappropriate times.

This recommendation would be undertaken as a condition of the EPL.

Fuelling of plant or vehicles within bunded area

Section 5.7.1 Chemicals and Dangerous Goods of the EIS refers to the Dangerous Goods to be stored onsite in accordance with AS 1940-2004.

Recommendation: The decanting of any chemicals or dangerous goods, including the fuelling of plant or vehicles from the 2000L bunded diesel tank, is to be conducted wholly within a covered and bunded area that excludes rainwater.

This recommendation would be undertaken as a condition of the EPL.

7. SYDNEY WATER

Submission was received from Sydney Water in relation to Trade Waste Information and Sydney Water Servicing. These concerns are addressed below.

Trade Waste Information

Should this development generate trade wastewater, this correspondence does not guarantee the applicant that Sydney Water will accept the trade wastewater to its wastewater system. In the event trade wastewater is generated, the property owner is required to submit an application for permission to discharge trade wastewater to the wastewater system before business activities commence. A boundary trap will be required where arrestors and special units are installed for trade waste pre-treatment.

If this development type is "industrial", then the property may be part of sewerage catchment subject to a wastewater reuse scheme. This may impact the level of pollutants such as Total Dissolved Solids (TDS) that Sydney Water will accept from the property to the sewerage system. Businesses wishing to discharge wastewater (other than domestic sewerage) should contact a Sydney Water Trade Waste Office. A boundary trap will be required where arrestors and special units are installed for trade waste pre-treatment.

No Trade Waste would be generated at the site.

Sydney Water Servicing

Sydney Water will further assess the impact of any subsequent development when the developer applies for a Section 73 Certificate. This assessment will enable to specify any works required as a result of the future development and to assess if amplification and/or changes to the system are applicable. The developer must fund any adjustments needed to Sydney Water infrastructure as a result of the development.

The developer should engage a Water Servicing Coordinator to get a Section 73 Certificate and manage the servicing aspects of the development. The Water Servicing Coordinator will ensure submitted infrastructure designs are sized and configured according to The Water Supply Code of Australia (Sydney Water Edition WSA 03-2002) and the Sewerage Code of Australia (Sydney Water Edition WSA 02-2002).

This is a matter to be addressed at the Construction Certificate stage.

This concludes the response to submissions.

Prepared by

Linda Zanotto
Senior Environmental Engineer

Duke Ismael
Senior Environmental Engineer

8. LIMITATIONS

Our services for this project are carried out in accordance with our current professional standards for site assessment investigations. No guarantees are either expressed or implied.

This report has been prepared solely for the use of Glass Recovery Services, as per our agreement for providing environmental services. Only Glass Recovery Services is entitled to rely upon the findings in the report within the scope of work described in this report. Otherwise, no responsibility is accepted for the use of any part of the report by another in any other context or for any other purpose.

Although all due care has been taken in the preparation of this study, no warranty is given, nor liability accepted (except that otherwise required by law) in relation to any of the information contained within this document. We accept no responsibility for the accuracy of any data or information provided to us by Glass Recovery Servicesfor the purposes of preparing this report.

Any opinions and judgements expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal advice.

ATTACHMENTS

Attachment 1: Letter Report – Biodesign & Associates Pty Ltd (16 August 2013)

BioDesign

Brent Winning
Claron Property Group
PO Box 115
Castle Hill NSW 1765

16th August, 2013

Dear Brent,

Re: DA for Operation of Waste and Recycling Facility, 126 Andrews Road Penrith

This response to the requests for information by Penrith Council and the NSW Office of Water deals with landscape and vegetation management issues raised by these Authorities. I have broken our response up into two parts: 1 – Penrith Council's concerns and 2 – the NSW Office of Water's.

Penrith Council's planning controls

LEP Considerations

Clause 5.9 – Preservation of Trees or Vegetation provides that the removal of trees or other DCP prescribed vegetation requires consent from Council (or the applicable determining authority). The application includes the removal of six (6) trees which is considered satisfactory subject to adherence to the proposed landscape plan and the provision of endemic replacement landscaping species.

Response: The approved Landscape Plan will be amended to accommodate the approved redesign of the stormwater detention/drainage system (CONSENT # DA12-0539). The new landscape design is essentially the same with regard to the retention of significant trees on the site and the establishment of new tree plantings, but due to the realignment of the stormwater flow path, three clumps of small Casuarina glauca along the northern boundary will need to be removed. They are to be replaced with new tree plantings on the mounds that are to be installed in this location. No additional tree removals are proposed under this application.

DCP Considerations

- *Clause 4.5 of Penrith Development Control Plan 2010 (Part D – Industrial Development) outlines specific requirements for the storage of materials and chemicals. The proposed external storage bunkers should be appropriately designed to minimise their visual*

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presentation with conditions of consent requested to be imposed regarding external finishes and landscaping treatments.

Response: Landscaping is proposed along the interface with the area. It includes dense plantings of trees and shrubs that will screen views of the hardstand from Andrews Road and the sportsfields to the north-east and north.

- *Landscaping proposed for the site should also be endemic to the area noting the likely existence of endangered ecological community as outlined in the Biodiversity comments below.*

Response: All plant species proposed in the landscape are selected on the basis of their ecological association with the locality and the site conditions. The Landscape Plan provides for plantings of species from Alluvial Woodland and Riparian ecological communities associated with the Fluvial Landscape Richmond Soils of the Cumberland Plain. Weeds are to be controlled.

Biodiversity Considerations

The level of ecological assessment is not considered to be adequate. A complete flora and fauna survey has not been undertaken on the site. The Director General's Requirements specify the need for a field survey and assessment of threatened species. This was not undertaken for vegetation at the back of the site (southern boundary) and along the western boundary of the site. It is therefore unclear if this remnant vegetation and wetland areas constitute an Endangered Ecological Community (EEC) under the TSC Act. It is expected that the wetland areas at least would fit the description of the EEC: Freshwater Wetlands on Coastal Floodplains.

Despite the lack of a full ecological assessment, the expected impact of the development on the vegetation on site is considered low. A total of 6 trees will be removed for the development – three of which were planted previously (and are not endemic), and two of which are remnant. The development proposes to replace these with locally endemic species at the rear of the site.

To mitigate any impacts associated with the development, detailed landscape plans have been prepared identifying areas for planting, weed management and other activities (Figure 5-45: Landscape Concept Plan and Figure 5-46: Landscape Planting plan). These should be adhered to in their entirety. It is recommended that the Department require annual reports on the implementation of the Landscape Plan to be provided at 12 and 24 month intervals.

Further to the Landscape Plan, it is recommended that the Department require the following be implemented during construction:

> *- No trees or other vegetation (including understory species) should be removed, ringbarked, cut, topped or lopped or wilfully destroyed (other than those within the Landscape Plans Figures 5-44, 5-45, 5-46) without prior consent.*

Response: (SAME AS FOR LEP): The approved Landscape Plan will be amended to accommodate the approved redesign of the stormwater detention/drainage system (CONSENT # DA12-0539). The new landscape design is essentially the same with regard to the retention of significant trees on the site and the establishment of new tree plantings, but due to the realignment of the stormwater flow path, three clumps of small Casuarina glauca along the northern boundary will need to be removed. They are to be replaced with new tree plantings on the mounds that are to be installed in this location. No additional tree removals are proposed under this application.

> *- No fill, machinery, or materials should be placed or stored within the drip-line of any tree.*

Response: A Tree and Landscape Protection Plan forms part of the approved Landscape Plan (CONSENT # DA12-0539) for the site. It is expected that conditions of consent will be imposed to ensure trees are protected in accordance with this requirement.

> *- Where possible all fallen trees, logs, leaf litter, rocks and other debris should be retained on site as habitat and to maintain soil stability and structure.*

Response: No felling of trees is proposed under this application. The approved Landscape Plan (CONSENT # DA12-0539) includes the retention to a large felled tree for habitat in the landscape. The landscape is to be managed as a “bushland” site that provides habitat in the form required by this condition.

Waterway / Flood Management Considerations

- *There is an unnamed waterway adjacent to the western boundary of the site. The EIS states that this waterway is a second order stream. Should any works occur within waterfront land (within 40m of this waterway) a controlled activity approval is required from the NSW Office of Water, prior to the commencement of any works. The integrity of the riparian corridor is to be preserved and maintained in line with the Office of Water’s guidelines and objectives for riparian corridor management.*

Response: It is proposed that weeds be controlled in this area and natural regeneration of indigenous vegetation supported.

- *No details have been provided on the design parameters of the constructed wetland, such as depth or where macrophyte zones are located. BioDesign's landscape planting plan shows generic detail only. Best practice wetland design incorporates benching or bands of shallow and deep water macrophytes perpendicular to the direction of flow to guarantee contact time with the vegetation. The wetland layout needs to demonstrate that it is fit for purpose and results in biological treatment as well as physical treatment. A comprehensive monitoring regime must also be developed and implemented for the commissioning and ongoing functioning of the wetland to ensure water quality objectives are achieved.*

Response: The "wetland" is ephemeral and contains an extremely shallow profile (see survey). It was inspected by Susan Hobley, BioDesign's ecologist, in late June 2013 following the highest ever recorded rainfall levels for that month. Only minor ponding occurred in two areas indicated on the landscape plans as "retain existing wetland". These areas were mapped as "existing wetland" because, despite the absence of standing water or muddy conditions, they contained sedges and rushes at the time of the site assessments. There is no opportunity to provide for deep water macrophytes; the planting approach has been to work with the grades, vegetation and soil conditions, but it is expected that the indigenous plantings will opportunistically occupy the most suitable soil profiles over time (this has been BioDesign's experience on past projects involving wetland plantings).

NSW Office of Water

Section 5.3.1.5 of the EIS notes the existing wetalnd areas are in poor condition and contain low to moderate weeds (page 5-148). It is noted a weed control program shall be implemented over the entire site, including the existing wetalnd area on the western side of the site. The Office of Water supports weed control being undertaken within the riparian/wetland area on the site. The Landscape Concept Plan does not indicate naïve plants are proposed to be planted within the wetland area on the western side of the site. It is recommended the riparian/wetland area is rehabilitated to mimc a natural system. The rehabilitation should include the establihsment of local nativeriparian plant species endemic to the local vegetation community to improve the riparian/wetland area.

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Response: The approve Landscape Concept Plan (CONSENT # DA12-0539) provided for the rehabilitation of the riparian area along the western boundary outside the works zone through weed control and support for natural regeneration. This application will not involve new works that will impinge on this area. The approved Landscape Plan (CONSENT # DA12-0539) specifies a minimum maintenance period of 24months for the entire landscape.

Regards

Sue Hobley

BioDesign & Associates Pty Ltd

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Attachment 2: Letter Report, Air Quality Assessment – Benbow Environmental (August 2013)

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DI/sc
Ref: Attachment 2_Benbow Environmental_Air letter report
30 August 2013

Mr Dom Tenace
Glass Recovery Services
82-88 Maffra Street,
COOLAROO VIC 3048

Dear Dom,

RE: Addendum to the Air Quality Assessment of the Environmental Impact Statement for Glass Recovery Services Pty Ltd – 126 Andrews Road, PENRITH

Introduction

This letter report has been prepared to provide an addendum to the Air Quality Assessment component of the EIS prepared for Glass Recovery Services. It specifically addresses issues raised in Submissions from Penrith City Council and NSW EPA. These issues include:

Penrith City Council:

It is noted that the development does not comply with the relevant criteria for PM10 unless water sprays are utilised. Importantly, even when the use of these sprays has been modelled, there still appears to be a significant impact south of the site, as shown in Figure 5-27. Although there are no identified receivers in this area (and no receivers assessed), it is not clear how far this plume extends to the south (the figure does not show where the area of impact ends), and there are residents and recreational facilities located in this direction. It needs to be considered whether such a large area of affectation is appropriate.

NSW EPA:

Air emission modelling (s 5.1.8.1 of the EIS) was calculated based on truck movements between 6am to 6pm. Handling of external stockpiles was modelled for 4pm to 6pm. The applicant has not satisfactorily justified the need for operating hours extending in to the night for external plant and heavy vehicle activity.

The addendum aims to provide the results for the changes in the assumptions utilised in the original assessment, along with the associated changes in the air emissions inventory, description of the changes made, and other configuration input parameters relevant to this addendum.

These have been provided as follows.

Description of Changes in Assumptions

Changes made in the list of assumptions are based on increasing the active hours of emissions within the modelling that would more accurately reflect the activities on site. Hours of operation are assumed to be 24 hours per day and 7 days per week.

However, the proponent is committed to only operate the activities carried out within the building throughout the night-time period whilst truck movements and yard activities remain to be conducted during the day time, which were assumed in the original assessment.

Changes in Assumptions Utilised for the Assessment

The following list of assumptions is a modified version of the list of assumptions provided in Section 5.1.8.4 of the EIS (with changes highlighted in bold red):

- A total maximum annual production capacity of 150,000 tonnes were used to estimate the emissions from the subject site;
- Emissions from the site have been conservatively assessed as 24 hours per day, 7 days per week;
- The emission generating operations were assumed to include the following:
  - Crushed cullet stored in bunkers emits 24 hours per day, with emissions controlled by wind breaks;
  - Truck loading at bunkers occurs from 6.00am to 5.00pm, transfer activity occurs from 4pm to 6pm, and emissions are controlled by wind breaks;
  - At Source S1, operations occur for 24 hours per day and 7 days per week, transfer activity occurs from 4.00pm to 6.00pm, and emissions are controlled by an enclosed building;
  - At Source S2, operations occur for 24 hours per day and 7 days per week, transfer activity occurs from 4pm to 6.00pm, and emissions are controlled by an enclosed building with water sprays; and
  - At Source S3, crushing occurs for 24 hours per day and 7 days per week, and emissions are controlled by a dust collector.
- Emission control efficiency for the dust collector was conservatively assumed to be 90%, despite some of the modern dust collectors being able to achieve efficiencies up to 95-98%; and
- Scope of air emissions are limited to what has been described in Section 3.1.2.

The following conditions (as listed in Section 5.1.8.4 of the EIS) remain to be applicable:

- Exit air velocities for all pseudostacks (Sources S1 & S2) were conservatively assumed to be 0.1 m/s;
- Source S1 and Source S2 were modelled as 3 pseudostacks each to account for temperature effects;
- Stack tip heights for Source S1 and S2 were assumed to be 1.5 m for each pseudostack;
- Stack tip height for Source S3 was assumed to be 1 m above ground;
- Stack tip diameters for all stack sources on site were assumed to be 2 m;
- Stack temperatures for all stacks were set to ambient temperature;
- Loading areas were modelled as area sources (10 in total);
- Area source diameters and heights were assumed to be 2 m and 1 m respectively; and
- External bunkers were modelled as volume sources (10 in total).

The following figure from Section 5.1.8.4 has been reproduced for your convenience.

Figure 5-11: Location of Emission Sources – Aerial Photograph of Subject Site

Where:

S1:	Stack source 1: conveying and transfer activity; enclosed building control
S2:	Stack source 2: unloading and transfer activity; enclosed building and water spray control
S3:	Stack source 3: crushing activity; dust collector control
A:	Area source: loading activity from external bunkers
V:	Volume source: external bunker storage

Note: Diagram above not to scale and is only used for representation purposes.

Air Emissions Inventory

The following summaries of emission rates remain to be applicable, with the exception of the periods when some element of the emissions are active for all hours of the day (as highlighted in bold red in tables below). Please note that the following remains to assume a dust collector efficiency rate of 90%.

Table 5-11: Summary of Emission Rates at Each Source for PM_{10} (24-hour Operations)

Emission Source	Time	Emission Activities	Controls	Emission Rate (g/s)	Averaging Period
Stack 1	All hours	Conveying	Within enclosed building	2.74×10^{-3}	24 hour/annual
	4pm-6pm	Conveying and transfer activity	Within enclosed building	2.42×10^{-1}	24 hour/annual
Stack 2	6am-8am	Truck unloading	Within enclosed building, Water spray	7.47×10^{-6}	24 hour/annual
	All hours	Truck unloading and transfer activity	Within enclosed building, Water spray	2.66×10^{-2}	24 hour/annual
	4pm-6pm	Truck unloading and transfer activity	Within enclosed building, Water spray	2.66×10^{-2}	24 hour/annual
Stack 3	All hours	Crushing	Dust collector[1]	9.51×10^{-3}	24 hour/annual
Bunkers (V)	24 hours	Wind erosion	Wind breaks	8.57×10^{-5}	24 hour/annual
Loading areas (A)	6am-8am	Truck loading	Wind breaks	2.18×10^{-4}	24 hour/annual
	8am-4pm	Truck loading	Wind breaks	3.63×10^{-5}	24 hour/annual
	4pm-6pm	Truck loading and transfer activity	Wind breaks	5.59×10^{-1}	24 hour/annual

Table 5-12: Summary of Emission Rates at Each Source for TSP and Dust Deposition (24-Hour Operations)

Emission Source	Time	Emission Activities	Controls	Emission Rate (g/s)	Averaging Period
Stack 1	All hours	Conveying	Within enclosed building	$5.37x\ 10^{-3}$	Annual
	4pm-6pm	Conveying and transfer activity	Within enclosed building	5.03×10^{-1}	Annual
Stack 2	6am-8am	Truck unloading	Within enclosed building, Water spray	1.47×10^{-5}	Annual
	All hours	Truck unloading and transfer activity	Within enclosed building, Water spray	5.52×10^{-2}	Annual
	4pm-6pm	Truck unloading and transfer activity	Within enclosed building, Water spray	5.52×10^{-2}	Annual
Stack 3	All hours	Crushing	Dust collector[1]	2.47×10^{-2}	Annual
Bunkers (V)	24 hours	Wind erosion	Wind breaks	1.68×10^{-4}	Annual
Loading area (A)	6am-8am	Truck loading	Wind breaks	4.27×10^{-4}	Annual
	8am-4pm	Truck loading	Wind breaks	7.12×10^{-5}	Annual
	4pm-6pm	Truck loading and transfer activity	Wind breaks	1.16	Annual

Updated Air Dispersion Modelling Results

Results for Stage 1 provided in the original EIS remain to apply, given that the assumptions listed above do not affect the parameters used for the Stage 1 air dispersion modelling.

Table 1 below provides the updated results for the modelling, using the updated assumptions listed above.

Given the request from Penrith City Council, the expanded ground level concentration isopleth diagram for the PM_{10} 24-hour impacts have been provided as Figure 1 of this addendum. Please note that this result includes the depletion effects due to scavenging and deposition of particulates, as it migrates off-site.

The PM_{10} 24-hour impacts of the Stage 2 development as shown in the Figure 1 do not reach or extend to areas where residential premises are located. The 0.05 mg/m^3 criteria line is depicted by the contour that separates the purple line from the blue line in the figure presented below. It is however acknowledged that the 0.05 mg/m^3 contour line is seen to be present at a reasonable distance away south of the site.

This therefore concludes that with the PM_{10} 24-hour averaging period impact results, no exceedances are expected to occur as part of the activities.

Included as the attachments to this addendum is an extract of the AUSPLUME text file.

Table-14: Predicted Air Quality Impacts from Operation (Stage 2) at the Nearest Potentially Affected Receptors (All Hours of Operation)

Substances	Averaging Time & Impact	Scenario Description	Predicted Concentration at Receptor ($\mu g/m^3$)											Units	Criteria	Pass
			R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11			
Fine Particulates (PM_{10})	24 hour Incremental Impacts[(a)]	All emission sources.	3.03	8.23	7.74	1.41	2.53	5.29	1.55	0.71	0.88	0.44	4.90	$\mu g/m^3$	50 $\mu g/m^3$	Yes
	24 hour Cumulative Impacts[1(a)]	All emission sources.	35.23	40.43	39.94	33.61	34.73	37.49	33.75	32.91	33.08	32.64	37.10	$\mu g/m^3$		Yes
	Annual Incremental Impacts	All emission sources.	0.14	0.13	0.14	0.06	0.05	0.05	0.08	0.01	0.02	0.04	0.08	$\mu g/m^3$	30 $\mu g/m^3$	Yes
	Annual Cumulative Impacts[1]	All emission sources.	14.94	14.93	14.94	14.86	14.85	14.85	14.88	14.81	14.82	14.84	14.88	$\mu g/m^3$		Yes
Total Suspended Particulates (TSP)	Annual Incremental Impacts	All emission sources.	0.48	0.44	0.47	0.18	0.16	0.16	0.27	0.04	0.08	0.13	0.26	$\mu g/m^3$	90 $\mu g/m^3$	Yes
	Annual Cumulative Impacts[2]	All emission sources.	29.48	29.44	29.47	29.18	29.16	29.16	29.27	29.04	29.08	29.13	29.26	$\mu g/m^3$		Yes
Deposited Dust	Annual Incremental Impacts	All emission sources.	0.07	0.05	0.03	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.02	$g/m^2/month$	2 $g/m^2/month$	Yes
	Annual Cumulative Impacts[3]	All emission sources.	2.075	2.049	2.030	2.013	2.010	2.009	2.013	2.002	2.003	2.008	2.022	$g/m^2/month$	4 $g/m^2/month$	Yes

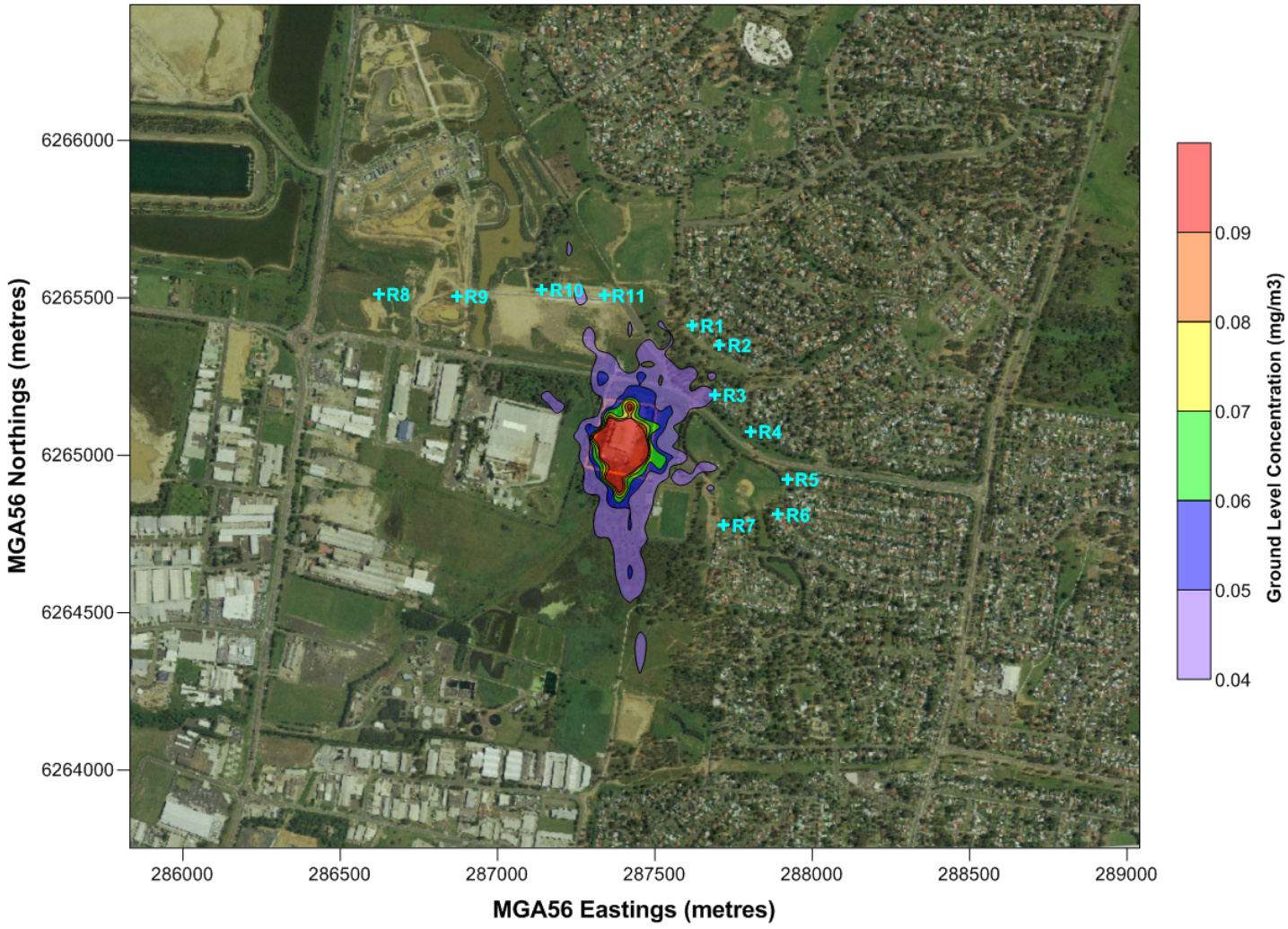
Note: [1] Background concentration data for PM_{10} used.

[2] Background concentration data for TSP used.

[3] Background concentration value of 2 g/m^2/month used.

[(a)] Depletion effects were accounted for in the modelling. Depletion is defined as the effects of scavenging or deposition of particulates as these travels through the air from the source.

Figure 1: Predicted PM_{10} Impacts from Operation (Stage 2) - 24-Hour Averaging Time with Background Concentration (Cumulative Impacts)



Averaging Time:	24 hours
Percentile:	100th
Criteria:	0.05 mg/m^3

This concludes the addendum.

Prepared by:

Duke Ismael
Senior Environmental Engineer

ATTACHMENTS

Attachment 1: Extract of AUSPLUME Output File - PM_{10} 24-Hour Modelling of Sources S1 to S3

1

111144 Modelling of emissions from glass crushing 150000T

Concentration or deposition Concentration
Emission rate units grams/second
Concentration units milligrams/m3
Units conversion factor 1.00E+03
Constant background concentration 0.00E+00
Terrain effects Egan method
Plume depletion due to dry removal mechanisms included.
Smooth stability class changes? No
Other stability class adjustments ("urban modes") None
Ignore building wake effects? No
Decay coefficient (unless overridden by met. file) 0.000
Anemometer height 10 m
Roughness height at the wind vane site 0.300 m
Use the convective PDF algorithm? No
Averaging time for sigma-theta values 60 min.

DISPERSION CURVES
Horizontal dispersion curves for sources <100m high Sigma-theta
Vertical dispersion curves for sources <100m high Pasquill-Gifford
Horizontal dispersion curves for sources >100m high Briggs Rural
Vertical dispersion curves for sources >100m high Briggs Rural
Enhance horizontal plume spreads for buoyancy? Yes
Enhance vertical plume spreads for buoyancy? Yes
Adjust horizontal P-G formulae for roughness height? Yes
Adjust vertical P-G formulae for roughness height? Yes
Roughness height 0.600m
Adjustment for wind directional shear None

PLUME RISE OPTIONS
Gradual plume rise? Yes
Stack-tip downwash included? Yes
Building downwash algorithm: PRIME method.
Entrainment coeff. for neutral & stable lapse rates 0.60,0.60
Partial penetration of elevated inversions? No
Disregard temp. gradients in the hourly met. file? No

and in the absence of boundary-layer potential temperature gradients
given by the hourly met. file, a value from the following table
(in K/m) is used:

Wind Speed Category	Stability Class A	B	C	D	E	F
1	0.000	0.000	0.000	0.000	0.020	0.035
2	0.000	0.000	0.000	0.000	0.020	0.035
3	0.000	0.000	0.000	0.000	0.020	0.035
4	0.000	0.000	0.000	0.000	0.020	0.035
5	0.000	0.000	0.000	0.000	0.020	0.035
6	0.000	0.000	0.000	0.000	0.020	0.035

WIND SPEED CATEGORIES
Boundaries between categories (in m/s) are: 1.54, 3.09, 5.14, 8.23, 10.80

WIND PROFILE EXPONENTS: "Irwin Urban" values (unless overridden by met. file)

AVERAGING TIMES
24 hours

111144 Modelling of emissions from glass crushing 150000T

SOURCE CHARACTERISTICS

STACK SOURCE: S1A

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
287372	6265019	30m	2m	2.00m	25C	0.1m/s

No building wake effects.

Emission rates by hour of day in grams/second:

1 1.52E-04	2 1.52E-04	3 1.52E-04	4 1.52E-04
5 4.06E-02	6 4.06E-02	7 1.52E-04	8 1.52E-04
9 1.52E-04	10 1.52E-04	11 1.52E-04	12 1.52E-04
13 1.52E-04	14 1.52E-04	15 1.52E-04	16 1.52E-04
17 1.52E-04	18 1.52E-04	19 1.52E-04	20 1.52E-04
21 1.52E-04	22 1.52E-04	23 1.52E-04	24 1.52E-04

Particle Mass fraction	Particle Size (micron)	Particle Density (g/cm3)
0.0740	2.5	2.80
0.0900	5.0	2.80
0.2760	10.0	2.80
0.5600	20.0	2.80

STACK SOURCE: S1B

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
287372	6265019	30m	3m	2.00m	25C	0.1m/s

No building wake effects.

Emission rates by hour of day in grams/second:

1 1.52E-04	2 1.52E-04	3 1.52E-04	4 1.52E-04
5 4.06E-02	6 4.06E-02	7 1.52E-04	8 1.52E-04
9 1.52E-04	10 1.52E-04	11 1.52E-04	12 1.52E-04
13 1.52E-04	14 1.52E-04	15 1.52E-04	16 1.52E-04
17 1.52E-04	18 1.52E-04	19 1.52E-04	20 1.52E-04
21 1.52E-04	22 1.52E-04	23 1.52E-04	24 1.52E-04

Particle Mass fraction	Particle Size (micron)	Particle Density (g/cm3)
0.0740	2.5	2.80
0.0900	5.0	2.80
0.2760	10.0	2.80
0.5600	20.0	2.80

STACK SOURCE: S1C

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
287372	6265019	30m	5m	2.00m	25C	0.1m/s

No building wake effects.

Emission rates by hour of day in grams/second:

1 1.52E-04	2 1.52E-04	3 1.52E-04	4 1.52E-04
5 4.06E-02	6 4.06E-02	7 1.52E-04	8 1.52E-04
9 1.52E-04	10 1.52E-04	11 1.52E-04	12 1.52E-04
13 1.52E-04	14 1.52E-04	15 1.52E-04	16 1.52E-04
17 1.52E-04	18 1.52E-04	19 1.52E-04	20 1.52E-04
21 1.52E-04	22 1.52E-04	23 1.52E-04	24 1.52E-04

Particle Mass fraction	Particle Size (micron)	Particle Density (g/cm3)
0.0740	2.5	2.80
0.0900	5.0	2.80
0.2760	10.0	2.80
0.5600	20.0	2.80

STACK SOURCE: S2A

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
287395	6265012	30m	2m	2.00m	25C	0.1m/s

No building wake effects.

Emission rates by hour of day in grams/second:

1 2.96E-03	2 2.96E-03	3 2.96E-03	4 2.96E-03
5 2.96E-03	6 2.96E-03	7 2.96E-03	8 2.96E-03
9 2.96E-03	10 2.96E-03	11 2.96E-03	12 2.96E-03
13 2.96E-03	14 2.96E-03	15 2.96E-03	16 2.96E-03
17 1.18E-02	18 1.18E-02	19 2.96E-03	20 2.96E-03
21 2.96E-03	22 2.96E-03	23 2.96E-03	24 2.96E-03

Particle Mass fraction	Particle Size (micron)	Particle Density (g/cm3)
0.0740	2.5	2.80
0.0900	5.0	2.80
0.2760	10.0	2.80
0.5600	20.0	2.80

STACK SOURCE: S2B

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
287395	6265012	30m	3m	2.00m	25C	0.1m/s

No building wake effects.

Emission rates by hour of day in grams/second:

1 2.96E-03	2 2.96E-03	3 2.96E-03	4 2.96E-03
5 2.96E-03	6 2.96E-03	7 2.96E-03	8 2.96E-03
9 2.96E-03	10 2.96E-03	11 2.96E-03	12 2.96E-03
13 2.96E-03	14 2.96E-03	15 2.96E-03	16 2.96E-03
17 1.18E-02	18 1.18E-02	19 2.96E-03	20 2.96E-03
21 2.96E-03	22 2.96E-03	23 2.96E-03	24 2.96E-03

Particle Mass fraction	Particle Size (micron)	Particle Density (g/cm3)
0.0740	2.5	2.80
0.0900	5.0	2.80
0.2760	10.0	2.80

0.5600 20.0 2.80

STACK SOURCE: S2C

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
287395	6265012	30m	5m	2.00m	25C	0.1m/s

No building wake effects.

Emission rates by hour of day in grams/second:

1 2.96E-03	2 2.96E-03	3 2.96E-03	4 2.96E-03
5 2.96E-03	6 2.96E-03	7 2.96E-03	8 2.96E-03
9 2.96E-03	10 2.96E-03	11 2.96E-03	12 2.96E-03
13 2.96E-03	14 2.96E-03	15 2.96E-03	16 2.96E-03
17 1.18E-02	18 1.18E-02	19 2.96E-03	20 2.96E-03
21 2.96E-03	22 2.96E-03	23 2.96E-03	24 2.96E-03

Particle Mass fraction	Particle Size (micron)	Particle Density (g/cm3)
0.0740	2.5	2.80
0.0900	5.0	2.80
0.2760	10.0	2.80
0.5600	20.0	2.80

STACK SOURCE: S3

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
287444	6265090	30m	1m	2.00m	25C	0.1m/s

No building wake effects.

Emission rates by hour of day in grams/second:

1 3.17E-03	2 3.17E-03	3 3.17E-03	4 3.17E-03
5 3.17E-03	6 3.17E-03	7 3.17E-03	8 3.17E-03
9 3.17E-03	10 3.17E-03	11 3.17E-03	12 3.17E-03
13 3.17E-03	14 3.17E-03	15 3.17E-03	16 3.17E-03
17 3.17E-03	18 3.17E-03	19 3.17E-03	20 3.17E-03
21 3.17E-03	22 3.17E-03	23 3.17E-03	24 3.17E-03

Particle Mass fraction	Particle Size (micron)	Particle Density (g/cm3)
0.0740	2.5	2.80
0.0900	5.0	2.80
0.2760	10.0	2.80
0.5600	20.0	2.80

111144 Modelling of emissions from glass crushing 150000T

RECEPTOR LOCATIONS

The Cartesian receptor grid has the following x-values (or eastings):
285832.m 285864.m 285897.m 285929.m 285962.m 285994.m 286026.m
286059.m 286091.m 286124.m 286156.m 286188.m 286221.m 286253.m
286286.m 286318.m 286350.m 286383.m 286415.m 286448.m 286480.m

286512.m 286545.m 286577.m 286610.m 286642.m 286675.m 286707.m
286739.m 286772.m 286804.m 286837.m 286869.m 286901.m 286934.m
286966.m 286999.m 287031.m 287063.m 287096.m 287128.m 287161.m
287193.m 287225.m 287258.m 287290.m 287323.m 287355.m 287387.m
287420.m 287452.m 287485.m 287517.m 287549.m 287582.m 287614.m
287647.m 287679.m 287712.m 287744.m 287776.m 287809.m 287841.m
287874.m 287906.m 287938.m 287971.m 288003.m 288036.m 288068.m
288100.m 288133.m 288165.m 288198.m 288230.m 288262.m 288295.m
288327.m 288360.m 288392.m 288424.m 288457.m 288489.m 288522.m
288554.m 288586.m 288619.m 288651.m 288684.m 288716.m 288749.m
288781.m 288813.m 288846.m 288878.m 288911.m 288943.m 288975.m
289008.m 289040.m

and these y-values (or northings):
6263753.m 6263784.m 6263815.m 6263846.m 6263877.m 6263908.m 6263939.m
6263970.m 6264001.m 6264032.m 6264063.m 6264094.m 6264125.m 6264156.m
6264187.m 6264218.m 6264249.m 6264280.m 6264311.m 6264342.m 6264373.m
6264404.m 6264435.m 6264466.m 6264497.m 6264528.m 6264559.m 6264590.m
6264621.m 6264652.m 6264683.m 6264714.m 6264745.m 6264776.m 6264807.m
6264838.m 6264869.m 6264900.m 6264931.m 6264962.m 6264993.m 6265024.m
6265055.m 6265086.m 6265117.m 6265148.m 6265179.m 6265210.m 6265241.m
6265272.m 6265303.m 6265334.m 6265365.m 6265396.m 6265427.m 6265458.m
6265489.m 6265520.m 6265551.m 6265582.m 6265613.m 6265644.m 6265675.m
6265706.m 6265737.m 6265768.m 6265799.m 6265830.m 6265861.m 6265892.m
6265923.m 6265954.m 6265985.m 6266016.m 6266047.m 6266078.m 6266109.m
6266140.m 6266171.m 6266202.m 6266233.m 6266264.m 6266295.m 6266326.m
6266357.m 6266388.m 6266419.m

DISCRETE RECEPTOR LOCATIONS (in metres)

No.	X	Y	ELEVN	HEIGHT	No.	X	Y	ELEVN	HEIGHT
1	287617	6265411	39.0	0.0	7	287721	6264785	30.0	0.0
2	287703	6265348	40.0	0.0	8	286622	6265512	30.0	0.0
3	287689	6265195	39.0	0.0	9	286870	6265505	30.0	0.0
4	287802	6265079	36.0	0.0	10	287141	6265526	30.0	0.0
5	287921	6264929	32.0	0.0	11	287338	6265508	30.0	0.0
6	287890	6264824	30.0	0.0					

METEOROLOGICAL DATA : Met File for 2011 Penrith Lakes AWS

Attachment 3: Letter Report, Noise Impact Assessment – Benbow Environmental (August 2013)

Benbow
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FT/RTB/LZ
Ref: 137010_Let_Rep
21 August 2013

Mr Chris Ritchie
Department of Planning & Infrastructure
23-33 Bridge Street,
SYDNEY NSW 2000

Dear Mr Ritchie,

RE: Penrith Glass Beneficiation Plan (SSD 5267) Response to Submissions – Noise Impact Assessment

This letter report has addressed all issues and comments raised by Penrith City Council and the Environment Protection Authority (EPA) regarding noise impact findings stated in the environmental impact assessment report 111144_EIS_Rep_Final undertaken by Benbow Environmental in May 2013.

The advice received from the findings of a site inspection undertaken by officers of Council and the EPA has been most helpful in addressing these issues. The noise modelling was restudied in detail as the noise team leader who was responsible for the Sound Plan modelling has left our organization to undertake travel overseas.

In reviewing the noise model, the causes of the exceedances during adverse weather conditions at receptor R3 were reanalysed. These exceeedances were for the intrusive noise criteria when worst case conditions for a 15 minute period are analysed.

In remodelling this worst case time period the number of trucks that could operate during the 15 minute period were reassessed and increased from two to three.

The control recommended in the report 111144_EIS_Rep_Final that trucks would not proceed past the southern side of the building is explained further. This control is aimed at allowing only one truck at a time to go around to the eastern side of the building and enter through a high speed roller shutter door. Any other truck on site would remain behind the building and wait till the other truck has unloaded and returned past the parked truck. This requirement would be documented in work procedures being prepared for an EMP for the site. As part of this procedure, signage would be erected to forewarn truck drivers. A similar sign with graphic display would be erected at the incoming side of the weighbridge.

The operation of the FEC has also been re-examined and although this is not a major noise source at night time, as it has limited usage we consider it good practice if this is not allowed to operate during night time along the eastern side of the building where there are cullet bunkers located. This would further safeguard residents at and near R3 from noise emissions from mobile equipment.

In reviewing the noise modelling, our databank of highway truck noise levels was reviewed as the sound power levels used were found to be those of dump trucks working at quarries. A re-examination of highway trucks travelling on site at 10 km/hour have a sound power level not exceeding 105.4 dB(A) and this has been utilized in the remodelling.

In addition, the following assumptions have been considered:

- Internal activity will be conducted 24 hours;
- External operational activity including plant and heavy truck movements will be conducted between 6am and 6pm;
- Up to three (3) truck movements could be undertaken during any 15-minute period during the day and night time periods and this would be worst case;
  One (1) front end loader will be operating on-site during the day time period only at all bunkers and during night time it would be used 1–2 per hour and then only behind the building;
- Scenario 3 considers noise emissions associated with internal operations, and on-site vehicle movements considering all roller shutter doors to be fully opened;
- Scenario 4 considers noise emissions associated with internal operations and on-site vehicle movements considering all roller shutter doors to be fully closed;
- Condition A considers neutral weather conditions;
- Condition B considers 3 m/s wind from source to receiver; and
- Condition C considers 3 °C/100m temperature inversion with 2m/s wind from source to receiver.

The number of trucks per day should not exceed the values shown in the following table:

Table 1: Truck Frequency Data

Truck Type	% of Total Annual Tonnage	Annual Tonnage	Daily Tonnage	Truck Capacity (T)	Truck/ Day	6am – 8am	8am – 4pm	4pm – 5pm
8t Truck	10	15,000	41	8	5	3	1	1
Truck & Dog	75	112,500	308	29	11	7	1	3
B-double	15	22,500	62	42	1	1	1	1
Total	100	150,000	411		17	11	3	5

In addition, several noise control measures have been recommended in order to comply with the Intrusive and Amenity Noise Criterion.

Listed below are the recommended noise control measures:

- Throughout the night time hours (10pm – 7am) all roller shutter doors must remain in the closed position except for short periods of time when the trucks are accessing the building (6am-7am);
- High speed roller shutters are recommended;
- Throughout the night time hours (6am – 7am) all vehicles frequenting the site, namely trucks, are not permitted to use engine brakes;
- The EMP for the site and the procedure for truck drivers will advise that during day or night time when passing residential areas that engine brakes are not to be used.
- The steel cladding components of the existing roof must achieve a minimum Rw (Weighted Reduction Index) of 34 dB;
- The skylight components of the existing roof must achieve a minimum Rw (Weighted Reduction Index) of 27 dB;
- The steel cladding components of the eastern façade must achieve a minimum Rw (Weighted Reduction Index) of 34 dB;

- The dust collector located on the north eastern side of the building needs to be surrounded by a noise barrier made of 0.8mm Trimdek Zincalume. The noise barrier would extend from ground level to 1m above the height of the dust collector. In addition, a silencer should be placed on the outlet fan in order to achieve 85 dB(A) at 1m at the outlet of the dust collector. This outlet would also be within the enclosure and at ground level. The observations of this noise source by the EPA officer is greatly appreciated.

Tables 2 and 3 below, show the predicted noise levels at receiver location R3 against the intrusive criterion. Noise compliance has been predicted for Scenario 3 and Scenario 4 under both neutral and adverse weather conditions.

Table 2: Summary of On-Site Operational Predicted Noise Levels Considering The Intrusive Criterion, dB

		Scenario 3 - Condition A				Scenario 3 - Condition B/C				PSNL			
		Day L_{Aeq}	Evening L_{Aeq}	Night L_{Aeq}	Night L_{Amax}	Day L_{Aeq}	Evening L_{Aeq}	Night L_{Aeq}	Night L_{Amax}	Day L_{Aeq}	Evening L_{Aeq}	Night L_{Aeq}	Night L_{Amax}
Receiver	Level	dB(A)				dB(A)				dB(A)			
Residential													
R3	1	41.6	38.1	40.9	50.4	44.9	41.0	44.0	53.1	46.0	46.0	46.0	55.0
R3	2	42.2	38.9	41.5	51.1	45.0	41.2	44.1	53.2	46.0	46.0	46.0	55.0

Table 3: Summary of On-Site Operational Predicted Noise Levels Considering The Intrusive Criterion, dB

		Scenario 4 - Condition A				Scenario 4 - Condition B/C				PSNL			
		Day L_{Aeq}	Evening L_{Aeq}	Night L_{Aeq}	Night L_{Amax}	Day L_{Aeq}	Evening L_{Aeq}	Night L_{Aeq}	Night L_{Amax}	Day L_{Aeq}	Evening L_{Aeq}	Night L_{Aeq}	Night L_{Amax}
Receiver	Level	dB(A)				dB(A)				dB(A)			
Residential													
R3	1	39.6	30.6	38.3	50.4	42.9	32.1	41.4	53.1	46.0	46.0	46.0	55.0
R3	2	40.0	31.2	38.8	51.1	43.1	32.4	41.5	53.2	46.0	46.0	46.0	55.0

Penrith City Council and EPA comments have been briefly addressed below.

Penrith City Council comments:

1) "*Although mitigation measures have been recommended to address the acoustic impacts associated with the development, it is recognised that this in part relies on operational measures and this may be difficult to enforce from a compliance perspective. For example, it would be difficult to ensure trucks only travel half the length of the warehouse at night. This is not considered to be an appropriate method of regulating the activities on the site and as such further acoustic mitigation measures should be pursued without reliance on human behaviour*".

   Ans: Benbow Environmental understands Council's concern and therefore noise compliance does not rely on restrictions associated with the travel length of trucks.

2) *"The acoustic modelling undertaken has demonstrated that there will be some exceedances in the noise criteria at some of the receiver locations, particularly R3. It needs to be determined whether it is appropriate for residents to potentially experience these noise impacts in the long term as a result of the development".*

   Ans: Further noise calculations were undertaken specifically at receiver location R3 against the intrusive criterion. Several assumptions and recommendations have been considered in the new set of calculations. As shown in Tables 2 and 3, the Project Specific Noise Level has been achieved at receiver location R3.

EPA comments:

3) *"The predicted daytime noise level 0f 49 dB(A) is 3 dB above the Project Specific Noise Level (PSNL) of 46 dB(A) at location R3 6 Koala Glen, Cranebrook. The NIA does not appear to include justification that the residual level of impact at R3 is acceptable in accordance with Chapters 8 and 9 of the INP".*

   Ans: As mentioned previously, further calculations were undertaken resulting in noise compliance with the Project Specific Noise Levels.

4) *"The dust baghouse is currently installed externally"*

   Ans: Noise control measures have been recommend in order to ensure that the noise impact associated with the noise emissions from the baghouse is negligible at all the considered receiver locations.

5) "Hours of operation"

   Ans: As recommended by EPA, the hours of operation have been restricted to:

   - Internal activity conducted 24 hours;
   - External operational activity including plant and heavy truck movements will be conducted between 6am and 6pm.

We trust this clarifies the situation.

Yours faithfully,
for Benbow Environmental

Felipe T. R T Benbow

Felipe Torres
Acoustical Engineer

R T Benbow
Principal Consultant

Attachment 4: Targeted Environmental Site Assessment – Aargus Pty Ltd (November 2009)

Aargus
AUSTRALIA

ACN 063 579 313

Environmental - Remediation - Geotechnical Engineering - Laboratories - Drilling

TARGETED ENVIRONMENTAL SITE ASSESSMENT

126 Andrews Road, Penrith NSW

Prepared for

Walleroo Pty Ltd

November 2009

Aargus Pty Ltd
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DOCUMENT HISTORY

Revision No.	Issue Date	Description
0	13/11/09	Initial Issue

Issued By: .....

Date: .....13/11/09.....

Aargus

REFERENCES

- Department of Urban Affairs and Planning – EPA (1998) "*Managing Land Contamination – Planning Guidelines – SEPP 55 – Remediation of Land*"
- Ministry of Spatial Planning and the Environment (MHSPE) (1999) *Environmental Quality Standards in the Netherlands.*
- National Environmental Protection Council (NEPC) (1999) – *National Environmental Protection (Assessment of Site Contamination) Measure.*
- NSW EPA (1994) – *Guidelines for Assessing Service Station Sites.*
- EPA (1995) – *Sampling Design Guidelines.*
- EPA (2009) – *Guidelines for Consultants Reporting on Contaminated Sites.*
- EPA (2009) – *Guidelines on Significant Risk of Harm from contaminated land and the duty to report.*
- DEC (2004) - *Contaminated Sites: Draft Guidelines for the assessment and Management of Groundwater Contamination*
- DECC (2009) - *Waste Classification Guidelines, Part 1: Classifying Waste*

Aargus

ABBREVIATIONS

AIP	Australian Institute of Petroleum Ltd
ANZECC	Australian and New Zealand Environment and Conservation Council
AST	Aboveground Storage Tank
BGL	Below Ground Level
BTEX	Benzene, Toluene, Ethyl benzene and Xylene
COC	Chain of Custody
DA	Development Approval
DP	Deposited Plan
DQOs	Data Quality Objectives
EPA	Environment Protection Authority
ESA	Environmental Site Assessment
HIL	Health-Based Soil Investigation Level
LGA	Local Government Area
NEHF	National Environmental Health Forum
NEPC	National Environmental Protection Council
NHMRC	National Health and Medical Research Council
PID	Photo Ionisation Detector
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance, Quality Control
RAC	Remediation Acceptance Criteria
RAP	Remediation Action Plan
RPD	Relative Percentage Difference
SAC	Site Assessment Criteria
SVC	Site Validation Criteria
TCLP	Toxicity Characteristics Leaching Procedure
TPH	Total Petroleum Hydrocarbons
UCL	Upper Confidence Limit
UST	Underground Storage Tank

TABLE OF CONTENTS

Aargus

LIST OF TABLES

Aargus

APPENDICIES

Aargus

EXECUTIVE SUMMARY

Aargus Pty Ltd (Aargus) was appointed by Walleroo Pty Ltd to undertake a Targeted Environmental Site Assessment (TESA) for the site located at 126 Andrews Road, Penrith NSW (refer to Figure 1 – Locality Map in Appendix A).

The report has been prepared as part of a due diligence process for investigation purposes into the contamination status of the site. Although the assessment draws upon relevant NSW EPA guidelines and regulatory criteria, as this is a targeted assessment, the assessment does not intend to be a detailed environmental assessment, and as such should only be for due diligence purposes.

The site consists of a large warehouse with offices and is sealed with concrete. A vehicle weighbridge exists on the sealed concrete surface surrounding the warehouse. There are two storage sheds located on the site. The majority of the site is sealed with concrete, but at the rear of the warehouse there is a compacted asphalt area. Large grassed areas and numerous trees border the site.

To determine the suitability of the site for on-going use as a commercial property, eight (8) boreholes were drilled across the site to a maximum depth of 1.2m below ground level. Nine (9) primary soil samples were collected from these boreholes and analysed for heavy metals, total petroleum hydrocarbons (TPH), benzene, toluene, ethyl-benzene and xylene (BTEX), PolyAromatic Hydrocarbons (PAHs) & organochlorine pesticides (OCP). The concentrations of the samples were assessed against Health-based Investigation Levels for Commercial / Industrial land use (HIL F) from the National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 1999 and the NSW EPA Service Station Guidelines (1994).

Laboratory results for the soil samples analysed were generally lower than the relevant regulatory guideline criteria adopted (HIL 'F' and EPA Service Station). There was no asbestos detected in the soil sample collected at BH6.

No groundwater assessment has been carried out on the site.

The vegetation surrounding the site, including the grassed areas on the site boundaries and vegetation on neighbouring properties, were observed to be generally healthy and free from stress with the exception of one tree and some dry patches of grass. Soil sampling conducted near the tree and effected grassed areas and the surrounding area suggests that it has not been impacted by contaminants originating from the site, past or present.

In Summary

Based on the information presented above, it is considered that the site poses a low risk to human health and the environment. The site is therefore considered ***suitable for the continued use as commercial/industrial land use.***

1.0 INTRODUCTION

Aargus Pty Ltd (Aargus) was appointed by Walleroo Pty Ltd to undertake a Targeted Environmental Site Assessment (TESA) for the site located at 126 Andrews Road, Penrith NSW (refer to Figure 1 – Locality Map in Appendix A).

The report has been prepared as part of due diligence process for contamination investigation purposes. Although the assessment draws upon relevant NSW EPA guidelines and regulatory criteria, as this is a targeted assessment, the assessment does not intend to be a detailed environmental assessment, and as such should only be for due diligence purposes.

Fieldwork for this site assessment was conducted on the 27th October 2009. Fieldwork and reporting was conducted in general accordance with the Aargus proposal, Aargus environmental protocols and with reference to relevant environmental regulatory criteria including the guidelines issued or endorsed by the EPA.

2.0 OBJECTIVES

The primary objective of this TESA was to assess the contamination status of the site and its suitability for continued use as a commercial property. The other objectives of this TESA were to:

- Assess the likelihood and/or extent of significant soil contamination which may have resulted from the current and/or past activities at the site;
- Identify contamination which may be occurring at the site, and non-compliance with existing environmental regulations; and

- Recommend management strategies which may be required at the site, including additional investigations and / or remediation works.

The TESA includes the assessment of the following:

- contaminant dispersion in soil;
- potential effects of contaminants on human health, the environment and building structures; and
- the adequacy and completeness of the information available on the contamination status of the site.

3.0 SCOPE OF WORKS

In order to achieve the project objectives, the following scope of work was carried out:

- Review of the information available, including historical data and past site practices, site survey, records of ownership and anecdotal information available;
- A targeted soil drilling/sampling program;
- Laboratory analysis of selected samples;
- Review of Quality Assurance/Quality Control (QA/QC) data and comparison with Data Quality Objectives;
- Interpretation of results and findings; and
- Conclusions and recommendations.

4.0 SITE INFORMATION

4.1 Site Identification

The site is located at 126 Andrews Road, Penrith NSW (refer to Figure 1 – Locality Map in Appendix A) and comprises of Lot 1 in Deposited Plan 747153. The site is located in the Penrith City Council area. The site area is approximately 4.014 hectares in area.

4.2 Site Description

The site consists of a large warehouse with offices and is sealed with concrete. A vehicle weighbridge exists on the sealed concrete surface surrounding the warehouse. There are two storage sheds located on the site. The majority of the site is sealed concrete but at the rear of the warehouse there is a compacted asphalt area. Large grassed areas and numerous trees border the site.

Site boundaries and surrounding land uses are as follows:

To the North ⇒ Andrews Road
To the South ⇒ Bushland (Trees & Shrubs)
To the East ⇒ Park / Reserve
To the West ⇒ Commercial properties

4.3 Local Geology & Hydrogeology

The residual soils are on the border of the following two geological profiles; The Geological Map of Penrith (Geological Series Sheet 9030, Scale 1:100,000, Edition 1,

1991), published by the Department of Minerals and Energy indicates the residual soils within the site to be underlain by:

- Triassic Age Shale of the Wianamatta Group, comprising shale, carbonaceous claystone, claystone, laminite, fine to medium grained lithic sandstone, rare coal and tuff; and
- Quaternary Age soils of the Cranebrook Formation, comprising of gravel, sand, silt and clay.

The closest water coarse to the site is Boundary Creek, approximately 1.5km to the south east of the site. It is assumed that groundwater would flow in this general direction, but a hydrogelogical study would be needed to confirm this assumption.

4.4 Proposed Development

It is understood that the site is to continue as a commercial property and that this assessment is for the identification of potentially contaminated soils due to previous site use as an open fertiliser storage centre.

5.0 SITE HISTORY

5.1 Title Search

No title searches were conducted for the site.

6.0 SITE WALKOVER

A site inspection was undertaken to assess the effects of past activities and current practises on the site and surrounding environment. A review of the site history and environmental documentation was undertaken to support these findings.

6.1 Site walkover

A site walkover was carried out during the fieldwork on the 27th October 2009, by Aargus Environmental Scientists. The Curriculum Vitae of personnel involved in the preparation of these reports are presented in Appendix H – Project Team. The following items were considered as part of this site walkover:

- Description of the building structures;
- Site surroundings;
- Present and past industrial processes and operations at the site;
- Surface water, stormwater and sewer;
- Present and past storage of chemicals and wastes associated with site use and their on-site location;
- Waste management practices and management of hazardous materials;
- Presence of Underground Storage Tanks or Above Ground Storage Tanks;
- Odour; and
- Occupational health and safety.

The main site features are reported on Figure 2 –Site Features in Appendix A – Site plans, with site photographs presented in Appendix E – Site photographs.

From the inspection of the above details, information was gathered with regards to the property.

The site consists of a large warehouse with offices and is sealed with concrete. A vehicle weighbridge exists on the sealed concrete surface surrounding the warehouse. There are two storage sheds located on the site. The majority of the site is sealed concrete but at the rear of the warehouse there is a compacted asphalt area. Large grassed areas and numerous trees border the site.

The previous use of the commercial property as an open fertiliser storage area was the client's main area of concern in relation to soil contamination. There was also a concern in regards to a previous chemical loading area and some staining was located on one of the stormwater drain grates near the weighbridge.

No further areas of concern were identified by the client. Sampling design was adjusted accordingly to address any significant areas of concern.

6.2 Chemical Storage Use

This investigation revealed minimal amounts (<5L) of domestic cleaners at the site which included cleaners such as detergents, and degreasers such as paints, thinners, solvents and oils are expected to have been used at some time in the site history and have been anticipated in the sampling design.

6.3 Trade Waste

Inquiries with Penrith City Council have revealed that no Trade Waste agreements or licenses affecting the property were noted.

6.4 EPA Notices

The NSW DECC publishes records of contaminated sites under Section 58 of the Contaminated Land Management (CLM) Act 1997. The notices relate to investigation and/or remediation of site contamination considered to pose a significant risk of harm under the definition in the CLM Act.

A search of the EPA Priority Sites Register on the 5th November 2009 indicated that the site is not listed on the Register. However, there were three sites listed in the Penrith City Council area with current notices. The first one was located at 86-88 Great Western Highway, Colyton. The site name is the Ampol Service Station and is located approximately 8.5km south east of the site. The second site listed was located at Lot 4 the Northern Road, Luddenham. The site name is the Elura Liquid Waste Disposal Site and is located approximately 12.5km south of the site. The third one was located at Castlereagh Road, Penrith. The site name is the Crane Enfield Metals and Adjacent Land and is located approximately 600m to the south west of the site.

It should be noted that the DECC record of Notices for Contaminated Land does not provide a record of all contaminated land in NSW.

6.5 Areas of environmental concerns

Based on the above information, site history and site walkover, the areas of environmental concern (AEC) and associated chemicals of concern (CoC) for the site were identified. The areas of concern are summarised in the following table.

Table 1: Areas of Environmental Concern

Potential AEC	Description of potentially contaminating activity	CoC	Likelihood of contamination	Remarks
Fill	Imported fill of unknown origin	Various	Low	The source of fill material is unknown. Minimal filling was encountered within the site.
Carpark areas	Car parking. Vehicles may have leaked oil, petrol and other chemicals over time.	Metals, TPH, BTEX	Low	No significant staining was noted on any of the concrete and bitumen sealed surfaces.
Vicinity of Metal Features	Degradation of metal features	Metals	Low	If this has occurred, the impact is likely to be restricted to the topsoil/fill. The site was predominantly sealed.
Asbestos/Fibro features	Only if broken during demolition	Asbestos	Low	To be removed by a qualified contractor.
Rear Asphalt area & surrounding grass & tree area	Open storage of fertilisers / pesticides to have leached into the soil or under concrete slabs of commercial property	OCP	Low	If this has occurred, the impact is likely to have been localised. The vegetation at the site was found to be generally healthy with the exception of a tree and a few bare patches of grass.

7.0 SITE ASSESSMENT CRITERIA

7.1 Soil

The EPA has indicated that the assessment of soil test results and comparison with defined soil criteria should include consideration of a number of factors such as:

1. Land uses, e.g. residential, agricultural/horticultural, recreation or commercial/industrial;
2. Potential child occupancy;
3. Potential environmental effects including leaching into groundwater;
4. Single or multiple contaminants;
5. Depth of contamination;
6. Level and distribution of contamination;
7. Bioavailability of contaminant(s), e.g. Related to speciation, route of exposure;
8. Toxicological assessment of the contaminant(s), e.g. Toxic kinetics, carcinogenicity, acute and chronic toxicity;
9. Physico-chemical properties of the contaminant(s);
10. State of the site surface, e.g. paved or grassed exposed;
11. Potential exposure pathways; and
12. Uncertainties with the sampling methodology and toxicological assessment.

To assess the contamination status of soils at a site, the NSW EPA refers to the document entitled NSW EPA (1994) *Guidelines for Assessing Service Station Sites*. Reference is also made to the National Environment Protection Council (1999) *National Environmental Protection (Assessment of Site Contamination) Measure* (NEPM).

Tables listing the threshold values extracted from the above mentioned guidelines are reported in Appendix F – Regulatory Criteria.

Contaminant concentrations slightly in excess of the investigation levels are unlikely to pose an environmental or health hazard. At or below the investigation levels, the soil is not considered to pose an environmental or health hazard. Domestic single dwelling use with accessible soils is considered to be the most sensitive land use, whereas commercial/industrial use is the least stringent use reported in the table of the guidelines presenting the threshold values.

In proposing recommendations and/or remediation criteria for this site, the above factors will be considered and the published EPA (1994) *Guidelines for Assessing Service Station Sites* and Health-based Investigation Levels (HILs) for a 'commercial / industrial dwelling: includes premises such as shops and offices as well as factories and industrial sites' will be used (NEPM Soil Investigation Levels for an exposure setting 'F').

8.0 FIELD INVESTIGATIONS

8.1 Soil sampling

Field work was undertaken by Aargus environmental scientists on the 27th October 2009. The field investigation included the drilling of eight (8) boreholes, BH1 to BH8, across the ground level of the site at depths ranging from 0.1m to 1.2m BGL using a hand auger.

The boreholes were located to target gross contamination across the site associated with the site usage. The rationale for the sampling locations is described in the following table.

Table 2: Rationale for sampling locations

Borehole	Rationale
BH1	• Adjacent to the stained stormwater grate
BH2	• Adjacent to the stained stormwater grate
BH3	• In vicinity of stored open fertiliser area
BH4	• Downgradient of open fertiliser area (unsealed area) • In the vicinity of tree & grassed areas showing signs of distress
BH5	• In vicinity of stored open fertiliser area
BH6	• Downgradient of open fertiliser area (unsealed area) • In vicinity of previous asbestos fragment location • In the vicinity of tree & grassed areas showing signs of distress
BH7	• In vicinity of old chemical loading area
BH8	• In vicinity of old chemical loading area

The approximate locations of the boreholes are shown on Figure 2 – Site features in Appendix A – Site Plan.

Nine (9) primary soil samples were collected from the borehole locations in accordance with Aargus sampling protocols (Appendix G).

8.2 Subsurface conditions – soil

Subsurface conditions observed during drilling at the site are summarised as follows:

- FILL, Silty Sandy Clay, medium to coarse grained, low-medium plasticity, brown, grey & orange, with traces of gravel & rock inclusions overlying:
- NATURAL CLAY, medium-high plasticity, brown, orange with some grey mottling

Soil subsurface conditions are recorded in more detail on the borehole logs presented in Appendix D – Borehole logs.

8.3 Laboratory analysis

Selected samples were dispatched to SGS Laboratories. The samples were selected for analysis based on a combination of sample location and site observations.

9.0 LABORATORY RESULTS

Laboratory reports for the samples analysed are presented in Appendix C – Laboratory reports, with a summary of results being presented in the following tables.

9.1 Soil Laboratory analysis

Table 3: Summary of laboratory results – Heavy Metals

Sample Reference	Depth(m)	ARSENIC	CADMIUM	CHROMIUM	COPPER	NICKEL	LEAD	ZINC	MERCURY
	Analyte	METALS (mg/kg)							
BH3	0.3	<3	0.6	24	27	55	17	100	<0.05
BH3	1.2	5	<0.3	9.7	17	9.9	10	36	<0.05
BH5	0.2	<3	0.4	35	43	26	16	1200	<0.05
Practical Quantitation Limits (PQL)		3	0.3	0.3	0.5	0.5	1	0.5	0.05
GUIDELINES FOR THE NSW SITE AUDITOR SCHEME (2006)									
Provisional Phytotoxity-Based Investigation Levels (PPBIL)		20	3	400/1[e]	100	60	600	200	1
NATIONAL ENVIRONMENT PROTECTION MEASURE (1999)									
Health Investigation Levels (HIL) [a] (HIL 'A')		100	20	12%/100[f]	1000	600	300	7000	10/15[g]
HIL 'D' [b]		400	80	48%/400	4000	2400	1200	28000	40/60
HIL 'E' [c]		200	40	24%/200	2000	600	600	14000	20/30
HIL 'F' [d]		500	100	60%/500	5000	3000	1500	35000	50/75

Notes
a: Residential development with accessible soils, including childrens day care centres, kindergartens, preschools and primary schools.
b: Residential with minimal opportunities for soil access, including high-rise, apartments and flats
c: Parks, recreational open space and playing fields, including secondary schools
d: Commercial or industrial development
e: 400mg/kg for Chromium (+3) and 1mg/kg for Chromium (+6).
f: 12% (120000mg/kg) for Chromium (+3) and 100mg/kg for Chromium (+6).
g: 10mg/kg for Methyl Mercury and 15mg/kg for Inorganic Mercury.

As shown in Table 3, the concentrations were well below the HIL F guideline criteria for commercial / industrial land uses.

Table 4: Summary of laboratory results – Metals Composite Test Results

Analyte / Composite Number	HEAVY METALS (mg/kg)							
	ARSENIC	CADMIUM	CHROMIUM	COPPER	LEAD	MERCURY	NICKEL	ZINC
Composite A	4	0.4	13	19	16	<0.05	9.6	59
Composite B	6	0.4	12	18	12	<0.05	8.7	44
Practical Quantitation Limits (PQL)	3	0.1	0.3	0.5	1	0.05	0.5	0.3
NATIONAL ENVIRONMENT PROTECTION MEASURE (1999)								
Health Investigation Levels (HIL) (HIL 'F')	500	100	60%/500 b	5000	1500	50/75 c	3000	35000
Adjusted HIL [a]	167	33	20%/167	1667	500	17/25	1000	11667

Notes

a: Adjusted HIL=HIL/3

b: 60% (600000mg/kg) for Chromium (+3) and 500mg/kg for Chromium (+6).

c: 50mg/kg for Methyl Mercury and 75mg/kg for Inorganic Mercury.

Concentrations of analytes were assessed against the adjusted Threshold Levels. If the concentration of an analyte for a composite sample is in excess of the adjusted Threshold Level, then all sub-samples of the failed composite samples with higher concentrations will be analysed individually. The purpose is to detect potentially contaminated sub-sample(s) within the failed composite sample.

Adjustment of the Threshold Level for composite samples was based on Method 1, Section 6 of the EPA "Sampling Design Guidelines for Contaminated Sites" 1995. The Adjusted Threshold Levels were calculated by dividing the Threshold Levels by three.

As indicated in Table 4, the concentrations of Heavy Metals were below the Adjusted Threshold Levels for a HIL F commercial / industrial development.

Table 5: Summary of laboratory results – TPH & BTEX

Analyte / Sample Location	Depth (m)	TPH (mg/kg) C6-C9	C10-C14	C15-C28	C29-C40	C10-C36 [b]	BTEX (mg/kg) BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES
BH3	1.2	<20	<20	<50	<50	<120	<0.5	<0.5	<0.5	<1.5
BH5	0.2	<20	<20	74	94	168	<0.5	<0.5	<0.5	<1.5
BH7	0.2	<20	<20	<50	<50	<120	<0.5	<0.5	<0.5	<1.5
BH8	0.3	<20	<20	<50	<50	<120	<0.5	<0.5	<0.5	<1.5
Practical Quantitation Limits (PQL)		20	20	50	50	NA	0.5	0.5	0.5	1.5
EPA Levels [a]		65	C10-C36 =1000				1	1.4	3.1	14

Notes
a: Contaminated Sites: "Guidelines for Assessing Service Station Sites", 1994, EPA
b: C10-C36 = (C10-C14) + (C15-C28) + (C29-C36); concentrations less than PQL are assumed equal to PQL.
NA: Not Applicable

As indicated in Tables 5, TPH and BTEX concentrations were all below the suggested Levels in the EPA service station guidelines.

Table 6: Summary of laboratory results –PAH

Sample Location	Depth (m)	BENZO(a)PYRENE (mg/kg)	TOTAL PAH (mg/kg)
BH3	1.2	<0.05	<1.7
BH7	0.2	<0.05	<1.7
BH8	0.3	<0.05	<1.7
Practical Quantitation Limit (PQL)		0.5	NA
NATIONAL ENVIRONMENT PROTECTION MEASURE (1999)			
Health Investigation Levels (HIL) [a] (HIL 'A')		1	20
HIL 'D' [b]		4	80
HIL 'E' [c]		2	40
HIL 'F' [d]		5	100

Notes
a: Residential with gardens and accessible soil including children's day-care centres, preschools, primary schools, townhouses and villas.
b: Residential with minimal opportunities for soil access, including high-rise, apartments and flats
c: Parks, recreational open space and playing fields, including secondary schools
d: Commercial or industrial development
NA: Not Applicable

As shown in Table 6, the concentrations of all benzo(a)pyrene and total PAH were well below all the assessment criteria those being HIL 'F'.

Table 7: Summary of laboratory results – OCP

Analyte / Sample Reference	Depth (m)	Organochlorine Pesticides (mg/kg)						
		HEPTACHLOR	ALDRIN	DIELDRIN	DDD	DDE	DDT	CHLORDANE (trans & cis)
BH3	0.3	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2
BH5	0.2	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2
Practical Quantitation Limits (PQL)		0.1	0.1	0.1	0.2	0.2	0.2	0.2
NATIONAL ENVIRONMENT PROTECTION MEASURE (1999) Health Investigation Levels (HIL) [a] (HIL 'F')		50	50 [b]	50 [b]	1000 [c]			250

Notes
a: Commercial or industrial development
b: Aldrin + Dieldrin
c: Total of DDD + DDE + DDT

As shown in Table 7, the concentrations of OCP were well below all the assessment criteria those being HIL 'F.

Table 8: Summary of laboratory results – OCP Composite Test Results

Analyte / Composite Number	Organochlorine Pesticides (mg/kg)						
	HEPTACHLOR	ALDRIN	DIELDRIN	DDD	DDE	DDT	CHLORDANE (trans & cis)
Composite A	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2
Composite B	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2
Practical Quantitation Limits (PQL)	0.1	0.1	0.1	0.2	0.2	0.2	0.2
NATIONAL ENVIRONMENT PROTECTION MEASURE (1999)							
HIL 'F' [a]	50	50 [c]	50 [c]		1000 [d]		250
Adjusted HIL [b]	17	17	17		333		83

Notes
a: Commercial or industrial development
b: Adjusted HIL=HIL/3
c: Aldrin + Dieldrin
d: Total of DDD + DDE + DDT

Concentrations of analytes were assessed against the adjusted Threshold Levels. If the concentration of an analyte for a composite sample is in excess of the adjusted Threshold Level, then all sub-samples of the failed composite samples with higher concentrations will be analysed individually. The purpose is to detect potentially contaminated sub-sample(s) within the failed composite sample.

Adjustment of the Threshold Level for composite samples was based on Method 1, Section 6 of the EPA "Sampling Design Guidelines for Contaminated Sites" 1995. The Adjusted Threshold Levels were calculated by dividing the Threshold Levels by three.

As indicated in Table 8, the concentrations of OCP were below the Adjusted Threshold Levels for a HIL F commercial / industrial development.

9.2 Asbestos

There was no asbestos detected in the soil sample collected at BH6.

10.0 QUALITY ASSURANCE / QUALITY CONROL (QA/QC)

10.1 Data Quality Objectives

Data Quality Objectives (DQOs) have been defined to ensure that the data was sufficiently accurate and precise to be used for the purpose of these environmental works. DQOs have been defined for a number of areas including:

- sampling methods;
- decontamination procedures;
- sample storage (including nature of the containers) and preservation;
- laboratory analysis, including PQL, recoveries (surrogates, spikes), duplicates;
- preparation of CoC forms;
- document and data completeness; and
- data comparability.

In summary, a review of analytical results shows that laboratory QAQC samples were within their respective limits. Fieldwork was conducted in general accordance with Aargus fieldwork protocols which are based on industry accepted standard practice and as such met relevant DQOs. All other data was reviewed and found to meet our DQOs and as such the data was found to be of a sufficient quality to allow accurate interpretation of results. A discussion of DQOs is presented in Appendix G – Aargus fieldwork protocols.

10.2 Field QA/QC

Aargus procedures followed throughout investigation works are presented in Appendix G – Aargus fieldwork protocols, which are based on industry accepted standard practice. The work was undertaken by appropriately qualified personnel, curriculum vitae of Aargus personnel are presented in Appendix H – Project Team.

Soil sampling was carried out using a stainless steel hand auger. The decontamination of sampling equipment was achieved by washing the equipment with phosphate-free detergent and tap water, followed by a final rinse with distilled water. Decontamination was conducted after the collection of samples at each sample location. Soil samples were placed in 250g clean glass jars, leaving no headspace, and closed using Teflon-coated lids. Samples were then stored in an ice brick-cooled esky and transported to the laboratory.

10.3 Intra-laboratory Duplicates

A total of one intra-laboratory duplicate sample was collected and analysed in order to assess the variation in analyte concentration between samples collected from the same sampling point. The duplicate sample frequency was computed using the total number of samples analysed as part of this assessment.

The duplicate sample frequencies computed are presented in the following table.

Table 9: Soil Duplicate Sample Analyses

Analyte - Soil	Samples Analysed	Duplicate Samples	Frequency
Heavy Metals	9	1	11%
OCP	8	1	12%

The duplicate frequency for most of the analytical suite adopted complies with the NEPM, which recommends a duplicate frequency of at least 5%.

It is considered that the number of duplicate samples collected is adequate to assess the variation in analyte concentration between samples collected from the same sampling point. A summary of the test results with the Relative Percentage Difference (RPD) is presented in the following tables. A discussion of the test data is also presented below

Table 10: Duplicate D1 –RPD's (Soil)

ANALYTE	BH3 0.3m mg/kg	DUPLICATE D1 mg/kg	RELATIVE PERCENTAGE DIFFERENCE %
HEAVY METALS			
Arsenic	<3	6	-
Cadmium	0.6	0.4	40
Chromium	24	26	8
Copper	27	13	70
Nickel	55	9.7	140
Lead	17	40	81
Zinc	100	46	74
Mercury	<0.05	<0.05	-
ORGANOCHLORINE PESTICIDES (OCP)			
Heptachlor	<0.1	<0.1	-
Aldrin	<0.1	<0.1	-
Dieldrin	<0.1	<0.1	-
DDD	<0.2	<0.2	-
DDE	<0.2	<0.2	-
DDT	<0.2	<0.2	-
Chlordane (trans & cis)	<0.2	<0.2	-

The comparisons between the intra-laboratory duplicates and corresponding original samples indicated generally acceptable RPD overall in Table 10 with the exception of: Copper (70%), Nickel (140%), Lead (81%) & Zinc (74%).

The higher RPD's in Table 10 exceeded the DQOs for this project, however this exceedance is not considered to be significant as the concentrations of most samples are

at generally low concentrations and/or were recovered from fill materials, therefore heterogeneity of the samples might result in relatively higher RPD.

Overall, the duplicate sample comparisons indicate that the laboratory test data provided by SGS are of adequate accuracy and reliability for this assessment.

10.4 Conclusion for the field QA/QC

Overall the field QA/QC is considered satisfactory for this project.

10.5 Laboratory quality assurance quality control

Soil samples were analysed by SGS Laboratories located in NSW, which is accredited by the National Association of Testing Authorities (NATA) for the analyses undertaken.

A Review of the SGS QC procedures including matrix and surrogate spikes, provided within the laboratory report indicated that the laboratory QA/QC was satisfactory for the laboratory analyses undertaken, and met the DQOs for this project.

10.6 Conclusion for the QA/QC

The sampling methods (including sample preservation, transport and decontamination procedures) and laboratory methods followed during this investigation works were consistent with Aargus protocols and were found to meet the DQOs for this project. It is therefore considered that the data is sufficiently precise and accurate and that the results can be used for the purpose of this project.

11.0 CONCLUSIONS AND RECOMMENDATIONS

To determine the suitability of the site for on-going use as a commercial property, eight (8) boreholes were drilled across the site to a maximum depth of 1.2m below ground level. Nine (9) primary soil samples were collected from these boreholes and analysed for heavy metals, total petroleum hydrocarbons (TPH), benzene, toluene, ethyl-benzene and xylene (BTEX), PolyAromatic Hydrocarbons (PAHs) & organochlorine pesticides (OCP). The concentrations of the samples were assessed against Health-based Investigation Levels for Commercial / Industrial land use (HIL F) from the National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 1999 and the NSW EPA Service Station Guidelines (1994).

Laboratory results for the soil samples analysed were generally lower than the relevant regulatory guideline criteria adopted (HIL 'F' and EPA Service Station). There was no asbestos detected in the soil sample collected at BH6.

No groundwater assessment has been carried out on the site.

The vegetation surrounding the site, including the grassed areas on the site boundaries and vegetation on neighbouring properties, were observed to be generally healthy and free from stress with the exception of one tree and some dry patches of grass. Soil sampling conducted near the tree and effected grassed areas and the surrounding area suggests that it has not been impacted by contaminants originating from the site, past or present (if any).

In Summary

Based on the information presented above, it is considered that the site poses a low risk to human health and the environment. The site is therefore considered ***suitable for the continued use as commercial/industrial land use.***

Aargus

We would be pleased to provide further information on any aspects of this report.

For and on behalf of
Aargus Pty Ltd

Michael Silk
Environmental Scientist

Reviewed by

Mark Kelly
Environmental Manager

Aargus

12.0 LIMITATIONS

Whilst to the best of our knowledge, information contained in this report is accurate at the date of issue, although subsurface conditions, including groundwater levels and contaminant concentrations, can change in a limited time. This should be borne in mind if the report is used after a protracted delay.

There is always some disparity in subsurface conditions across a site that cannot be fully defined by investigation. Hence it is unlikely that measurements and values obtained from sampling and testing during environmental works carried out at a site will characterise the extremes of conditions that exist within the site.

There is no investigation that is thorough enough to preclude the presence of material that presently or in the future, may be considered hazardous at the site. Since regulatory criteria are constantly changing, concentrations of contaminants presently considered low may, in the future, fall under different regulatory standards that require remediation.

Opinions are judgements which are based on our understanding and interpretation of current regulatory standards, and should not be construed as legal opinions.

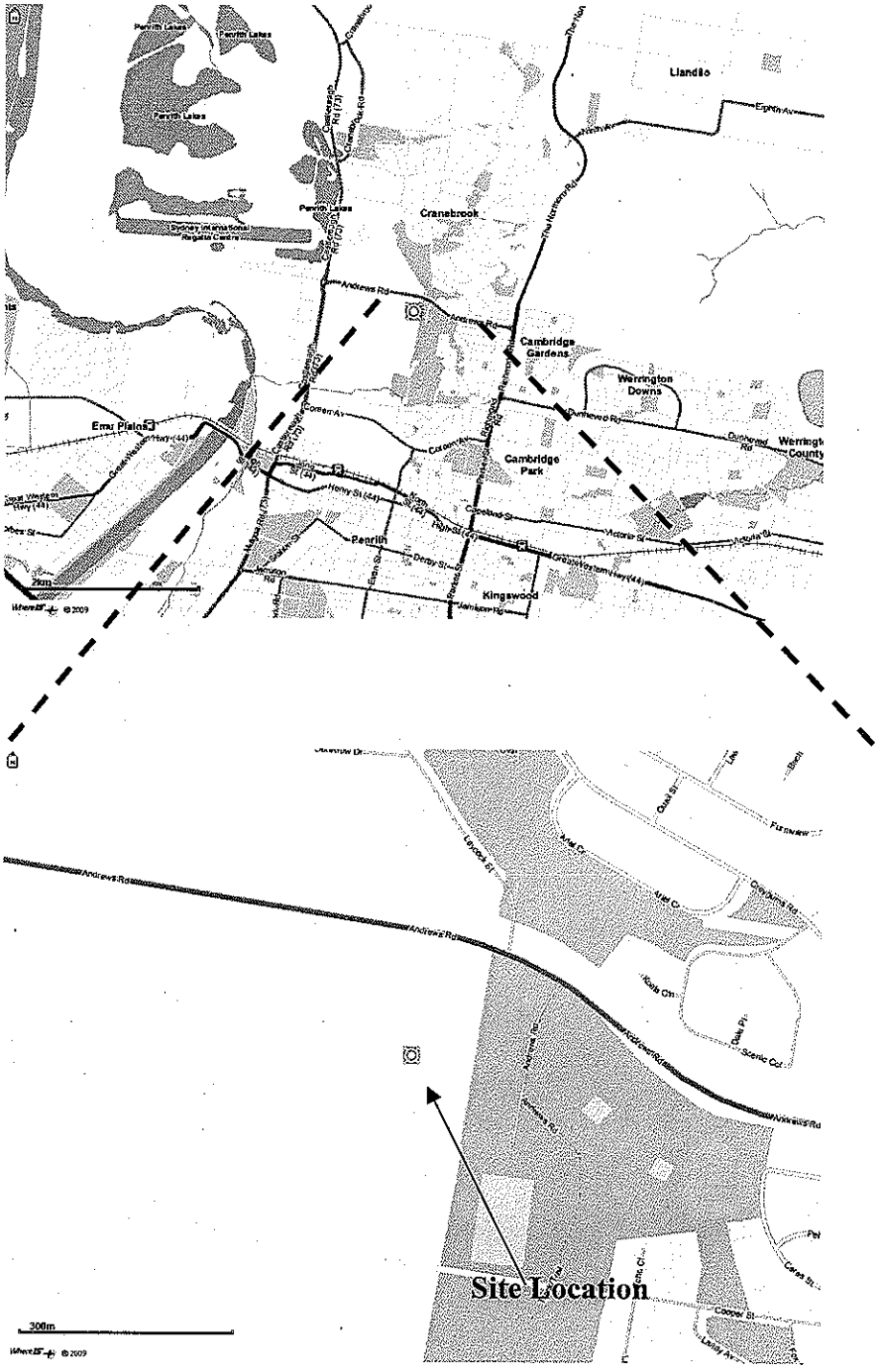
Appendix B – Important information about your environmental report, should also be read in conjunction with this report.

APPENDIX A

LOCALITY MAP & SITE PLAN

Aargus

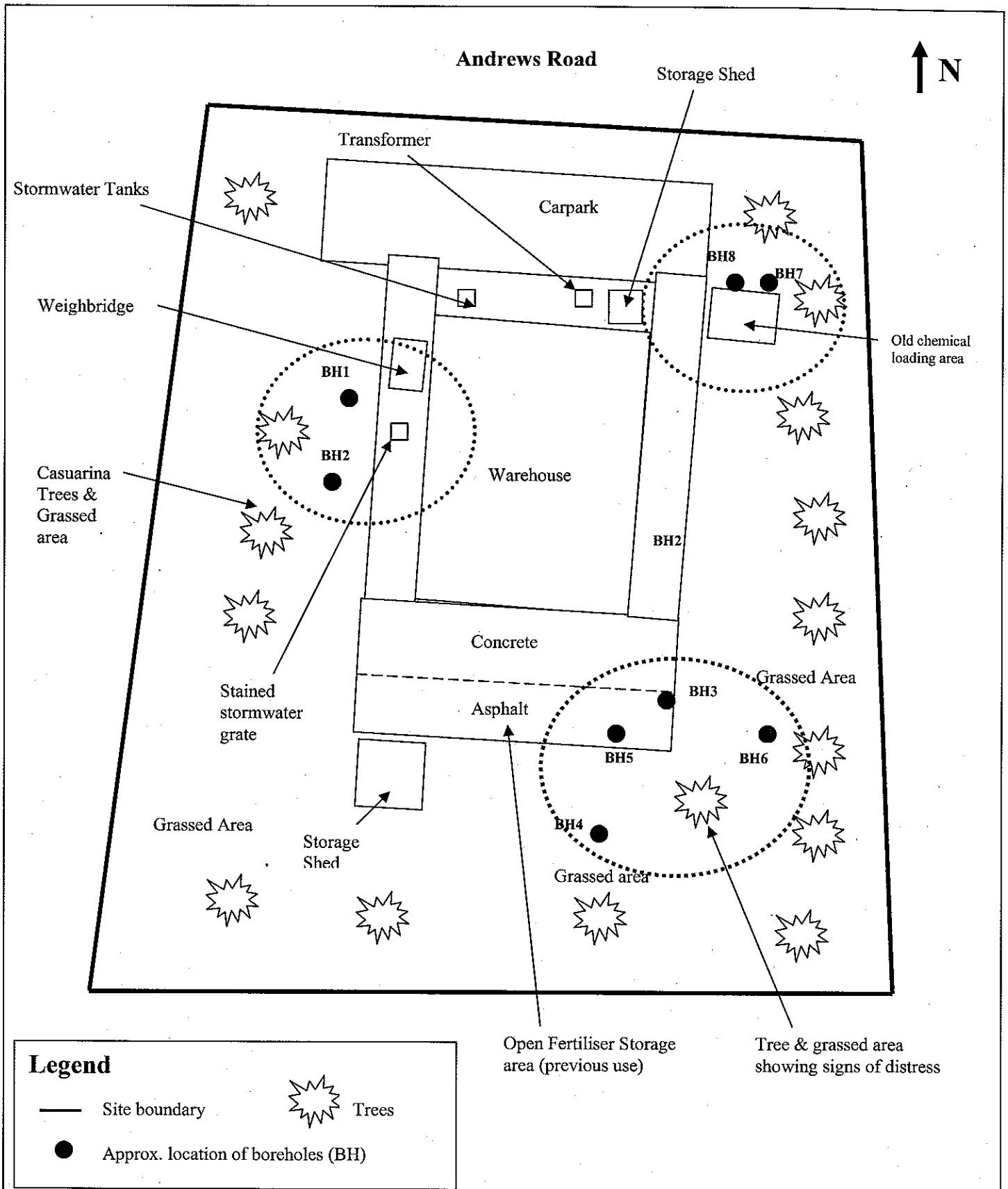
LOCALITY MAP



Reference: whereis.com.au (2009)

ABN 46 063 579 313	Aargus Pty Limited	Environment – Remediation – Geotechnical Engineering
Drawn: MS	**Walleroo Pty Ltd Targeted Environmental Site Assessment 126 Andrews Road, Penrith NSW**	Figure 1
Approved: MK		
Date: 5/11/09		
Scale: as shown	Aargus AUSTRALIA	Job No: ES3008

SITE FEATURES



ABN 46 063 579 313 Aargus Pty Limited Environment – Remediation – Geotechnical Engineering

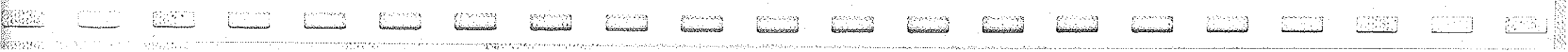
Drawn:	MS
Approved:	MK
Date:	27/10/09
Scale:	as shown

Walleroo Pty Ltd
Targeted Environmental Site Assessment
126 Andrews Road, Penrith NSW

Aargus AUSTRALIA

Figure **2**

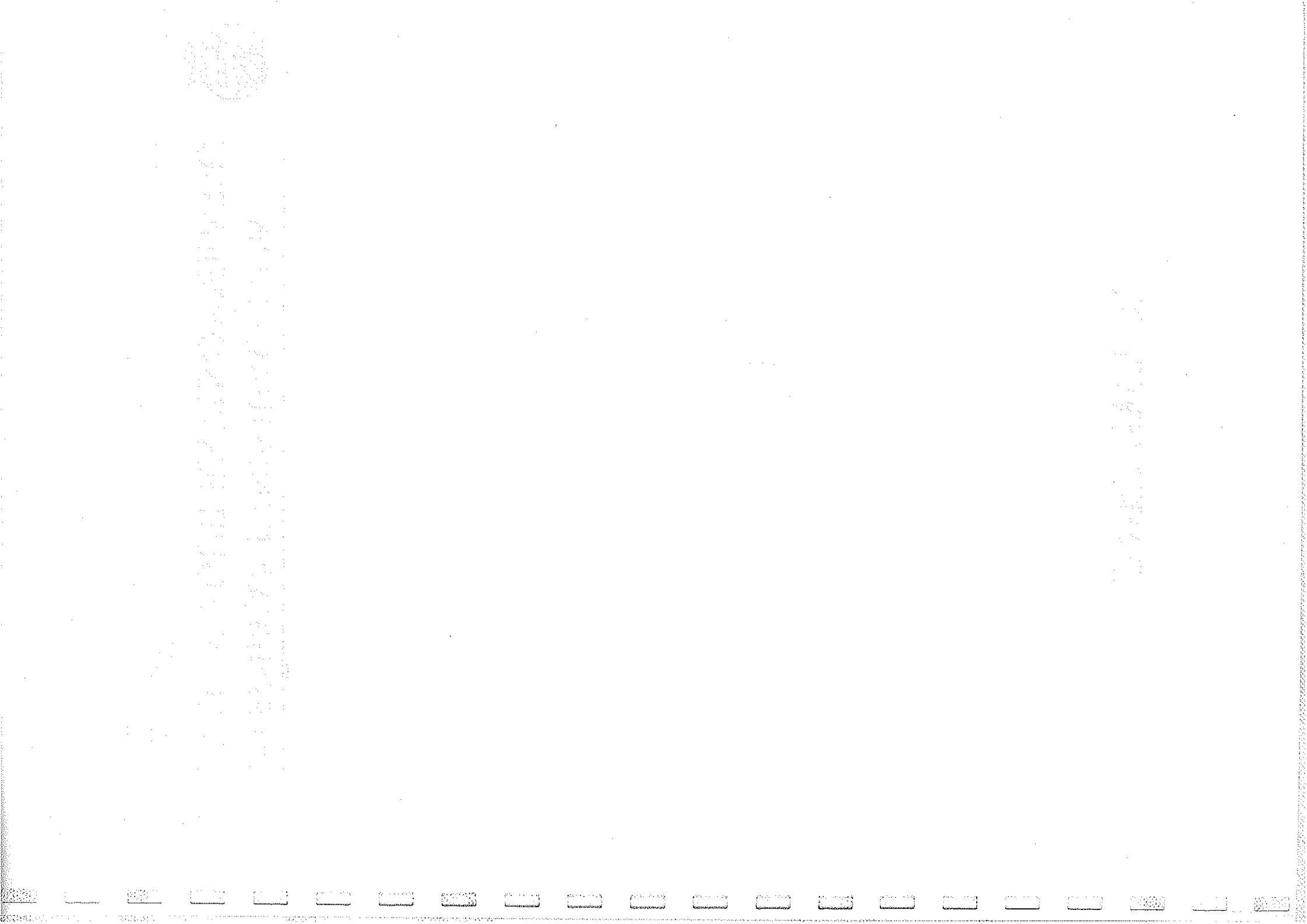
Job No: ES3008



APPENDIX B

IMPORTANT INFORMATION ABOUT YOUR ENVIRONMENTAL REPORT

Aargus



IMPORTANT INFORMATION ABOUT YOUR ENVIRONMENTAL SITE ASSESSMENT

Aargus
AUSTRALIA

These notes have been prepared by Aargus (Australia) Pty Ltd and its associated companies using guidelines prepared by ASFE (The Association) of Engineering Firms Practising in the Geo-sciences. They are offered to help you in the interpretation of your Environmental Site Assessment (ESA) reports.

REASONS FOR CONDUCTING AN ESA

ESA's are typically, though not exclusively, carried out in the following circumstances:

- as pre-acquisition assessments, on behalf of either purchaser or vender, when a property is to be sold;
- as pre-development assessments, when a property or area of land is to be redeveloped or have its use changed for example, from a factory to a residential subdivision;
- as pre-development assessments of greenfield sites, to establish "baseline" conditions and assess environmental, geological and hydrological constraints to the development of, for example, a landfill; and
- as audits of the environmental effects of an ongoing operation.

Each of these circumstances requires a specific approach to the assessment of soil and groundwater contamination. In all cases however, the objective is to identify and if possible quantify the risks that unrecognised contamination poses to the proposed activity. Such risks may be both financial, for example, cleanup costs or limitations on site use, and physical, for example, health risks to site users or the public.

THE LIMITATIONS OF AN ESA

Although the information provided by an ESA could reduce exposure to such risks, no ESA, however, diligently carried out can eliminate them. Even a rigorous professional assessment may fail to detect all contamination on a site. Contaminants may be present in areas that were not surveyed or sampled, or may migrate to areas which showed no signs of contamination when sampled.

AN ESA REPORT IS BASED ON A UNIQUE SET OF PROJECT SPECIFIC FACTORS

Your environmental report should not be used:

- when the nature of the proposed development is changed, for example, if a residential development is proposed instead of a commercial one;
- when the size or configuration of the proposed development is altered;
- when the location or orientation of the proposed structure is modified;
- when there is a change of ownership
- or for application to an adjacent site.

To help avoid costly problems, refer to your consultant to determine how any factors, which have changed subsequent to the date of the report, may affect its recommendations.

ESA "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site assessment identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists who then render an opinion about overall subsurface conditions, the nature and extent of contamination, its likely impact on the proposed development and appropriate remediation measures. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to help minimise its impact. For this reason owners should retain the services of their consultants

through the development stage, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

SUBSURFACE CONDITIONS CAN CHANGE

Natural processes and the activity of man change subsurface conditions. As an ESA report is based on conditions, which existed at the time of subsurface exploration, decisions should not be based on an ESA report whose adequacy may have been affected by time. Speak with the consultant to learn if additional tests are advisable.

ESA SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS

Every study and ESA report is prepared in response to a specific brief to meet the specific needs of specific individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor, or even some other consulting civil engineer. Other persons should not use a report for any purpose, or by the client for a different purpose. No individual other than the client should apply a report even apparently for its intended purpose without first conferring with the consultant. No person should apply a report for any purpose other than that originally contemplated without first conferring with the consultant.

AN ESA REPORT IS SUBJECT TO MISINTERPRETATION

Costly problems can occur when design professionals develop their plans based on misinterpretations of an ESA. To help avoid these problems, the environmental consultant should be retained to work with appropriate design professionals to explain relevant findings and to review the adequacy of their plans and specifications relative to contamination issues.

LOGS SHOULD NOT BE SEPARATED FROM THE ENGINEERING REPORT

Final borehole or test pit logs are developed by environmental scientists, engineers or geologists based upon their interpretation of field logs (assembled by site personnel) and laboratory evaluation of field samples. Only final logs customarily included in our reports. These logs should not under any circumstances be redrawn for inclusion in site remediation or other design drawings, because drafters may commit errors or omissions in the transfer process. Although photographic reproduction eliminates this problem, it does nothing to minimise the possibility of contractors misinterpreting the logs during bid preparation. When this occurs, delays, disputes and unanticipated costs are the all-too-frequent result.

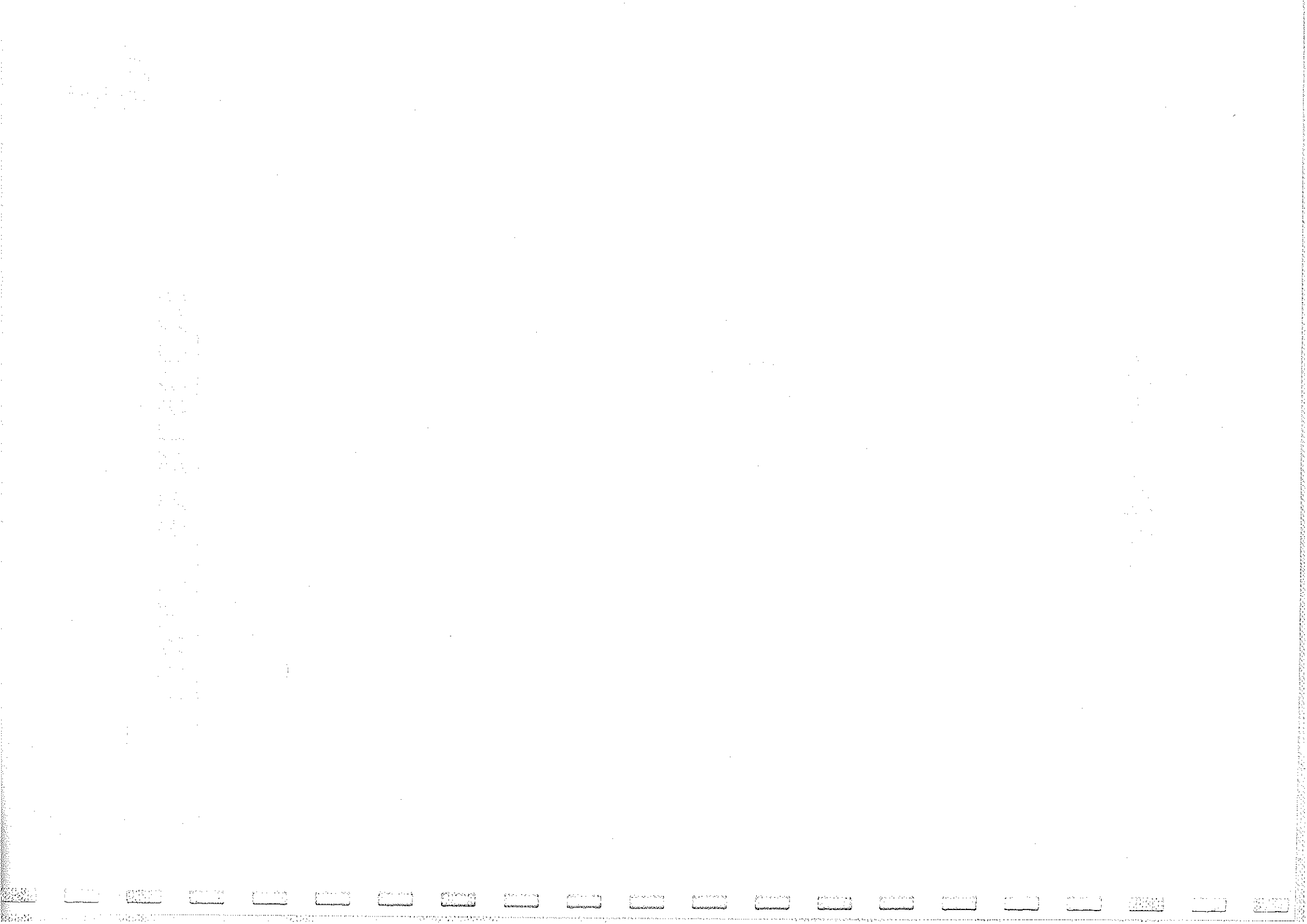
To reduce the likelihood of boring log misinterpretation, the complete report must be available to persons or organisations involved in the project, such as contractors, for their use. Those who o not provide such access may proceed under the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing all the available information to persons and organisations such as contractors helps prevent costly construction problems and the adversarial attitudes that may aggravate them to disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY

Because an ESA is based extensively on judgement and opinion, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, model clauses have been developed for use in transmittals. These are not exculpatory clauses designed to foist liabilities onto some other party. Rather, they are definitive clauses that identify where your consultant's responsibilities begin and end. Their use helps all parties involved recognise their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your ESA report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

APPENDIX C

LABORATORY RESULTS



ANALYTICAL REPORT

3 November 2009

Aargus Pty Ltd
446 Parramatta Road
PETERSHAM
NSW 2049

Attention: **Mark Kelly**

Your Reference: ES3008 - Penrith

Our Reference: SE73331

Samples: 10 Soils
Received: 28/10/2009

Preliminary Report Sent: Not Issued

These samples were analysed in accordance with your written instructions.

For and on Behalf of:
SGS ENVIRONMENTAL SERVICES

Client Services:	Simon Matthews	Simon.Matthews@sgs.com
Sample Receipt:	Angela Mamalicos	AU.SampleReceipt.Sydney@sgs.com
Laboratory Manager:	Edward Ibrahim	Edward.Ibrahim@sgs.com

Results Approved and/or Authorised by:

Ly Kim Ha
Organics Signatory

Huong Crawford
Metals Signatory

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BTEX in Soil					
Our Reference:	UNITS	SE73331-4	SE73331-6	SE73331-8	SE73331-9
Your Reference	----------	BH3	BH5	BH7	BH8
Composite Reference	----------	-	-	-	-
Sample Matrix		Soil	Soil	Soil	Soil
Date Sampled		27/10/2009	27/10/2009	27/10/2009	27/10/2009
Depth		1.2	0.2	0.2	0.3
Date Extracted (BTEX)		29/10/2009	29/10/2009	29/10/2009	29/10/2009
Date Analysed (BTEX)		29/10/2009	29/10/2009	29/10/2009	29/10/2009
Benzene	mg/kg	<0.5	<0.5	<0.5	<0.5
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<0.5	<0.5	<0.5	<0.5
Total Xylenes	mg/kg	<1.5	<1.5	<1.5	<1.5
BTEX Surrogate (%)	%	62	109	102	119

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TRH in soil with C6-C9 by P/T Our Reference: Your Reference Composite Reference Sample Matrix Date Sampled Depth	UNITS ---------- ----------	SE73331-4 BH3 - Soil 27/10/2009 1.2	SE73331-6 BH5 - Soil 27/10/2009 0.2	SE73331-8 BH7 - Soil 27/10/2009 0.2	SE73331-9 BH8 - Soil 27/10/2009 0.3
Date Extracted (TRH C6-C9 PT)		29/10/2009	29/10/2009	29/10/2009	29/10/2009
Date Analysed (TRH C6-C9 PT)		29/10/2009	29/10/2009	29/10/2009	29/10/2009
TRH C_6 - C_9 P&T	mg/kg	<20	<20	<20	<20
Date Extracted (TRH C10-C36)		29/10/2009	29/10/2009	29/10/2009	29/10/2009
Date Analysed (TRH C10-C36)		29/10/2009	29/10/2009	29/10/2009	29/10/2009
TRH C_{10} - C_{14}	mg/kg	<20	<20	<20	<20
TRH C_{15} - C_{28}	mg/kg	<50	74	<50	<50
TRH C_{29} - C_{36}	mg/kg	<50	94	<50	<50

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PAHs in Soil Our Reference: Your Reference Composite Reference Sample Matrix Date Sampled Depth	UNITS ---------- ----------	SE73331-3 BH3 - Soil 27/10/2009 0.3	SE73331-8 BH7 - Soil 27/10/2009 0.2	SE73331-9 BH8 - Soil 27/10/2009 0.3
Date Extracted		29/10/2009	29/10/2009	29/10/2009
Date Analysed		29/10/2009	29/10/2009	29/10/2009
Naphthalene	mg/kg	<0.10	<0.10	<0.10
2-Methylnaphthalene	mg/kg	<0.10	<0.10	<0.10
1-Methylnaphthalene	mg/kg	<0.10	<0.10	<0.10
Acenaphthylene	mg/kg	<0.10	<0.10	<0.10
Acenaphthene	mg/kg	<0.10	<0.10	<0.10
Fluorene	mg/kg	<0.10	<0.10	<0.10
Phenanthrene	mg/kg	<0.10	<0.10	<0.10
Anthracene	mg/kg	<0.10	<0.10	<0.10
Fluoranthene	mg/kg	<0.10	<0.10	<0.10
Pyrene	mg/kg	<0.10	<0.10	<0.10
Benzo[*a*]anthracene	mg/kg	<0.10	<0.10	<0.10
Chrysene	mg/kg	<0.10	<0.10	<0.10
Benzo[*b,k*]fluoranthene	mg/kg	<0.20	<0.20	<0.20
Benzo[*a*]pyrene	mg/kg	<0.05	<0.05	<0.05
Indeno[*123-cd*]pyrene	mg/kg	<0.10	<0.10	<0.10
Dibenzo[*ah*]anthracene	mg/kg	<0.10	<0.10	<0.10
Benzo[*ghi*]perylene	mg/kg	<0.10	<0.10	<0.10
Total PAHs (sum)	mg/kg	<1.7	<1.7	<1.7
Nitrobenzene-d5	%	97	101	101
2-Fluorobiphenyl	%	92	96	96
p -Terphenyl-*d14*	%	103	109	106

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OC Pesticides in Soil Our Reference:	UNITS	SE73331-3	SE73331-6	SE73331-10	SE73331-11	SE73331-12
Your Reference	----------	BH3	BH5	D1	Composite A	Composite B
Composite Reference	----------	-	-	-	1+2+5	7+8+9
Sample Matrix		Soil	Soil	Soil	Soil	Soil
Date Sampled		27/10/2009	27/10/2009	27/10/2009	27/10/2009	27/10/2009
Depth		0.3	0.2	-	-	-
Date Extracted		29/10/2009	29/10/2009	29/10/2009	29/10/2009	29/10/2009
Date Analysed		29/10/2009	29/10/2009	29/10/2009	29/10/2009	29/10/2009
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC (Lindane)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
o,p-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-Endosulfan	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
trans-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
cis-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
trans-Nonachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
p,p-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
o,p-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
o,p-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-Endosulfan	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
p,p-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
p,p-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Ketone	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
2,4,5,6-Tetrachloro-m-xylene *(Surrogate*	%	129	129	129	129	129

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Metals in Soil by ICP-OES Our Reference:	UNITS	SE73331-3	SE73331-4	SE73331-6	SE73331-10	SE73331-11
Your Reference	----------	BH3	BH3	BH5	D1	Composite A
Composite Reference	----------	-	-	-	-	1+2+5
Sample Matrix		Soil	Soil	Soil	Soil	Soil
Date Sampled		27/10/2009	27/10/2009	27/10/2009	27/10/2009	27/10/2009
Depth		0.3	1.2	0.2	-	-
Date Extracted (Metals)		30/10/2009	30/10/2009	30/10/2009	30/10/2009	30/10/2009
Date Analysed (Metals)		30/10/2009	30/10/2009	30/10/2009	30/10/2009	30/10/2009
Arsenic	mg/kg	<3	5	<3	6	4
Cadmium	mg/kg	0.6	<0.3	0.4	0.4	0.4
Chromium	mg/kg	24	9.7	35	26	13
Copper	mg/kg	27	17	43	13	19
Lead	mg/kg	17	10	16	40	16
Nickel	mg/kg	55	9.9	26	9.7	9.6
Zinc	mg/kg	100	36	1,200	46	59

Metals in Soil by ICP-OES Our Reference:	UNITS	SE73331-12
Your Reference	----------	Composite B
Composite Reference	----------	7+8+9
Sample Matrix		Soil
Date Sampled		27/10/2009
Depth		-
Date Extracted (Metals)		30/10/2009
Date Analysed (Metals)		30/10/2009
Arsenic	mg/kg	6
Cadmium	mg/kg	0.4
Chromium	mg/kg	12
Copper	mg/kg	18
Lead	mg/kg	12
Nickel	mg/kg	8.7
Zinc	mg/kg	44

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Mercury Cold Vapor/Hg Analyser Our Reference: Your Reference Composite Reference Sample Matrix Date Sampled Depth	UNITS ---------- ----------	SE73331-3 BH3 - Soil 27/10/2009 0.3	SE73331-4 BH3 - Soil 27/10/2009 1.2	SE73331-6 BH5 - Soil 27/10/2009 0.2	SE73331-10 D1 - Soil 27/10/2009 -	SE73331-11 Composite A 1+2+5 Soil 27/10/2009 -
Date Extracted (Mercury)		29/10/2009	29/10/2009	29/10/2009	29/10/2009	29/10/2009
Date Analysed (Mercury)		29/10/2009	29/10/2009	29/10/2009	29/10/2009	29/10/2009
Mercury	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05

Mercury Cold Vapor/Hg Analyser Our Reference: Your Reference Composite Reference Sample Matrix Date Sampled Depth	UNITS ---------- ----------	SE73331-12 Composite B 7+8+9 Soil 27/10/2009 -
Date Extracted (Mercury)		29/10/2009
Date Analysed (Mercury)		29/10/2009
Mercury	mg/kg	<0.05

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Moisture Our Reference: Your Reference Composite Reference Sample Matrix Date Sampled Depth	UNITS ----------	SE73331-3 BH3 - Soil 27/10/2009 0.3	SE73331-4 BH3 - Soil 27/10/2009 1.2	SE73331-6 BH5 - Soil 27/10/2009 0.2	SE73331-8 BH7 - Soil 27/10/2009 0.2	SE73331-9 BH8 - Soil 27/10/2009 0.3
Date Analysed (moisture)		29/10/2009	29/10/2009	29/10/2009	29/10/2009	29/10/2009
Moisture	%	12	17	12	12	17

Moisture Our Reference: Your Reference Composite Reference Sample Matrix Date Sampled Depth	UNITS ----------	SE73331-10 D1 - Soil 27/10/2009 -	SE73331-11 Composite A 1+2+5 Soil 27/10/2009 -	SE73331-12 Composite B 7+8+9 Soil 27/10/2009 -
Date Analysed (moisture)		29/10/2009	29/10/2009	29/10/2009
Moisture	%	13	16	15

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Method ID	Methodology Summary
SEO-018	BTEX / C6-C9 Hydrocarbons - Soil samples are extracted with methanol, purged and concentrated by a purge and trap apparatus, and then analysed using GC/MS technique. Water samples undergo the same analysis without the extraction step. Based on USEPA 5030B and 8260B.
SEO-020	Total Recoverable Hydrocarbons - determined by solvent extraction with dichloromethane / acetone for soils and dichloromethane for waters, followed by instrumentation analysis using GC/FID. Where applicable Solid Phase Extraction Manifold technique is used for aliphatic / aromatic fractionation.
SEO-030	Polynuclear Aromatic Hydrocarbons - determined by solvent extraction with dichloromethane / acetone for soils and dichloromethane for waters, followed by instrumentation analysis using GC/MS SIM mode.
SEO-005	OC/OP/PCB - Determination of a suite of Organchlorine Pesticides, Chlorinated Organo-phosphorus Pesticides and Polychlorinated Biphenyls (PCB's) by liquid-liquid extraction using dichloromethane for waters, or mechanical extraction using acetone / hexane for soils, followed by instrumentation analysis using GC/ECD. Based on USEPA 8081/8082.
SEM-010	Determination of elements by ICP-OES following appropriate sample preparation / digestion process. Based on USEPA 6010C / APHA 21st Edition, 3120B.
SEM-005	Mercury - determined by Cold-Vapour AAS following appropriate sample preparation or digestion process. Based on APHA 21st Edition, 3112B.
AN002	Preparation of soils, sediments and sludges undergo analysis by either air drying, compositing, subsampling and 1:5 soil water extraction where required. Moisture content is determined by drying the sample at 105 ± 5°C.

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QUALITY CONTROL BTEX in Soil	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted (BTEX)				29/10/2009	[NT]	[NT]	LCS	29/10/2009
Date Analysed (BTEX)				29/10/2009	[NT]	[NT]	LCS	29/10/2009
Benzene	mg/kg	0.5	SEO-018	<0.5	[NT]	[NT]	LCS	97%
Toluene	mg/kg	0.5	SEO-018	<0.5	[NT]	[NT]	LCS	102%
Ethylbenzene	mg/kg	0.5	SEO-018	<0.5	[NT]	[NT]	LCS	104%
Total Xylenes	mg/kg	1.5	SEO-018	<1.5	[NT]	[NT]	LCS	105%
BTEX Surrogate (%)	%	0	SEO-018	109	[NT]	[NT]	LCS	110%

QUALITY CONTROL TRH in soil with C6-C9 by P/T	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted (TRH C6-C9 PT)				29/10/2009	SE73331-8	29/10/2009 || [N/T]	LCS	29/10/2009
Date Analysed (TRH C6-C9 PT)				29/10/2009	SE73331-8	29/10/2009 || [N/T]	LCS	29/10/2009
TRH C_6 - C_9 P&T	mg/kg	20	SEO-018	<20	SE73331-8	<20 || [N/T]	LCS	113%
Date Extracted (TRH C10-C36)				29/10/2009	SE73331-8	29/10/2009 || 29/10/2009	LCS	29/10/2009
Date Analysed (TRH C10-C36)				29/10/2009	SE73331-8	29/10/2009 || 29/10/2009	LCS	29/10/2009
TRH C_{10} - C_{14}	mg/kg	20	SEO-020	<20	SE73331-8	<20 || <20	LCS	109%
TRH C_{15} - C_{28}	mg/kg	50	SEO-020	<50	SE73331-8	<50 || <50	LCS	98%
TRH C_{29} - C_{36}	mg/kg	50	SEO-020	<50	SE73331-8	<50 || <50	LCS	89%

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QUALITY CONTROL PAHs in Soil	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted				29/10/2009	SE73331-8	29/10/2009 || 29/10/2009	LCS	29/10/2009
Date Analysed				29/10/2009	SE73331-8	29/10/2009 || 29/10/2009	LCS	29/10/2009
Naphthalene	mg/kg	0.1	SEO-030	<0.10	SE73331-8	<0.10 || <0.10	LCS	106%
2-Methylnaphthalene	mg/kg	0.1	SEO-030	<0.10	SE73331-8	<0.10 || <0.10	[NR]	[NR]
1-Methylnaphthalene	mg/kg	0.1	SEO-030	<0.10	SE73331-8	<0.10 || <0.10	[NR]	[NR]
Acenaphthylene	mg/kg	0.1	SEO-030	<0.10	SE73331-8	<0.10 || <0.10	LCS	99%
Acenaphthene	mg/kg	0.1	SEO-030	<0.10	SE73331-8	<0.10 || <0.10	LCS	123%
Fluorene	mg/kg	0.1	SEO-030	<0.10	SE73331-8	<0.10 || <0.10	[NR]	[NR]
Phenanthrene	mg/kg	0.1	SEO-030	<0.10	SE73331-8	<0.10 || <0.10	LCS	113%
Anthracene	mg/kg	0.1	SEO-030	<0.10	SE73331-8	<0.10 || <0.10	LCS	119%
Fluoranthene	mg/kg	0.1	SEO-030	<0.10	SE73331-8	<0.10 || <0.10	LCS	123%
Pyrene	mg/kg	0.1	SEO-030	<0.10	SE73331-8	<0.10 || <0.10	LCS	128%
Benzo[a]anthracene	mg/kg	0.1	SEO-030	<0.10	SE73331-8	<0.10 || <0.10	[NR]	[NR]
Chrysene	mg/kg	0.1	SEO-030	<0.10	SE73331-8	<0.10 || <0.10	[NR]	[NR]
Benzo[*b,k*]fluoranthene	mg/kg	0.2	SEO-030	<0.20	SE73331-8	<0.20 || <0.20	[NR]	[NR]
Benzo[a]pyrene	mg/kg	0.05	SEO-030	<0.05	SE73331-8	<0.05 || <0.05	LCS	102%
Indeno[*123-cd*]pyrene	mg/kg	0.1	SEO-030	<0.10	SE73331-8	<0.10 || <0.10	[NR]	[NR]
Dibenzo[*ah*]anthracene	mg/kg	0.1	SEO-030	<0.10	SE73331-8	<0.10 || <0.10	[NR]	[NR]
Benzo[*ghi*]perylene	mg/kg	0.1	SEO-030	<0.10	SE73331-8	<0.10 || <0.10	[NR]	[NR]
Total PAHs (sum)	mg/kg	1.75	SEO-030	<1.7	SE73331-8	<1.7 || <1.7	[NR]	[NR]
Nitrobenzene-d5	%	0	SEO-030	114	SE73331-8	101 || 98 || RPD: 3	LCS	92%
2-Fluorobiphenyl	%	0	SEO-030	109	SE73331-8	96 || 94 || RPD: 2	LCS	90%
p -Terphenyl-*d*14	%	0	SEO-030	113	SE73331-8	109 || 103 || RPD: 6	LCS	107%

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QUALITY CONTROL OC Pesticides in Soil	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted				29/10/09	[NT]	[NT]	LCS	29/10/09
Date Analysed				29/10/09	[NT]	[NT]	LCS	29/10/09
HCB	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
alpha-BHC	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
gamma-BHC (Lindane)	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
Heptachlor	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	LCS	127%
Aldrin	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	LCS	129%
beta-BHC	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
delta-BHC	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	LCS	117%
Heptachlor Epoxide	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
o,p-DDE	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
alpha-Endosulfan	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
trans-Chlordane	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
cis-Chlordane	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
trans-Nonachlor	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
p,p-DDE	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
Dieldrin	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	LCS	122%
Endrin	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	LCS	128%
o,p-DDD	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
o,p-DDT	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
beta-Endosulfan	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
p,p-DDD	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
p,p-DDT	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	LCS	128%
Endosulfan Sulphate	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
Methoxychlor	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
Endrin Ketone	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
2,4,5,6-Tetrachloro-m-xylene *(Surrogate*	%	0	SEO-005	127	[NT]	[NT]	LCS	129%

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QUALITY CONTROL Metals in Soil by ICP-OES	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted (Metals)				30/10/2009	SE73331-3	30/10/2009 || 30/10/2009	LCS	30/10/2009
Date Analysed (Metals)				30/10/2009	SE73331-3	30/10/2009 || 30/10/2009	LCS	30/10/2009
Arsenic	mg/kg	3	SEM-010	<3	SE73331-3	<3 || <3	LCS	87%
Cadmium	mg/kg	0.3	SEM-010	<0.3	SE73331-3	0.6 || 0.5 || RPD: 18	LCS	86%
Chromium	mg/kg	0.3	SEM-010	<0.3	SE73331-3	24 || 27 || RPD: 12	LCS	79%
Copper	mg/kg	0.5	SEM-010	<0.5	SE73331-3	27 || 29 || RPD: 7	LCS	85%
Lead	mg/kg	1	SEM-010	<1	SE73331-3	17 || 15 || RPD: 12	LCS	88%
Nickel	mg/kg	0.5	SEM-010	<0.5	SE73331-3	55 || 59 || RPD: 7	LCS	81%
Zinc	mg/kg	0.5	SEM-010	<0.5	SE73331-3	100 || 94 || RPD: 6	LCS	79%

QUALITY CONTROL Mercury Cold Vapor/Hg Analyser	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted (Mercury)				29/10/2009	SE73331-3	29/10/2009 || 29/10/2009	LCS	29/10/2009
Date Analysed (Mercury)				29/10/2009	SE73331-3	29/10/2009 || 29/10/2009	LCS	29/10/2009
Mercury	mg/kg	0.05	SEM-005	<0.05	SE73331-3	<0.05 || <0.05	LCS	105%

QUALITY CONTROL Hold sample-**NO test** required	UNITS	LOR	METHOD	Blank
Sample on HOLD		[NT]		[NT]

QUALITY CONTROL Moisture	UNITS	LOR	METHOD	Blank
Date Analysed (moisture)				[NT]
Moisture	%	1	AN002	<1

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Result Codes

[INS]	:	Insufficient Sample for this test	[RPD]	:	Relative Percentage Difference
[NR]	:	Not Requested	*	:	Not part of NATA Accreditation
[NT]	:	Not tested	[N/A]	:	Not Applicable

Report Comments

Samples analysed as received. Solid samples expressed on a dry weight basis.
Date Organics extraction commenced:
NATA Corporate Accreditation No. 2562, Site No 4354
Note: Test results are not corrected for recovery (excluding Dioxins/Furans*)
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Quality Control Protocol

Method Blank: An analyte free matrix to which all reagents are added in the same volume or proportions as used in sample processing. The method blank should be carried through the complete sample preparation and analytical procedure. A method blank is prepared every 20 samples.
Duplicate: A separate portion of a sample being analysed that is treated the same as the other samples in the batch. One duplicate is processed at least every 10 samples.
Surrogate Spike: An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. Surrogates are added to samples before extraction to monitor extraction efficiency and percent recovery in each sample.
Internal Standard: Added to all samples requiring analysis for organics (where relevant) or metals by ICP after the extraction/digestion process; the compounds/elements serve to give a standard of retention time and/or response, which is invariant from run-to-run with the instruments.
Laboratory Control Sample: A known matrix spiked with compound(s) representative of the target analytes. It is used to document laboratory performance. When the results of the matrix spike analysis indicates a potential problem due to the sample matrix itself, the LCS results are used to verify that the laboratory can perform the analysis in a clean matrix.
Matrix Spike: An aliquot of sample spiked with a known concentration of target analyte(s). The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix.

Quality Acceptance Criteria

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.au.sgs.com/sgs-mp-au-env-qu-022-qa-qc-plan-en-09.pdf

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APPENDIX D

BOREHOLE LOGS

Aargus

BOREHOLE LOG

CLIENT	Walleroo Pty Ltd	**BOREHOLE NO.**	BH1
PROJECT	Targeted Environmental Site Assessment	**DATE.**	27.10.09
LOCATION	126 Andrews Road, Penrith NSW	**JOB NO.**	ES3008
METHOD	Hand Auger	**SURFACE ELEV.**	N/A
LOGGED BY	MS	**CHECKED BY**	mk

Aargus AUSTRALIA

Depth (m)	Sample	Graphic Symbol	Ground Water	Classification Symbol	Soil Description (Colour, particle characteristics, strength, placticity, moisture, etc)	Observations
0.25				F	FILL, Silty Sandy Clay, medium grained, low plasticity, brown & orange with some traces of rocks and gravels	No asbestos No Odour Dry
0.5					End of Borehole @ 0.5m below ground level in fill	
0.75						
1						
1.25						
1.5						
1.75						
2						
2.25						
2.5						
2.75						
3						

Log Symbols

Standing groundwater level in borehole

Water seepage in borehole (wet)

Samples

BH1.0.5 - Soil sample taken at indicated depth
S - Surface water sample
GW/W - Groundwater sample/water sample

Moisture Condition

D Dry - Runs freely through fingers
M Moist - Does not run freely but no free water visible on soil surface
W Wet - Free water visible on soil surface

Soil Classification

Clay - Particle size less than 0.002mm
Silt - Particle size between 0.002 and 0.06mm
Sand - Particle size between 0.06 and 2.0mm
Gravel - Particle size between 2.0 and 60mm

Strength

VS Very Soft - Unconfined compressive strength less than 25kPa
S Soft - Unconfined compressive strength 25-50kPa
F Firm - Unconfined compressive strength 50-100kPa
St Stiff - Unconfined compressive strength 100-200kPa
VSt Very Stiff - Unconfined compressive strength 200-400kPa
H Hard - Unconfined compressive strength greater than 400kPa

BOREHOLE LOG

CLIENT	Walleroo Pty Ltd	**BOREHOLE NO.**	BH2
PROJECT	Targeted Environmental Site Assessment	**DATE.**	27.10.09
LOCATION	126 Andrews Road, Penrith NSW	**JOB NO.**	ES3008
METHOD	Hand Auger	**SURFACE ELEV.**	N/A
LOGGED BY	MS	**CHECKED BY**	mk

Aargus
AUSTRALIA

Depth (m)	Sample	Graphic Symbol	Ground Water	Classification Symbol	Soil Description (Colour, particle characteristics, strength, plasticity, moisture, etc)	Observations
				F	FILL, Sandy Loam, medium grained, low-medium plasticity, brown, some rocks	No asbestos No Odour Dry
0.25					End of Borehole @ 0.2m below ground level in fill	
0.5						
0.75						
1						
1.25						
1.5						
1.75						
2						
2.25						
2.5						
2.75						
3						

Log Symbols

Standing groundwater level in borehole
Water seepage in borehole (wet)

Samples

BH1.0.5 - Soil sample taken at indicated depth
S - Surface water sample
GW/W - Groundwater sample/water sample

Moisture Condition

D Dry - Runs freely through fingers
M Moist - Does not run freely but no free water visible on soil surface
W Wet - Free water visible on soil surface

Soil Classification

Clay - Particle size less than 0.002mm
Silt - Particle size between 0.002 and 0.06mm
Sand - Particle size between 0.06 and 2.0mm
Gravel - Particle size between 2.0 and 60mm

Strength

VS Very Soft - Unconfined compressive strength less than 25kPa
S Soft - Unconfined compressive strength 25-50kPa
F Firm - Unconfined compressive strength 50-100kPa
St Stiff - Unconfined compressive strength 100-200kPa
VSt Very Stiff - Unconfined compressive strength 200-400kPa
H Hard - Unconfined compressive strength greater than 400kPa

BOREHOLE LOG

CLIENT	Walleroo Pty Ltd	BOREHOLE NO.	BH3
PROJECT	Targeted Environmental Site Assessment	DATE.	27.10.09
LOCATION	126 Andrews Road, Penrith NSW	JOB NO.	ES3008
METHOD	Hand Auger	SURFACE ELEV.	N/A
LOGGED BY	MS	CHECKED BY	mk

Aargus
AUSTRALIA

Depth (m)	Sample	Graphic Symbol	Ground Water	Classification Symbol	Soil Description (Colour, particle characteristics, strength, placticity, moisture, etc)	Observations
0.25				F	FILL, Sandy Clay, medium grained, low plasticity, brown & grey, rocks & moist	No asbestos No Odour
0.5						
0.75						
1						
1.25				CI-CH	NATURAL - CLAY,medium-high plasticity, brown & orange	Hydrocarbon Odour H/C Staining Moist
1.5					End of Borehole @ 1.5m below ground level in Natural Clay	
1.75						
2						
2.25						
2.5						
2.75						
3						

Log Symbols

Standing groundwater level in borehole
Water seepage in borehole (wet)

Samples

BH1.0.5 - Soil sample taken at indicated depth
S - Surface water sample
GW/W - Groundwater sample/water sample

Moisture Condition

D Dry - Runs freely through fingers
M Moist - Does not run freely but no free water visible on soil surface
W Wet - Free water visible on soil surface

Soil Classification

Clay - Particle size less than 0.002mm
Silt - Particle size between 0.002 and 0.06mm
Sand - Particle size between 0.06 and 2.0mm
Gravel - Particle size between 2.0 and 60mm

Strength

VS Very Soft - Unconfined compressive strength less than 25kPa
S Soft - Unconfined compressive strength 25-50kPa
F Firm - Unconfined compressive strength 50-100kPa
St Stiff - Unconfined compressive strength 100-200kPa
VSt Very Stiff - Unconfined compressive strength 200-400kPa
H Hard - Unconfined compressive strength greater than 400kPa

BOREHOLE LOG

CLIENT	Walleroo Pty Ltd	**BOREHOLE NO.**	BH4
PROJECT	Targeted Environmental Site Assessment	**DATE.**	27.10.09
LOCATION	126 Andrews Road, Penrith NSW	**JOB NO.**	ES3008
METHOD	Hand Auger	**SURFACE ELEV.**	N/A
LOGGED BY	MS	**CHECKED BY**	mk

Aargus
AUSTRALIA

Depth (m)	Sample	Graphic Symbol	Ground Water	Classification Symbol	Soil Description (Colour, particle characteristics, strength, placticity, moisture, etc)	Observations
0.25				CI-CH	NATURAL - CLAY,medium-high plasticity, brown & orange, grey mottling, moist	No asbestos No Odour
0.5					End of Borehole @ 0.5m below ground level in Natural Clay	
0.75						
1						
1.25						
1.5						
1.75						
2						
2.25						
2.5						
2.75						
3						

Log Symbols

Standing groundwater level in borehole
Water seepage in borehole (wet)

Samples

BH1.0.5 - Soil sample taken at indicated depth
S - Surface water sample
GW/W - Groundwater sample/water sample

Moisture Condition

D Dry - Runs freely through fingers
M Moist - Does not run freely but no free water visible on soil surface
W Wet - Free water visible on soil surface

Soil Classification

Clay - Particle size less than 0.002mm
Silt - Particle size between 0.002 and 0.06mm
Sand - Particle size between 0.06 and 2.0mm
Gravel - Particle size between 2.0 and 60mm

Strength

VS Very Soft - Unconfined compressive strength less than 25kPa
S Soft - Unconfined compressive strength 25-50kPa
F Firm - Unconfined compressive strength 50-100kPa
St Stiff - Unconfined compressive strength 100-200kPa
VSt Very Stiff - Unconfined compressive strength 200-400kPa
H Hard - Unconfined compressive strength greater than 400kPa

BOREHOLE LOG

CLIENT	Walleroo Pty Ltd	**BOREHOLE NO.**	BH5
PROJECT	Targeted Environmental Site Assessment	**DATE.**	27.10.09
LOCATION	126 Andrews Road, Penrith NSW	**JOB NO.**	ES3008
METHOD	Hand Auger	**SURFACE ELEV.**	N/A
LOGGED BY	MS	**CHECKED BY**	mk

Aargus
AUSTRALIA

Depth (m)	Sample	Graphic Symbol	Ground Water	Classification Symbol	Soil Description (Colour, particle characteristics, strength, placticity, moisture, etc)	Observations
0.25				F	FILL, Sandy Clay, medium grained, low plasticity, brown & grey, some rocks, gravel & root fibre inclusions	No asbestos No Odour
0.5				CI-CH	NATURAL - CLAY,medium-high plasticity, brown & orange	
0.75						
1					End of Borehole @ 1.0m below ground level in Natural Clay	
1.25						
1.5						
1.75						
2						
2.25						
2.5						
2.75						
3						

Log Symbols

Standing groundwater level in borehole
Water seepage in borehole (wet)

Samples

BH1.0.5 - Soil sample taken at indicated depth
S - Surface water sample
GW/W - Groundwater sample/water sample

Moisture Condition

D Dry - Runs freely through fingers
M Moist - Does not run freely but no free water visible on soil surface
W Wet - Free water visible on soil surface

Soil Classification

Clay - Particle size less than 0.002mm
Silt - Particle size between 0.002 and 0.06mm
Sand - Particle size between 0.06 and 2.0mm
Gravel - Particle size between 2.0 and 60mm

Strength

VS Very Soft - Unconfined compressive strength less than 25kPa
S Soft - Unconfined compressive strength 25-50kPa
F Firm - Unconfined compressive strength 50-100kPa
St Stiff - Unconfined compressive strength 100-200kPa
VSt Very Stiff - Unconfined compressive strength 200-400kPa
H Hard - Unconfined compressive strength greater than 400kPa

BOREHOLE LOG

CLIENT	Walleroo Pty Ltd	**BOREHOLE NO.**	BH6
PROJECT	Targeted Environmental Site Assessment	**DATE.**	27.10.09
LOCATION	126 Andrews Road, Penrith NSW	**JOB NO.**	ES3008
METHOD	Hand Auger	**SURFACE ELEV.**	N/A
LOGGED BY	MS	**CHECKED BY**	mk

Aargus
AUSTRALIA

Depth (m)	Sample	Graphic Symbol	Ground Water	Classification Symbol	Soil Description (Colour, particle characteristics, strength, plasticity, moisture, etc)	Observations
0.25				F	FILL, Silty Sandy Clay, medium grained, low plasticity, brown & orange with some traces of rocks and gravels	No asbestos No Odour
0.5					End of Borehole @ 0.5m below ground level in fill	
0.75						
1						
1.25						
1.5						
1.75						
2						
2.25						
2.5						
2.75						
3						

Log Symbols

Standing groundwater level in borehole
Water seepage in borehole (wet)

Samples

BH1.0.5 - Soil sample taken at indicated depth
S - Surface water sample
GW/W - Groundwater sample/water sample

Moisture Condition

D Dry - Runs freely through fingers
M Moist - Does not run freely but no free water visible on soil surface
W Wet - Free water visible on soil surface

Soil Classification

Clay - Particle size less than 0.002mm
Silt - Particle size between 0.002 and 0.06mm
Sand - Particle size between 0.06 and 2.0mm
Gravel - Particle size between 2.0 and 60mm

Strength

VS Very Soft - Unconfined compressive strength less than 25kPa
S Soft - Unconfined compressive strength 25-50kPa
F Firm - Unconfined compressive strength 50-100kPa
St Stiff - Unconfined compressive strength 100-200kPa
VSt Very Stiff - Unconfined compressive strength 200-400kPa
H Hard - Unconfined compressive strength greater than 400kPa

BOREHOLE LOG

CLIENT	Walleroo Pty Ltd	BOREHOLE NO.	BH7
PROJECT	Targeted Environmental Site Assessment	DATE.	27.10.09
LOCATION	126 Andrews Road, Penrith NSW	JOB NO.	ES3008
METHOD	Hand Auger	SURFACE ELEV.	N/A
LOGGED BY	MS	CHECKED BY	mk

Aargus
AUSTRALIA

Depth (m)	Sample	Graphic Symbol	Ground Water	Classification Symbol	Soil Description (Colour, particle characteristics, strength, plasticity, moisture, etc)	Observations
0.25				F	FILL, Sandy Loam, medium grained, low-medium plasticity, brown, some rocks & gravel	No asbestos No Odour
					End of Borehole @ 0.25m below ground level in fill	
0.5						
0.75						
1						
1.25						
1.5						
1.75						
2						
2.25						
2.5						
2.75						
3						

Log Symbols

Standing groundwater level in borehole
Water seepage in borehole (wet)

Samples

BH1.0.5 - Soil sample taken at indicated depth
S - Surface water sample
GW/W - Groundwater sample/water sample

Moisture Condition

D Dry - Runs freely through fingers
M Moist - Does not run freely but no free water visible on soil surface
W Wet - Free water visible on soil surface

Soil Classification

Clay - Particle size less than 0.002mm
Silt - Particle size between 0.002 and 0.06mm
Sand - Particle size between 0.06 and 2.0mm
Gravel - Particle size between 2.0 and 60mm

Strength

VS Very Soft - Unconfined compressive strength less than 25kPa
S Soft - Unconfined compressive strength 25-50kPa
F Firm - Unconfined compressive strength 50-100kPa
St Stiff - Unconfined compressive strength 100-200kPa
VSt Very Stiff - Unconfined compressive strength 200-400kPa
H Hard - Unconfined compressive strength greater than 400kPa

BOREHOLE LOG

CLIENT	Walleroo Pty Ltd	BOREHOLE NO.	BH8
PROJECT	Targeted Environmental Site Assessment	DATE.	27.10.09
LOCATION	126 Andrews Road, Penrith NSW	JOB NO.	ES3008
METHOD	Hand Auger	SURFACE ELEV.	N/A
LOGGED BY	MS	CHECKED BY	mk

Aargus
AUSTRALIA

Depth (m)	Sample	Graphic Symbol	Ground Water	Classification Symbol	Soil Description (Colour, particle characteristics, strength, plasticity, moisture, etc)	Observations
0.25				F	FILL, Sandy Loam, medium grained, low-medium plasticity, brown & orange, some rocks & gravel	No asbestos No Odour
0.5					End of Borehole @ 0.4m below ground level in fill	
0.75						
1						
1.25						
1.5						
1.75						
2						
2.25						
2.5						
2.75						
3						

Log Symbols

Standing groundwater level in borehole
Water seepage in borehole (wet)

Samples

BH1.0.5 - Soil sample taken at indicated depth
S - Surface water sample
GW/W - Groundwater sample/water sample

Moisture Condition

D Dry - Runs freely through fingers
M Moist - Does not run freely but no free water visible on soil surface
W Wet - Free water visible on soil surface

Soil Classification

Clay - Particle size less than 0.002mm
Silt - Particle size between 0.002 and 0.06mm
Sand - Particle size between 0.06 and 2.0mm
Gravel - Particle size between 2.0 and 60mm

Strength

VS Very Soft - Unconfined compressive strength less than 25kPa
S Soft - Unconfined compressive strength 25-50kPa
F Firm - Unconfined compressive strength 50-100kPa
St Stiff - Unconfined compressive strength 100-200kPa
VSt Very Stiff - Unconfined compressive strength 200-400kPa
H Hard - Unconfined compressive strength greater than 400kPa

APPENDIX E

SITE PHOTOGRAPHS

Aargus

SITE PHOTOGRAPHS

Client	Walleroo Pty Ltd
Project	Targeted Environmental Site Assessment
Location	126 Andrews Road, Penrith NSW
Job No.	ES3008
Checked By	MK

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Photograph N° 1

View of Warehouse & Carpark area
Looking south east

Photograph N° 2

View of stormwater tanks
Looking south east

Photograph N° 3

View of the sealed concrete bordering the warehouse
Looking south

Photograph N° 4

View of tree the client was concerned was suffering from distress
Looking east

Photograph N° 5

View of the grass & tree areas surrounding the warehouse
Looking north

Photograph N° 6

View of the compacted asphalt area at the rear of the warehouse
Looking north west

SITE PHOTOGRAPHS

Client	Walleroo Pty Ltd
Project	Targeted Environmental Site Assessment
Location	126 Andrews Road, Penrith NSW
Job No.	ES3008
Checked By	MK

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Photograph N° 7

View of grass & tree areas surrounding the site
Looking south

APPENDIX F

REGULATORY CRITERIA

Aargus

Table 5-A - Soil Investigation Levels (mg/kg)

Substances	Health Investigation Levels (HILs)						Ecological Investigation Levels (EILs)		Background
	A[1]	B[2]	C[3]	D	E	F	REIL[4]	Interim Urban[5]	Ranges[6]
METALS/METALLOIDS									
Arsenic (total)	100			400	200	500		20	1 - 50
Barium								300	100 - 3000
Beryllium	20			80	40	100			
Cadmium	20			80	40	100		3	1
Chromium (III)	12%			48%	24%	60%		400	
Chromium (VI)	100			400	200	500		1	
Chromium (Total)[7]									5 - 1000
Cobalt	100			400	200	500			1 - 40
Copper	1000			4000	2000	5000		100	2 - 100
Lead	300			1200	600	1500		600	2 - 200
Manganese	1500			6000	3000	7500		300	850
Methyl mercury	10			40	20	50			
Mercury (inorganic)	15			60	30	75		1	0.03
Nickel	600			2400	600	3000		60	5 - 500
Vanadium								50	20 - 500
Zinc	7000			28000	14000	35000		200	10 - 300
ORGANICS									
Aldrin + Dieldrin	10			40	20	50			
Chlordane	50			200	100	250			
DDT + DDD + DDE	200			800	400	1000			
Heptachlor	10			40	20	50			
Polycyclic aromatic hydrocarbons (PAHs)	20			80	40	100			
Benzo(a)pyrene	1			4	2	5			
Phenol	8500			34000	17000	42500			
PCBs (Total)	10			40	20	50			
Petroleum Hydrocarbon Components (constituents):									
• >C16 – C35 Aromatics[8]	90			360	180	450			
• >C16 – C35 Aliphatics	5600			22400	11200	28000			
• >C35 Aliphatics	56000			224000	112000	280000			
OTHER									
Boron	3000			12000	6000	15000			
Cyanides (Complexed)	500			2000	1000	2500			
Cyanides (free)	250			1000	500	1250			
Phosphorus								2000	
Sulfur								600	
Sulfate[9]								2000	

Limited Australian data collected to this

1 Human exposure settings based on land use have been established for HILs (see Taylor and Langley 1998). These are:
A. 'Standard' residential with garden/accessible soil (home-grown produce contributing less than 10% of vegetable and fruit intake; no poultry): this category includes children's day-care centres, kindergartens, preschools and primary schools.
B. Residential with substantial vegetable garden (contributing 10% or more of vegetable and fruit intake) and/or poultry providing any egg or poultry meat dietary intake.
C. Residential with substantial vegetable garden (contributing 10% or more of vegetable and fruit intake); poultry excluded.
D. Residential with minimal opportunities for soil access: includes dwellings with fully and permanently paved yard space such as high-rise apartments and flats.
E. Parks, recreational open space and playing fields: includes secondary schools.
F. Commercial/Industrial: includes premises such as shops and offices as well as factories and industrial sites.
(For details on derivation of HILs for human exposure settings based on land use see Schedule B(7A).

2 Site and contaminant specific: on site sampling is the preferred approach for estimating poultry and plant uptake. Exposure estimates may then be compared to the relevant ADIs, PTWIs and GDs.

3 Site and contaminant specific: on site sampling is the preferred approach for estimating plant uptake. Exposure estimates may then be compared to the relevant ADIs, PTWIs and GDs.

4 These will be developed for regional areas by jurisdictions as required.

5 Interim EILs for the urban setting are based on considerations of phytotoxicity, ANZECC B levels, and soil survey data from urban residential properties in four Australian capital cities.

6 Background ranges, where HILs or EILs are set, are taken from the Field Geologist's Manual, compiled by D A Berkman, Third Edition 1989, Publisher – The Australasian Institute of Mining & Metallurgy. This publication contains information on a more extensive list of soil elements than is included in this Table. Another source of information is Contaminated Sites Monograph No. 4: Trace Element Concentrations in Soils from Rural & Urban Areas of Australia, 1995. South Australian Health Commission.

7 Valence state not distinguished – expected as Cr (III).

8 The carbon number is an 'equivalent carbon number' based on a method that standardises according to boiling point. It is a method used by some analytical laboratories to report carbon numbers for chemicals evaluated on a boiling point GC column.

9 For protection of built structures.

Table 3 Threshold concentrations for sensitive land use — soils

Analytes	Threshold concentrations [a] (mg/kg dry wt)	Sources
TPH [b, c]: C6–C9	65	see note [d]
TPH [c]: C10–C40 (C10–C14, C15–C28, C29–C40)	1,000	see note [e]
Benzene	1 [f]	ANZECC/NHMRC 1992
Toluene	1.4 [g] / 130 [h]	Netherlands 1994
Ethyl benzene	3.1 [i] / 50 [j]	Netherlands 1994
Total Xylenes	14 [k] / 25 [j]	Netherlands 1994
Phenol	— [l]	— [l]
Total Lead	300	ANZECC/NHMRC 1992
Benzo(a)pyrene	1	ANZECC/NHMRC 1992
Total PAHs [m]	20	ANZECC/NHMRC 1992

NB. Scientifically justified alternative threshold concentrations may be acceptable. Thresholds may be reviewed as new scientific information becomes available.

Explanatory notes for Table 3

a Refer to relevant source documents for details.

Definitions of terms used in discussion of Netherlands criteria (Denneman 1993) are:

- **The maximum permissible concentration** (MPC) is the 'concentration of a toxic substance that fully protects 95% of the species in an ecosystem'.
- **The intervention level** represents 'a level where action is needed because impermissible risks may occur. It depends on other than chemical characteristics if action should take place immediately or not'. In the case of ecological risk, the intervention level 'fully protects 50% of the species in an ecosystem'.

Further information regarding MPCs and intervention levels may be found in Denneman & van den Berg 1993.

The Netherlands sourced values in Table 2 refer to soil with 10% natural organic matter content. These threshold concentrations must be adjusted for the particular natural organic matter content of the specific site. The natural organic matter content in soil may be determined using the Walkley and Black Method, AS 1289.D1.1–1977, *Determination of the Organic Matter Content of a Soil (Standard Method)*.

The threshold concentrations for ethyl benzene and xylenes to protect terrestrial organisms have been derived from aquatic toxicological data using equilibrium partitioning. Investigations have shown (Van Gestel & Ma 1993) that in the case of earthworms, toxicity is related to the pore water contaminant concentration. The LC_{50} pore water concentrations for several compounds have been favourably compared with LC_{50} aquatic toxicological data for fish.

Explanatory notes for Table 3 (cont.)

The derivations of criteria adopted as threshold concentrations have not explicitly taken account of chemical mixtures. The potential impact of mixtures of chemicals should be assessed on a site-specific basis.

The potential for the generation of odours may mean that lower thresholds than those listed in Table 2 are required for volatile compounds.

b Total petroleum hydrocarbons

c Approximate range of petroleum hydrocarbon fractions: petrol C6–C9, kerosene C10–C18, diesel C12–C18 and lubricating oils above C18.

d The TPH C6–C9 threshold concentration, i.e. 65 mg/kg, applies to soil containing 10% natural organic matter. This concentration has been calculated assuming the following:

- that there has been a fresh spill of petrol
- that the aromatic content of the petrol is 30%
- that the resultant BTEX soils concentrations are at their lower thresholds.

TPH C6–C9 concentrations above the relevant threshold may indicate that BTEX concentrations are above their thresholds. This threshold concentration should be interpreted as only an approximate potential indicator of contamination.

e The TPH C10–C40 threshold concentration is based on a consideration both of the Netherlands Intervention Level for the TPH C10–C40 range and on commonly reported analytical detection limits. The Netherlands intervention value is 5,000 mg/kg dry weight.

f A lower benzene threshold concentration may be needed to protect groundwater.

g The toluene threshold concentration is the Netherlands MPC to protect terrestrial organisms in soil. This value was obtained by applying a US EPA assessment factor to terrestrial chronic No Observed Effect Concentration (NOEC) data. The MPC is an 'indicative' value (Van de Plassche *et al.* 1993; Van de Plassche & Bockting 1993).

h Human health and ecologically based protection level for toluene. The threshold concentration presented here is the Netherlands intervention value for the protection of terrestrial organisms. Other considerations such as odours and the protection of groundwater may require a lower remediation criterion.

i The ethyl benzene threshold concentration is the Netherlands MPC for the protection of terrestrial organisms in soil. No terrestrial ecotoxicological data could be found for use in the Netherlands criteria derivation. Therefore, equilibrium partitioning has been applied to the MPC for water to obtain estimates of the MPC for soil. The MPC for water has been derived from aquatic ecotoxicological data (Van de Plassche *et al.* 1993; Van de Plassche & Bockting 1993).

j Human health based protection level for ethyl benzene or total xylenes as shown. The threshold concentration presented here is the Netherlands intervention value. Other considerations such as odours and the protection of groundwater may require a lower remediation criterion

k The xylene threshold concentration is the Netherlands MPC for the protection of terrestrial organisms in soil. No terrestrial ecotoxicological data could be found for use in the Netherlands criteria derivation. Therefore, equilibrium partitioning has been applied to the MPC for water to obtain an estimate of the MPC for soil. The MPC for water has been derived from aquatic ecotoxicological data. The concentration shown applies to total xylenes and is based on the arithmetic average of the individual xylene MPCs (Van de Plassche *et al.* 1993; Van de Plassche & Bockting 1993).

l Phenol contamination is not expected to be significant at service station sites. Phenol has been included in the analyte list because it is a potential constituent of waste oil. The potential impact of phenol should be evaluated on a site-specific basis. Phenol may have a significant impact on waters.

m Polycyclic aromatic hydrocarbons

Contaminated aquifers and contaminated aquicludes should, as far as practicable, be remediated to the condition they were in before they became contaminated.

If groundwater is to be used for drinking water, analyte concentrations should not exceed the relevant drinking water guidelines: *Guidelines for Drinking Water Quality in Australia* (NHMRC/AWRC 1987), and *Draft Australian Drinking Water Guidelines* (NHMRC/ARMCANZ 1994). The draft NHMRC/ARMCANZ (1994) guidelines have been released for public comment, so some proposed guideline values may change upon review.

Groundwater that enters aquatic ecosystems (freshwater or marine) should not cause concentrations in the receiving ecosystem to exceed the relevant water quality guideline recommendations. See *Australian Water Quality Guidelines for Fresh and Marine Waters* (ANZECC 1992).

If the analyte concentrations in groundwater exceed the relevant thresholds, the groundwater should be remediated to or below the threshold concentrations. **If the threshold concentrations provided are not applicable, then the EPA should be consulted to determine the remediation goals.** The site assessor should keep a record of the reasons for selecting particular threshold concentrations. If other groundwater uses (e.g. industrial or agricultural) are affected, then other guideline recommendations should be considered (see ANZECC 1992).

The threshold concentrations may not apply in the following circumstances:

- when an appropriate human health risk assessment or ecological risk assessment demonstrates that lower or higher concentrations may be applicable
- when an appropriate risk-benefit analysis demonstrates that lower or higher concentrations may be acceptable.

2.5.2 How threshold concentrations have been selected

Threshold concentrations have, wherever possible, been selected from Australian sources, including ANZECC, NHMRC and ARMCANZ. In cases where the information was not available locally, Netherlands sources have been used (see Bibliography).

Threshold concentrations for soils are presented in Table 3. The concentrations have been taken from ANZECC/NHMRC (1992), and the Netherlands Ministry of Housing, Environment etc. (1994).

Threshold concentrations for waters are presented in Table 4. The

Table 4 Threshold concentrations — waters

Analytes	Threshold concentrations (µg/L)[a]				
	Protection of drinking water		Protection of aquatic ecosystems[b]		
	Health-based	Sources	Fresh	Marine	Source
TPH: C6–C9	—[c]	—[c]	—[e]	—[e]	—[e]
TPH: C10–C36	—[d]	—[d]	—[e]	—[e]	—[e]
Benzene	10[f]	NHMRC/AWRC	300	300	ANZECC
Toluene	800[g]	NHMRC/ARMCANZ	300	—[c]	ANZECC
Ethyl benzene	300[g]	NHMRC/ARMCANZ	140	—[c]	ANZECC
Xylene	600[g]	NHMRC/ARMCANZ	380[h]	380[h]	Netherlands 1994
Phenols	2	ANZECC	50	50	ANZECC
Benzo(a)pyrene	0.01	NHMRC/AWRC	—[c]	—[c]	—[c]
PAHs	—[c]	—[c]	3	3	ANZECC
Lead	10	NHMRC/ARMCANZ	1–5[i]	5	ANZECC

NB. Scientifically justified alternative threshold concentrations may be acceptable. Thresholds may be reviewed as new scientific information becomes available.

Explanatory notes for Table 4

a Refer to the relevant source documents for details. The unit µg/L = micrograms per litre.

b Groundwater entering aquatic ecosystems should not cause concentrations to exceed the relevant threshold concentrations.

c Information needed to select threshold concentrations is incomplete.

d Information needed to select threshold concentrations is incomplete. Alkanes in this range have low solubility and are unlikely to be of concern in water. All separate phase products must be removed.

e Information needed to select threshold concentrations is incomplete. The NSW Clean Waters Act 1970 and Clean Waters Regulations 1972 prohibit the pollution of waters by unlicensed contaminated discharges and require licensed discharges to be visually free of oil and grease. Experience has demonstrated that the latter criterion is equivalent to an oil and grease concentration of approximately 10 mg/L.

f NHMRC/ARMCANZ 1994 proposed 1 µg/L as the new benzene guideline concentration. This has not yet been adopted.

g NHMRC/ARMCANZ 1994 proposed concentrations are similar to WHO 1993 drinking-water quality guideline concentrations.

h Netherlands 1994 Maximum Permissible Concentration for total xylenes.

i Dependent on water hardness.

APPENDIX G

AARGUS FIELDWORK PROTOCOLS

Aargus

Fieldwork Protocols

Aargus
AUSTRALIA

February 2008

TABLE OF CONTENTS

LIST OF TABLES

Aargus

1.0 OBJECTIVE AND SCOPE

The objective of Aargus Pty Ltd (Aargus) Protocols is to ensure that the methodology followed during environmental works is adequate to provide data which is usable and representative of the conditions actually encountered at the site.

The scope of these protocols is to:

- Outline the methods and procedures for the field investigations during an environmental assessment or remediation and validation program; and
- Specify methods and procedures which ensure that soil and groundwater samples recovered are representative of the actual subsurface conditions at the site, as well as ensuring that the risk of introducing external contamination to samples and to the environment is minimised.

These protocols must be adhered to by Aargus personnel and by sub-contractors involved in field investigations. Any deviations from these protocols should be explained within the Environmental Report to which they are attached.

2.0 SOIL SAMPLING

2.1 Collection methods

Possible collection methods

Soil samples are generally collected by drilling or excavating the subsurface, using one of the following drilling / excavating technique:

- Rotary air hammer
- Hand auger
- Solid or hollow auger
- Backhoe or Excavator

Rotary Air Hammer

The air hammer technique requires the use of synthetic blend lubricants to prevent potential contamination of the borehole if a leak were to occur. In addition, micro-filters are installed into the drilling airline to avoid contamination by hydrocarbons present in the compressed air.

Samples of rock are generally not collected. Where rock samples are needed, specialised techniques are used.

Hand auger

A hand auger is generally used to investigate subsurface conditions of unconsolidated materials at shallow depths or in areas difficult to access with other equipment. Samples are recovered from the hand auger, taking care to avoid cross contamination, especially between samples from the same hole but at different depths. Sampling equipment is to be thoroughly cleaned between sampling events, in accordance with the procedures outlined in Section 2.5 Equipment decontamination.

Solid or Hollow auger

Solid and hollow auger drilling techniques are well suited to unconsolidated materials. The main advantage of the hollow auger technique is that the drill rods allow access of sampling equipment at specified depths within the annulus of the drill rods.

Samples of soil are recovered using a split spoon sampler at specific depth intervals. The split spoon sampler is driven into the soil by the drill rig whilst attached to the end of the drill rods. The retrieved sample is then split lengthways into two halves when duplicate samples are required. A few centimetres of soil from the top of the split spoon sampler is discarded. Samples for volatile analysis are collected first, without mixing.

Test pits and trenches excavated with a backhoe or an excavator

Test Pit and Trenches excavated with a backhoe/excavator are used to collect relatively shallow (i.e. less than 3.5m depth) soil samples on occasions where:

- Access multiple sample locations at a site are needed;
- A description of the subsurface soil profile to approximately 3.5 m depth is required (generally in unsaturated conditions);
- The investigated site is free from known underground services and access problems;
- The investigated site is free from impenetrable surface or near surface layers including concrete and asphalt pavements; and
- Undisturbed soil samples are required, usually at multiple depths.

Backfilling

On completion of drilling / test pitting, the investigated locations are backfilled with cuttings and compacted. Excess drill cuttings are disposed of appropriately. If the sampling location is located in an area used for the circulation of people or vehicles, the top of the sampling location should be sealed with mortar.

2.2 Soil logging

The lithological logging of soil samples and subsurface conditions is undertaken by environmental scientists / engineers. The soil characteristics are logged in accordance with the Australian Standard *AS1726-1993 Geotechnical Site Investigations.* This includes description of grain size, visible staining, odour and colour, and of the clues which may suggest that the soil may be contaminated. Descriptions of soils are made using the Northcote method.

2.3 Collecting soil samples

The soil sample is collected using a stainless steel trowel, or directly with the hand if the sampler wears disposable gloves. Soils are quickly transferred into 250g clean amber glass jars, which have been acid washed and solvent rinsed. The jars are sealed with a screw-on teflon lined plastic lid, labelled, and placed for storage in an ice filled chest.

2.4 Labelling of soil samples

Samples are labelled with the following information:

- Job number;
- Date of sample collection;
- Name of the environmental scientist / engineer who collected the sample; and
- Sample number: the letters used to label the samples are BH, C, SS, SP, TP and V which refer respectively to borehole samples, composite samples, surface samples, stockpile samples, test pit samples and validation samples. For borehole samples, BH3 1.0m is the sample taken from borehole 3 at 1.0m below ground level. For stockpile samples, SP1/1 is the first sample from stockpile 1. TP1 2.0m is the sample taken from testpit 1 at a depth of 2.0 metres below ground level. V3/F is the validation sample taken from location V3, the letters F N, S, E and W refer to the floor, north, south, east and west walls of an excavation; if some contamination is found in the validation sample, then chasing out of the contamination is required and in this case, the label of the sample is

changed by adding /1 or /2 according to the number of times the contamination has been chased out. B stands for blind.

2.5 Equipment decontamination

The drilling and sampling equipment are cleaned using an appropriate surfactant (e.g. phosphate-free detergent or Decon 90), then rinsed with tap water prior to final rinsing with distilled water.

The following procedures shall be followed for decontamination of drilling and sampling equipment:

- buckets or tubs used for decontamination shall be cleaned with tap water and detergent and rinsed with tap water before sampling commences;
- fill first bucket or tub with tap water, and phosphate free detergent;
- fill second bucket or tub with tap water;
- clean equipment thoroughly in detergent water, using a stiff brush; rinse equipment in tap water;
- dry equipment with disposable towels;
- rinse equipment by thoroughly spraying with tap water, then final rinse with distilled water;
- allow equipment to dry; and
- change water and detergent solution between sampling event.

Sampling decontaminated equipment should be kept in a clean area to prevent cross-contamination. Equipment that cannot be thoroughly decontaminated using the detergent wash and water rinse should be cleaned with steam or high pressure water or if a cleaner is not available, not used for further sampling (and labelled clearly "not decontaminated") or discarded. Equipment decontaminated using the high pressure steam cleaner will be treated as described above. Any equipment that cannot be thoroughly decontaminated shall be discarded and replaced.

A new pair of latex gloves is used to handle each sample. Contaminated materials such as disposable clothing should be disposed of in accordance with environmental best practice.

2.6 Surveying of sampling locations

Sampling locations are generally located by reference to existing ground features, e.g. fences, buildings.

If the survey for location and elevation is required, it should be done by a licensed surveyor, or alternatively by an Aargus environmental engineer / scientist if the level of precision required can be obtained by the use of Aargus field equipment. Aargus has GPS equipment and level meters.

If the location is given by a licensed surveyor, it is generally given to the nearest 0.1m and referenced to the Australian Map Grid (AMG) coordinates.

3.0 GROUNDWATER SAMPLING

3.1 Groundwater Sampling Objectives

The primary objective of any groundwater (quality) sampling is to produce groundwater samples that are representative of groundwater in the aquifer and will remain representative until analytical determination or measurements are made.

3.2 Groundwater well construction

Typically wells are installed to gain access to the groundwater to be sampled. Well construction details will depend on hydrogeological setting of the site, for example the depth to groundwater strata present. Relevant information regarding of the hydrogeological setting will have been obtained prior the development of any groundwater sampling program.

The preferred drilling methods will depend on the hydrogeological setting of the site and the objectives of the groundwater sampling program. For example, shallow wells in unconsolidated materials, such as sand, may be drilled using a hand auger. Drill rigs using solid of hollow flight augers may be used to drill deeper wells or through semi consolidated materials, such as stiff clay. Rotary air hammer drilling may be used were well is to be drilled through consolidated materials, such as rock. Soil samples may also be collected during drilling (see Section 2.0 SOIL SAMPLING).

Drilling methods and materials must not have an unacceptable impact on the groundwater to be sampled. For example, if groundwater from the wells is to be tested for organic analytes, petroleum based lubricants are not to be used and oil traps must be installed on compressed air lines. Drilling techniques should also minimise compaction or smearing of the boreholes wells and transport of material into different zones, in

particular, when drilling through potentially contaminated material to access groundwater.

Drill cuttings accumulated over a hole are to be removed as drilling progresses so as to prevent fallback of cuttings into the hole. Samples may be collected at a range of depths in the borehole profile during drilling.

The depth of groundwater well depends of the purpose of the investigation on the soil profile and the regional geology of the area. If the borehole location is covered by concrete, coring of the superficial hard layer is undertaken first.

Petroleum based lubricants are not used on drilling and sampling equipment, instead, Teflon based greases are used where appropriate. An Aargus environmental scientist/engineer monitors and records drilling activities, procedures adopted, materials used, progress of the stages of well construction (including (i.e. screen location - standpipe lens, placement, of sand filters and well seals, and general completion details), as well as the lithology of the subsurface, visible staining, unusual odours and colours (if any).

The use of a rotary air hammer rig has many advantages for consolidated material (e.g. rock), including:

- Large diameter to allow precise placement of groundwater monitoring equipment;
- No injection of drilling fluids into the formation with resulting benefits in ensuring integrity of recovered samples, and therefore no need to dispose 0ff-site drilling fluids;
- Rapid penetration in consolidated material; and
- Provision of reliable indications of saturated conditions whilst drilling.

Drill cuttings accumulated over a hole are removed as drilling progresses so as to prevent fallback of cuttings into the hole. Samples are taken at a range of depths in the borehole profile.

Construction of the monitoring well may be carried out by the Aargus environmental scientist/engineer or the drilling contractor under the direct supervision of the Aargus environmental scientist/engineer. Typically on completion of drilling, slotted heavy duty PVC pipe (generally 50mm in diameter for the installation of monitoring well) is inserted into the drilled hole. The base of the pipe is capped prior to insertion in order to prevent natural soils entering the well from below. The drilled area surrounding the pipe

screen is filled with coarse-grained sand. Bentonite or cement grout seal plugs may be placed above the screen depending on the hydrogeological setting of the site and sand cement mix. Excess drill cuttings are disposed of in accordance with environmental best practice.

The Aargus environmental scientist/engineer will monitor and record drilling activities, and materials encountered during drilling (including visible staining, unusual odours and colours (if any)). They will log the procedures adopted, materials used, and well construction (i.e. location of the screen, placement of sand packs and well seals and general completion details).

3.3 Development of monitoring wells

Development is the process of removing fine sand silt and clay from the aquifer around the well screen in order to maximise the hydraulic connection between the bore and the formation.

Development involves removal of fluids that may have been introduced during drilling operations as well as fines from the sand filter and screens. Well development generally involves actively agitating the water column in the well then pumping water out until, ideally, water pumped comes out visibly clean and of constant quality. Development can be undertaken immediately after installation of the groundwater well or after sufficient time has been allowed for bentonite / grout seals to consolidate.

Bores used for groundwater quality monitoring should be developed after drilling, then left for a period until bore chemistry can be demonstrated to have stabilised, any where between 24 hours and 7 days.

3.4 Purging of monitoring well

In most groundwater monitoring wells, there is a column of stagnant water above the screen that remains standing in the bore between sampling rounds. Stagnant water is generally not representative of formation water because it is in contact with bore construction materials for extended periods, is in direct contact with the atmosphere and is subject to different chemical equilibria.

Purging is the process of removing this water from the well prior to sampling. In newly installed wells, the disturbance cause by drilling may also affect water present in the well, and purging may be carried out concurrently with well development. Ideally wells should be purged at the lowest rate practicable until stable water chemistry is achieved.

Purging is to be performed less than 24 hours before sample collection, but usually it is performed just before sampling. The default procedure for purging a groundwater monitoring well is as follows:

- If required, measure the concentration of volatile organic vapours in the well standpipe headspace.
- Measure the depth to the standing water level in the well standpipe and the total depth of the well relative to a reference mark (generally the top of the groundwater pipe). The depth of any light non-aqueous phase liquids (LNAPL) floating on the standing water should be recorded if present using an interface probe or other suitable device.
- Calculate the volume of the groundwater in the well standpipe. The internal diameter of the well casing and the diameter of the drill hole are used to calculate the volume of water to be removed during development (nominally a minimum of three well volumes, including water present in the sand pack, should be abstracted during purging).
- Samples of water are collected generally following development/purging of each well volume. The samples are measured immediately in the field for water quality parameters, pH, electrical conductivity, redox potential and temperature. Water quality measurement probes are to be calibrated against stock standards on regular basis and decontaminated between wells.
- Pump/bail groundwater from the well until the water quality parameters have stabilised (i.e. within 10% of the previous reading) or the well is pumped/bailed dry. Collect all purged water into an appropriate volume measurement vessel. Purged water is disposed of appropriately.
- Record all appropriate development details on the well development and sampling sheet.
- Decontaminate all equipment used in the purging procedure.

3.5 Groundwater sampling

For each sampling event, starting water levels, purging times and volumes, water quality parameters and sample details are recorded on well development and sampling sheets.

At each groundwater monitoring well, a polyethylene sheet or Eski lid is placed beside the well head and firmly fixed into position. Sampling equipment is placed onto the sheet to avoid cross contamination between the ground surface and the groundwater in the well.

Groundwater samples are collected in a bailer (Stainless Steel or disposable polymer) fitted with a stainless steel emptying device. The bailer is decontaminated prior to use. All groundwater samples are retrieved at an appropriate rate in order for turbulence (which leads to cloudy samples) to be minimised.

When collecting a water sample the bailer is lowered gently into the well, until it is within the screened interval. The bailer is then steadily withdrawn, to minimise agitation of water in the well and disturbance of the surrounding sand filter material.

The procedure for using the bailer is:

- Slowly lower the bailer into the water and allow it to sink and fill with a minimum of disturbance;
- Empty the first bailer sample into a container in order to measure the volume of bailed water and to rinse the bailer with well water;
- Emptying the bailer through the bottom-emptying device (BED) collects the samples. The sample is discharged down the side of the sample bottle to minimise entry turbulence;
- Collect samples for volatile organics first, followed by semi-volatiles, other organics and then inorganics;
- The flow from the BED is adjusted so that a relatively low flow rate is maintained.

3.6 Low flow purging

Purging large volumes of water can be impractical, hazardous or may adversely affect the contaminant distribution in the sub-surface (e.g. through dilution). Low-flow purging involves minimal disturbance of the water column and aquifer ad is preferable to the removal of a number of bore volumes. This method removes only small volumes of water, typically at rates of 0.1 to 1.0L/min, at a discrete depth within the bore.

Low-flow purging consists essentially of the following steps:

- The pump inlet is carefully and slowly placed in the middle or slightly above the middle of the screened interval at the point where the contaminant concentration is required (dedicated pumps are ideal for low-flow sampling). Placement of the pump inlet too close to the bottom of the bore can cause increased entrainment of solids, which have collected in the bore over time.
- Purging begins, typically at a rate of 0.1 to 1.0L/min, although higher rates may be possible provident the rate of purging does not cause significant draw down in the bore.

- During purging, groundwater stabilisation parameters should be measured and recorded to determine when they stabilise.
- When parameters have stabilised, the sample may be collected, at a rate slower or equal to purge rate.

3.7 Field measurements

Field measurement of groundwater parameters provides a rapid means of assessing certain aspects of water quality. They are generally taken to:

- Ensure that formation water is being sampled
- Provide on-site measurements for water quality parameters that are sensitive to sampling and may change rapidly (e.g. temperature, pH, redox and dissolved oxygen (DO)).
- Compare with laboratory measurements of these parameters to assist in the interpretation of analytical results of other parameters (e.g. check for chemical changes due to holding time, preservation and transport).

Field measurements may be taken either in-situ or after groundwater has been extracted from a bore. Field measurements should be taken immediately before collecting each sample.

pH and dissolved oxygen meters need to be calibrated before every use, in accordance with the manufacturer's instructions. If field meters are to be used over several hours, periodic readings of a reference solution must be made to ensure calibration is stable.

3.8 Labelling of water samples

The water samples are identified with the same information than soil samples. GW4/2 is the sample collected from well GW4, and 2 refers to the sample number from this well, i.e. second time the well is sampled.

3.9 Sampling containers

Water samples are generally collected in bottles and containers provided by the laboratory who will analyse the samples. These are generally plastic bottles for inorganic analysis, and amber glass bottles for organic analysis. Vials are used to collect samples to be analysed for volatile organics. Sampling containers have appropriate preservatives added.

The bottles are filled to overflowing so as to remove air bubbles as much as possible prior to firmly screwing on the container cap. When performing purge and trap

analyses, the vials are filled to 100% of their capacity. For headspace analyses, the vials are filled to approximately 75% of their capacity.

3.10 Well surveying

If the survey for location and elevation of a groundwater well is required, it should be done by a licensed surveyor, or alternatively by an Aargus environmental engineer / scientist if the level of precision required can be obtained by the use of Aargus field equipment.

If the location is given by a licensed surveyor, it is generally given to the nearest 0.1m and referenced to the Australian Map Grid (AMG) coordinates.

If the elevation is given by a licensed surveyor, the top of the standpipe and the ground surface adjacent to the standpipe are generally given to the nearest 0.01m and may be referenced to the Australian Height Datum (AHD). Relative levels (RLs) can be used if general contours are required.

4.0 SURFACE WATERS AND STORMWATER SAMPLING

4.1 Surface waters

Surface water samples are collected by hand, using automatic samplers, batch samplers or continuous samplers which can be installed to take samples at discrete time intervals or continuously. For well mixed surface water samples (up to 1m depth) a sample bottle is immersed by hand covered by a glove below the surface. Samples are also taken with sample poles that have extension arms so that more representative samples can be taken. For areas where access is difficult, samples can be collected using a retractable sample extension pole (sample bottle on the end) or in a bucket and transferred to sample bottles immediately following collection. Other methods such as pumping systems, depth samplers, automatic samplers, and integrating systems are all relatively similar with water samples being supplied to a discharge point where samples can be collected in appropriate bottles.

4.2 Stormwater

The monitoring of stormwater quality is generally required prior to reject waters into stormwater drains. Field measurements are generally carried out using a Hanna Multiprobe prior to the discharge of the water to stormwater. The water parameters measured include pH, electrical conductivity (EC, in mS/cm) and Total Dissolved Solids (TDS).

If sampling is required, samples to be analysed for inorganic compounds are collected in plastic bottles, and samples to be analysed for organic compounds are collected in amber glass bottles. The bottles are filled to overflowing so as to remove air bubbles as much as possible prior to firmly screwing on the container cap. Sample containers may have preservatives added, in accordance with the laboratory recommendations.

Vials are used for volatile organic analysis. When performing purge and trap analysis, the vials should be filled to 100% of their capacity, whereas for headspace measurements, the vials should be filled to approximately 75% of their capacity..

4.3 Filtration devices

Water filtration devices may be required to filter surface water before it is discharged to the stormwater network, in order to remove suspended solids in water. One of the most simple and commonly used filtration device consists of between two to four retention sedimentation bays with a geotextile covering the inlet and outlet hoses.

Litter traps (wire or plastic grids or netting) may also be used to remove larger particles or debris. Other techniques to reduce the amount of suspended matter in water include wet basins, artificial wetlands, infiltration trenches and basins, sand filters and porous pavements. Some of these latter methods are also likely to reduce the bacterial levels in water.

The use of these filtration devices does not preclude carrying out monitoring of water quality following treatment and prior to discharge, particularly to the stormwater system.

5.0 PHOTO IONISATION DETECTOR (PID)

Photo Ionisation Detector (PID) measurements are used to provide indicative field measurements of the amount of ionisable vapours released from a soil or water sample into the head space above the sample.

The procedure for field screening of samples using the PID is as follows:

- Prior to testing commencing, the PID is calibrated using standard laboratory calibration gas. The battery of the PID should also be sufficiently charged for the duration of the testing;
- The background concentrations of total ionisable compounds in the ambient air in the vicinity of the work area are established prior to the commencement of site activities. Background measurements are normally taken approximately 5 to 10m upwind of the work area. The readings are observed before and after

each measurement of a sample to ensure that the PID is operating correctly. The maximums, fluctuations and other relevant comments are recorded.

- A glass sample jar is filled with the soil sample to be tested. The jar should not be filled more than 3/4 full;
- The jar is sealed with aluminium foil or plastic wrap and the lid is screwed;
- At least 20 minutes after placing the sample into the sampling jar, check that the PID reading is constant and similar to the background. Insert the top of the PID through the foil or plastic wrap in order to measure the ionisable vapour concentrations in the airspace above the sample;
- Monitor and record the PID readings noting fluctuations and maximum readings;
- Monitor the readings after returning the PID to a location with background concentrations. Interchangeable, clean, in-line filters for the PID probe are available to allow rapid decontamination of the unit in the field if background readings measured by the instrument are significantly greater than the background air concentration initially established;
- If perforations are present in the aluminium foil prior to analysis reseal the jar and test after having waited again for at least 20minutes.

An alternative acceptable method is to place the soil to be tested in a disposable zip loc plastic bag and test the sample by punching a hole in the bag with the PID tube to sample the gas from the bag.

6.0 ACID SULFATE SOILS

6.1 Desktop Classification

An initial review of Acid Sulphate Soils (ASS) Planning Maps is undertaken to identify the likelihood and risk of ASS being present at the site. The following geomorphic conditions of the site are also checked as an indication of the presence of ASS: sediments of recent geological age (Holocene) ~ 6000 to 10 000 years old; soil horizons less than 5m AHD (Australian Height Datum); marine or estuarine sediments and tidal lakes; coastal wetlands or back swamp areas; waterlogged or scalded areas; inter-dune swales or coastal sand dunes; areas where the dominant vegetation is mangroves, reeds, rushes and other swamp tolerant and marine vegetation; areas identified in geological descriptions or in maps bearing sulfide minerals, coal deposits or former marine shales/sediments; and deeper older estuarine sediments >10m below the ground surface.

6.2 Site Walkover

The presence on site of hydrogen sulphide odours, acid scalds, flocculated iron, monosulfidic sludges, salt crusts, stressed vegetation, corrosion of concrete and/or steel structures and water logged soils are noted as cues for the presence of ASS.

6.3 Visual Classification

Visual indicators taken into account for the presence of ASS are the presence of jarosite (pale yellow colour) horizons or mottling, unripe muds (waterlogged, soft, blue grey or dark greenish grey in colour), silty sands and sands (mid to dark grey in colour) and the presence of shells.

6.4 Sample Collection

Samples are collected to at least one metre below the depth of the proposed excavation or estimated drop in the water table, or two metres below ground level, whichever is deepest. Samples are collected from every soil horizon or every 0.25m. Large shells, stones and fragments of wood, charcoal and other matter are noted, but removed from the sample. Small roots are not removed from the sample. If laboratory analysis is required, samples are sent for laboratory testing within 24 hours of sampling.

6.5 Field Testing

The field pH peroxide test (pH_{FOX}) is used to obtain an indication of the presence of oxidisable sulphur in the soil. The procedure for this test is as follows:

- A small sample of soil (<100g) is collected in a glass jar and split into two sub-samples. One sub-sample is made into a 1:5 (soil : deionised water) solution in order to measure field soil pH and electrical conductivity (EC) analysis. If the resulting pH is less than 4 (pH_F<4), the sample is identified as actual acid sulphate soil (AASS)

- The second sub-sample is made into a 1:5 (soil : Hydrogen Peroxide) solution to measure pH of oxidised soil. Sodium Hydroxide (NaOH)-adjusted analytical (30%) grade Hydrogen Peroxide (H_2O_2) is used as the soil oxidising agent. A mobile electronic pH/EC probe is used to measure soil pH.

- The presence of oxidisable sulphides, organic matter or manganese in the sample, will trigger a chemical reaction. The type of effervescence and any colour change is noted with the final pH measured to give an indication of the potential change in pH should the soil remain exposed to oxygen. If the resulting pH is less than 3 (pH_{FOX}<3) or if pH_{FOX} is at least one unit less than the pH_F, this suggests that the soil tested is potential acid sulfate soil (PASS).

6.6 Laboratory Testing

When the field test suggests that the material tested contains ASS or PASS, this should be confirmed by laboratory analysis (POCAS/SPOCAS or TOS testing).

7.0 NOISE MONITORING

Measurements are taken at a range of times during the day in order to assess the trends in noise emission over time. Noise is measured using a hand-held Rion NA-29 Sound Level Meter with digital microphone. Some noise meters change and appropriate equioment which is calibrated is used for all monitoring. The reference level of the meter is checked before and after the measurements using a Rion NC-73 Sound Level Calibrator to ensure there is no significant drift. Noise measurements are made over a 15-minute interval using the "fast" response of the sound level meter. 5dB would be added if the noise is substantially tonal or impulsive in character. Measurements should be adapted to the type of noise being measured i.e. construction, occupation, club, etc.

8.0 DUST MONITORING

Sampling is conducted at locations of potential concern. The deposit gauge static sampler contains a glass funnel measuring approximately 150mm with the angle of the cones sides being 60 degrees, placed into a rubber stoppers in the mouth of a five-litre glass receptacle. The deposit gauge is placed in a stand so that the height of the funnel of the deposit gauge is between 1.8 and 2.2m above ground level. A quantity of 7.8g copper sulfate pentahydrate dissolved in water is placed in the glass receptacle in order to prevent algal growth.

Exposure periods vary depending on the purpose of the investigation but typically the period is 30 ±2 days. Samples are usually analysed for measured soils: total solids, insoluble solids, ash and combustible solids.

Dust can also be measured using a High Volume Air Sampler. Such sampler should be located at least 2 metre away from any structures so that an undisturbed sample can be collected. HVASs can be used indoors or outdoors.

9.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

9.1 Introduction

Inaccuracies in sampling and analytical programs can result from many causes, including collection of unrepresentative samples, unanticipated interferences between elements during laboratory analyses, equipment malfunctions and operator error. Inappropriate sampling, preservation, handling, storage and analytical techniques can also reduce the precision and accuracy of results.

The Australian Standard AS4482.1-2005 *Guide to the Sampling and Investigation of Potentially Contaminated Soil, Part 1: Non-Volatile and Semi-Volatile Compounds* has documented procedures for quality assurance (QA) and quality control (QC) for sampling and analysis to ensure that the required degree of accuracy and precision is obtained. The Australian Standard also recommends the use of two laboratories for the implementation of a QA program for the analyses in addition to the QC procedures followed by the primary laboratory.

9.2 Field QAQC samples

General

Procedures for duplicate sampling should be identical to those used for routine sampling and duplicate samples will be despatched for analysis for the same parameters using the same methods as the routine samples. No homogenisation of samples which may induce the loss of volatile compounds (such as BTEX) should occur. Whenever possible, the selection of samples for duplicate analyses should be biased towards samples believed to contain the contaminant of concern.

Intra-laboratory duplicates

Intra-laboratory duplicate samples, also referred to as Blind duplicates, are used to assess the variation in analyte concentration between samples collected from the same sampling point and / or also the repeatability of the laboratory analyses. Samples are split in the field to form a primary sample and a QC duplicate (intra-laboratory replicate) sample. The intra-laboratory duplicates are taken from a larger than normal quantity of soil collected from the same sampling point, removed from the ground in a single action, and divided into two vessels. These samples are submitted to the laboratory as two individual samples without any indication to the laboratory that they have been duplicated.

Intra-laboratory duplicate samples should be collected at a rate of approximately 1 in 20 soil samples and analysed for the full suite of analytes. At least one intra-laboratory duplicate sample should be included in each batch of samples.

Inter-laboratory duplicates

Inter-laboratory duplicate samples, also referred to as Split duplicates, provide a check on the analytical proficiency of the laboratories. The samples are taken from a larger than normal quantity of soil collected from the same sampling point, removed from the ground in a single action, and divided into two vessels. One sample from each set is submitted to a different laboratory for analysis. The same analytes should be determined by both laboratories using the same analytical methods.

Inter-laboratory duplicates should be collected at a rate of approximately 1 in 20 soil samples and analysed for the full suite of analytes. At least one inter-laboratory duplicate sample should be included in each batch of samples.

Blanks

Rinsate Blanks

Rinsate blank samples provide information on the potential for cross-contamination of substances from the sampling equipment used. Rinsate blanks are collected where cross-contamination of samples is likely to impact on the validity of the sampling and assessment process (e.g. when the investigation level of a contaminant is close to the detection limit for this contaminant). They are prepared in the field using empty bottles and the distilled water used during the final rinse of sampling equipment. After completion of the decontamination process, fresh distilled water is poured over the sampling equipment and collected. The distilled water is exposed to the air for approximately the same time the sample would be exposed. The collected water is then transferred to an appropriate sample bottle and the proper preservative added, if required.

One rinsate blank par day and / or one per piece of sampling equipment are collected during the decontamination process, and analysed for the analytes of interest. At least one rinsate blank should be included in each batch of samples. One rinsate blank should be collected for every 50 samples collected and analysed for the full suite of analytes.

Trip Blanks / Spikes

Trip blanks / spikes are a check on the sample contamination originating or lost from sample transport, handling, and shipping. These are samples of soil or water prepared by the laboratory with a zero or known concentration of analytes.

Field Blanks

Field blanks are a check on sample contamination originating from sample transport, handling, shipping, site conditions or sample containers. These are similar to trip blanks except the water is transferred to sample containers on site.

9.3 Laboratory quality assurance / quality control

The laboratories undertake the analyses utilising their own internal procedures and their test methods (for which they are NATA, or equivalent, accredited) and in accordance with their own quality assurance system which forms part of their accreditation.

Laboratory duplicate samples

Laboratory duplicate samples measure precision. These samples are taken from one sample submitted for analytical testing in a batch. The rate of duplicate analysis will be according to the requirements of the laboratory's accreditation but should be at least one per batch. Precision is reported as standard deviation SD or Relative Percent Difference %RPD, being:

$$\%RPD = \frac{(D1 - D2)}{(D1 + D2)} \times 200$$

where: D1: sample concentration and D2: duplicate sample concentration

Replicate data for precision is expected to be less than 30% RPD at concentration levels greater than ten times the EQL, or less than 50% RPD at concentration levels less than ten times the EQL. Sample results with a RPD exceeding 100% require specific discussion. Note that certain methods may allow for threshold limits outside of these limits.

Matrix Spiked Samples

Matrix spiked samples are used to monitor the performance of the analytical methods used, and to assess whether the sample matrix has an effect of on the extraction and analytical techniques. A sample is spiked by adding an aliquot of known concentration of the target analyte(s) to the sample matrix prior to sample extraction and analysis. These samples should be analysed at a rate of approximately 5% of all analyses, or at least one per batch. Matrix spikes are reported as a percent recovery %R, being:

$$\%R = \frac{(SSR-SR)}{SA} \times 100$$

where: SSR: spiked sample result, SR: sample result (blank) and SA: spike added

Recovery data for accuracy is described by control limits specified by the laboratory (generally ranging between 70% and 130%) and referenced to US EPA SW-846 method guidelines values.

Laboratory Blank

Laboratory blanks are used to correct for possible contamination resulting from the preparation or processing of the samples. These are usually an organic or aqueous solution that is as free as possible of analyte and contains all the reagents in the same volume as used in the processing of the samples. Laboratory blanks must be carried through the complete sample preparation procedure and contain the same reagent concentrations in the final solution as in the sample solution used for analysis. Laboratory blanks should be analysed at a rate of once per process batch, and typically at a rate of 5% of all analyses.

Laboratory Control Samples

Laboratory Control Samples, also referred to as Quality Control Check Samples, are used to assess the repeatability and long term accuracy of the laboratory analysis. These are externally prepared and supplied reference material containing representative analytes under investigation. Recovery check portions should be fortified at concentrations that are easily quantified but within the range of concentrations expected for real samples. Laboratory Control samples should be analysed at a rate of one per process batch, and typically at a rate of 5% of analyses. Laboratory control samples are reported as a percent recovery %R, being:

$$\%R = \frac{(SSR-SR)}{SA} \times 100$$

where: SSR: spiked sample result, SR: sample result (blank) and SA: spike added

Recovery data for accuracy is described by control limits specified by the laboratory and referenced to US EPA SW-846 method guidelines values. Ideally, all calculated recovery values should be within the acceptable limits. However, in the event that control limit outliers are reported, professional judgement is used to assess the extent to which such results may affect the overall usability of data.

Surrogates

Surrogates are used to provide a means of checking, for every analysis, that no gross errors have occurred at any stage of the procedure leading to significant analyte losses. Surrogate are quality control monitoring spikes, which are added to all fields and QAQC samples at the beginning of the sample extraction process in the laboratory. Surrogates are closely related to the sample analytes being measured (particularly with regard to

extraction, recovery through cleanup procedures and response to chromatography) and are not normally found in the natural environment.

Surrogate spikes will not interfere with quantification of any analytes of interest and may be separately and independently quantified by virtue of, for example, chromatographic separation or production of different mass ions in a GC/MS system. Surrogates are measured as Percent Recovery %R expressed as:

$$\%R = \frac{(SSR)}{SA} \times 100$$

where: SSR: spiked sample result and SA: spike added

Recovery data for accuracy is described by control limits specified by the laboratory and referenced to US EPA SW-846 method guidelines values.

10.0 DATA QUALITY OBJECTIVES

10.1 General

Data Quality Objectives (DQOs) are defined to ensure that the data is sufficiently accurate and precise to be used for the purpose of the environmental works. DQOs are defined for a number of areas including:

- sampling methods;
- decontamination procedures;
- sample storage (including nature of the containers) and preservation;
- laboratory analysis, including PQL, recoveries (surrogates, spikes), duplicates;
- preparation of CoC forms;
- document and data completeness; and
- data comparability.

The NSW DEC Contaminated Sites Guidelines for the NSW Site Auditor Scheme (2nd Ed) 2006 also provide a seven step process for Data Quality Objectives (DQOs). These are as follows:

- State the problem

- Identify the decisions
- Identify inputs to the decision
- Define the study boundaries
- Develop a decision rule
- Specify limits on decision errors
- Optimise the design for obtaining data

DQOs must be adopted for all assessments and remediation programmes. The DQO process must be commenced before any investigative works begin on a project.

10.2 Field DQOs

The DQOs for sampling methods, decontamination procedures, sample storage (including nature of the containers) and preservation, preparation of CoC forms, and document and data completeness are the Aargus protocols which have been described in the previous sections of this document.

10.3 Assessment of RPD values for field duplicate samples

The criteria used to assess RPD values for field duplicate samples is based on discussion reported in AS4482.1 1997, a summary of which is presented below:

Table 1: RPD acceptance criteria

Sample type	Typical acceptable RPD
Intra-laboratory duplicate (blind duplicate)	30-50°% (*)
Inter-laboratory duplicate (split duplicate)	30-50% (*)

It is noted that other factors such as sampling technique, sample variability, absolute concentration relative to criteria and laboratory performance should also be considered when evaluating RPD values.

The Australian Standard also states that the variation can be expected to be higher for organic analytes than for inorganics, and for low concentrations of analytes (lower than five times the detection limit). Based on Aargus Pty Ltd experience, RPD up to 70% are considered to be acceptable for organic species. RPD of 100% or more are generally considered to demonstrate poor correlation and should be discussed.

10.4 Laboratory Data Quality Objectives (DQO)

General

Labmark is the Aargus-preferred laboratory for the analysis of primary samples. Labmark is accredited by the National Association of Testing Authorities (NATA).

The laboratory generally used by Aargus for analysing inter-duplicate samples is SGS.

Analytical methods including detection limits are provided on each laboratory report and are checked as part of the data review process.

Laboratory QA/QC

Specific to Labmark, standard QA/QC data includes LCS, MB, CRM (CRM metals only), Laboratory Duplicate (1 in first 5-10 samples, then every tenth sample) and Spike sample (1 in first 5-20 samples, then every 20th sample), and surrogate recovery's (target organics). All QA/QC is reviewed by a senior chemist prior to customer release and includes a DQO comment on final report. Additional QA/QC maybe performed on batches less than 10 samples; however additional charges shall apply at the appropriate analytical rate/sample.

Laboratory analyses DQOs

The following table summarises Labmark laboratory analyses DQOs.

Table 2: Labmark Data Quality Objectives (DQOs)

Laboratory QA/QC Testing	Laboratory QA/QC Acceptance Criteria
Method Blanks	For all inorganic analytes the Method Blanks must be less than the LOR. For organics Method Blanks must contain levels less than or equal to LOR.
Surrogate Spikes	At least two of three routine level soil sample Surrogate Spike recoveries are to be within 70-130% where control charts have not been developed and within the estimated control limited for charted surrogates. Matrix effects may void this as an acceptance criteria. Any recoveries outside these limits will have comment. Water sample Surrogates Spike recoveries are to within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criteria. Any recoveries outside these limits will have comment.
Matrix Spikes	Sample Matrix Spike duplicate recovery RPD to be <30%. In the event that the matrix spike has been applied to samples whose matrix or contamination is problematic to the method then these acceptance criteria apply to the Control Matrix Spike.

Laboratory QA/QC Testing	Laboratory QA/QC Acceptance Criteria
Laboratory Control Samples	Control standards must be 80-120% of the accepted value. Control standard recoveries are to be within established control limits or as a default 60-140% unless compound specific limits apply.
Laboratory Duplicate Samples	For Inorganics laboratory duplicates RPD to be <15%. For Organics Laboratory duplicates must have a RPD <30%.
Calibration of Chromatography Equipment	The calibration check standards must be within +/-15%. The calibration check blanks must be less than the LOR.

Non-compliances

Exceedances of QAQC results outside the DQO should be thoroughly investigated and discussed with the laboratories concerned, and the outcomes of these investigations should be recorded in the project files.

11.0 USE AND CALCULATION OF THE 95% UCL FOR SITE VALIDATION PURPOSE

Validation of a site at the completion of remediation works should comply with the recommendations of the applicable guidelines. For a site to be considered uncontaminated or successfully remediated, the typical minimum requirement is that the 95% upper confidence limit (UCL) of the arithmetic average concentration of the contaminant(s) is less than an acceptable limit, eg the threshold value of an health-based investigation level.

The calculation of the 95% UCL of the arithmetic average concentration method requires that the probable average concentration and standard deviation of the contaminant be known. This method is most applicable for validation sampling, where the mean concentration and the standard deviation can be estimated from sampling results. The 95% UCL is calculated as follows:

$$95\%\ UCL = mean + t_{\alpha,n-1} \frac{STDEV}{\sqrt{n}}$$

where

mean arithmetic average of all sample measurements

$t_{\alpha,n-1}$ A test statistic (Student's t at an α level of significance and n-1 degrees of freedom)

$\propto$	The probability (in that case chosen to be 0.05) that the 'true' average concentration of the sampling area might exceed the UCL average determined by the above equation
STDEV	Standard deviation of the sample measurements
n	number of samples measurements

12.0 COPYRIGHT

13.0 ABBREVIATIONS

ANZECC	Australian and New Zealand Environment and Conservation Council
ASS	Acid Sulfate Soil
BGL	Below Ground Level
BTEX	Benzene, Toluene, Ethyl benzene and Xylene
CoC	Chain of Custody
DEC	Department of Conservation (formerly EPA)
DIPNR	Department of Infrastructure Planning and Natural Resources
DQO	Data Quality Objective
EIL	Ecological Investigation Level
EPA	Environment Protection Authority
ESA	Environmental Site Assessment
HIL	Health-Based Soil Investigation Level
LGA	Local Government Area
NEHF	National Environmental Health Forum
NEPC	National Environmental Protection Council
NEPM	National Environmental Protection Measure
NHMRC	National Health and Medical Research Council
NSL	No Set Limit
OCP/OPP	Organochlorine Pesticides /Organophosphate Pesticides
PAH	Polycyclic Aromatic Hydrocarbon
PASS	Potential Acid Sulfate Soil
PCB	Polychlorinated Biphenyl
PID	Photo Ionisation Detector
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance, Quality Control
RAC	Remediation Acceptance Criteria
RAP	Remediation Action Plan
RPD	Relative Percentage Difference
SAC	Site Assessment Criteria
SVC	Site Validation Criteria
SWL	Standing Water Level
TCLP	Toxicity Characteristics Leaching Procedure
TESA	Targeted Environmental Site Assessment
TPH	Total Petroleum Hydrocarbons
UCL	Upper Confidence Limit
VHC	Volatile Halogenated Compounds
VOC	Volatile Organic Compounds

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14.0 REFERENCES

- ANZECC (1992) – *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites.*
- ANZECC (1996) – *Drinking Water Guidelines.*
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- National Environment Protection Council (NEPC) (1999) – *National Environmental Protection (Assessment of Site Contamination) Measure.*
- Netherlands Ministry of Spatial Planning, Housing and the Environment (1994 rev. 2000) – *Environmental Quality Objectives in the Netherlands.*
- New South Wales Environment Protection Authority (1994) – *Guidelines for Assessing Service Station Sites.*
- New South Wales Environment Protection Authority (1995) – *Sampling Design Guidelines.*
- New South Wales Environment Protection Authority (1997) – *Guidelines for Consultants Reporting on Contaminated Sites.*
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- QLD EPA – Waste Management Branch, Contaminated Land Section – *Details about investigation thresholds and sampling – sent to Aargus on 14 Nov 2000.*
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- Standards Australia AS4482.1-1997 (1997) – *Guide to the Sampling and Investigation of Potentially Contaminated Soil, Part 1: Non-Volatile and Semi-Volatile Compounds.*
- Standards Australia AS5667.11-1998 (1998) – *Water Quality Sampling: Guidance on the Sampling of Groundwaters.*
- Victorian EPA (2000) – *Groundwater Sampling Guidelines*

Fieldwork Protocols

Aargus
AUSTRALIA

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TABLE OF CONTENTS

LIST OF TABLES

1.0 OBJECTIVE AND SCOPE

The objective of Aargus Pty Ltd (Aargus) Protocols is to ensure that the methodology followed during environmental works is adequate to provide data which is usable and representative of the conditions actually encountered at the site.

The scope of these protocols is to:

- Outline the methods and procedures for the field investigations during an environmental assessment or remediation and validation program; and
- Specify methods and procedures which ensure that soil and groundwater samples recovered are representative of the actual subsurface conditions at the site, as well as ensuring that the risk of introducing external contamination to samples and to the environment is minimised.

These protocols must be adhered to by Aargus personnel and by sub-contractors involved in field investigations. Any deviations from these protocols should be explained within the Environmental Report to which they are attached.

2.0 SOIL SAMPLING

2.1 Collection methods

Possible collection methods

Soil samples are generally collected by drilling or excavating the subsurface, using one of the following drilling / excavating technique:

- Rotary air hammer
- Hand auger
- Solid or hollow auger
- Backhoe or Excavator

Rotary Air Hammer

The air hammer technique requires the use of synthetic blend lubricants to prevent potential contamination of the borehole if a leak were to occur. In addition, micro-filters are installed into the drilling airline to avoid contamination by hydrocarbons present in the compressed air.

Samples of rock are generally not collected. Where rock samples are needed, specialised techniques are used.

Hand auger

A hand auger is generally used to investigate subsurface conditions of unconsolidated materials at shallow depths or in areas difficult to access with other equipment. Samples are recovered from the hand auger, taking care to avoid cross contamination, especially between samples from the same hole but at different depths. Sampling equipment is to be thoroughly cleaned between sampling events, in accordance with the procedures outlined in Section 2.5 Equipment decontamination.

Solid or Hollow auger

Solid and hollow auger drilling techniques are well suited to unconsolidated materials. The main advantage of the hollow auger technique is that the drill rods allow access of sampling equipment at specified depths within the annulus of the drill rods.

Samples of soil are recovered using a split spoon sampler at specific depth intervals. The split spoon sampler is driven into the soil by the drill rig whilst attached to the end of the drill rods. The retrieved sample is then split lengthways into two halves when duplicate samples are required. A few centimetres of soil from the top of the split spoon sampler is discarded. Samples for volatile analysis are collected first, without mixing.

Test pits and trenches excavated with a backhoe or an excavator

Test Pit and Trenches excavated with a backhoe/excavator are used to collect relatively shallow (i.e. less than 3.5m depth) soil samples on occasions where:

- Access multiple sample locations at a site are needed;
- A description of the subsurface soil profile to approximately 3.5 m depth is required (generally in unsaturated conditions);
- The investigated site is free from known underground services and access problems;
- The investigated site is free from impenetrable surface or near surface layers including concrete and asphalt pavements; and
- Undisturbed soil samples are required, usually at multiple depths.

Backfilling

On completion of drilling / test pitting, the investigated locations are backfilled with cuttings and compacted. Excess drill cuttings are disposed of appropriately. If the sampling location is located in an area used for the circulation of people or vehicles, the top of the sampling location should be sealed with mortar.

2.2 Soil logging

The lithological logging of soil samples and subsurface conditions is undertaken by environmental scientists / engineers. The soil characteristics are logged in accordance with the Australian Standard *AS1726-1993 Geotechnical Site Investigations.* This includes description of grain size, visible staining, odour and colour, and of the clues which may suggest that the soil may be contaminated. Descriptions of soils are made using the Northcote method.

2.3 Collecting soil samples

The soil sample is collected using a stainless steel trowel, or directly with the hand if the sampler wears disposable gloves. Soils are quickly transferred into 250g clean amber glass jars, which have been acid washed and solvent rinsed. The jars are sealed with a screw-on teflon lined plastic lid, labelled, and placed for storage in an ice filled chest.

2.4 Labelling of soil samples

Samples are labelled with the following information:

- Job number;
- Date of sample collection;
- Name of the environmental scientist / engineer who collected the sample; and
- Sample number: the letters used to label the samples are BH, C, SS, SP, TP and V which refer respectively to borehole samples, composite samples, surface samples, stockpile samples, test pit samples and validation samples. For borehole samples, BH3 1.0m is the sample taken from borehole 3 at 1.0m below ground level. For stockpile samples, SP1/1 is the first sample from stockpile 1. TP1 2.0m is the sample taken from testpit 1 at a depth of 2.0 metres below ground level. V3/F is the validation sample taken from location V3, the letters F N, S, E and W refer to the floor, north, south, east and west walls of an excavation; if some contamination is found in the validation sample, then chasing out of the contamination is required and in this case, the label of the sample is

changed by adding /1 or /2 according to the number of times the contamination has been chased out. B stands for blind.

2.5 Equipment decontamination

The drilling and sampling equipment are cleaned using an appropriate surfactant (e.g. phosphate-free detergent or Decon 90), then rinsed with tap water prior to final rinsing with distilled water.

The following procedures shall be followed for decontamination of drilling and sampling equipment:

- buckets or tubs used for decontamination shall be cleaned with tap water and detergent and rinsed with tap water before sampling commences;
- fill first bucket or tub with tap water, and phosphate free detergent;
- fill second bucket or tub with tap water;
- clean equipment thoroughly in detergent water, using a stiff brush; rinse equipment in tap water;
- dry equipment with disposable towels;
- rinse equipment by thoroughly spraying with tap water, then final rinse with distilled water;
- allow equipment to dry; and
- change water and detergent solution between sampling event.

Sampling decontaminated equipment should be kept in a clean area to prevent cross-contamination. Equipment that cannot be thoroughly decontaminated using the detergent wash and water rinse should be cleaned with steam or high pressure water or if a cleaner is not available, not used for further sampling (and labelled clearly "not decontaminated") or discarded. Equipment decontaminated using the high pressure steam cleaner will be treated as described above. Any equipment that cannot be thoroughly decontaminated shall be discarded and replaced.

A new pair of latex gloves is used to handle each sample. Contaminated materials such as disposable clothing should be disposed of in accordance with environmental best practice.

2.6 Surveying of sampling locations

Sampling locations are generally located by reference to existing ground features, e.g. fences, buildings.

If the survey for location and elevation is required, it should be done by a licensed surveyor, or alternatively by an Aargus environmental engineer / scientist if the level of precision required can be obtained by the use of Aargus field equipment. Aargus has GPS equipment and level meters.

If the location is given by a licensed surveyor, it is generally given to the nearest 0.1m and referenced to the Australian Map Grid (AMG) coordinates.

3.0 GROUNDWATER SAMPLING

3.1 Groundwater Sampling Objectives

The primary objective of any groundwater (quality) sampling is to produce groundwater samples that are representative of groundwater in the aquifer and will remain representative until analytical determination or measurements are made.

3.2 Groundwater well construction

Typically wells are installed to gain access to the groundwater to be sampled. Well construction details will depend on hydrogeological setting of the site, for example the depth to groundwater strata present. Relevant information regarding of the hydrogeological setting will have been obtained prior the development of any groundwater sampling program.

The preferred drilling methods will depend on the hydrogeological setting of the site and the objectives of the groundwater sampling program. For example, shallow wells in unconsolidated materials, such as sand, may be drilled using a hand auger. Drill rigs using solid of hollow flight augers may be used to drill deeper wells or through semi consolidated materials, such as stiff clay. Rotary air hammer drilling may be used were well is to be drilled through consolidated materials, such as rock. Soil samples may also be collected during drilling (see Section 2.0 SOIL SAMPLING).

Drilling methods and materials must not have an unacceptable impact on the groundwater to be sampled. For example, if groundwater from the wells is to be tested for organic analytes, petroleum based lubricants are not to be used and oil traps must be installed on compressed air lines. Drilling techniques should also minimise compaction or smearing of the boreholes wells and transport of material into different zones, in

particular, when drilling through potentially contaminated material to access groundwater.

Drill cuttings accumulated over a hole are to be removed as drilling progresses so as to prevent fallback of cuttings into the hole. Samples may be collected at a range of depths in the borehole profile during drilling.

The depth of groundwater well depends of the purpose of the investigation on the soil profile and the regional geology of the area. If the borehole location is covered by concrete, coring of the superficial hard layer is undertaken first.

Petroleum based lubricants are not used on drilling and sampling equipment, instead, Teflon based greases are used where appropriate. An Aargus environmental scientist/engineer monitors and records drilling activities, procedures adopted, materials used, progress of the stages of well construction (including (i.e. screen location - standpipe lens, placement, of sand filters and well seals, and general completion details), as well as the lithology of the subsurface, visible staining, unusual odours and colours (if any).

The use of a rotary air hammer rig has many advantages for consolidated material (e.g. rock), including:

- Large diameter to allow precise placement of groundwater monitoring equipment;
- No injection of drilling fluids into the formation with resulting benefits in ensuring integrity of recovered samples, and therefore no need to dispose 0ff-site drilling fluids;
- Rapid penetration in consolidated material; and
- Provision of reliable indications of saturated conditions whilst drilling.

Drill cuttings accumulated over a hole are removed as drilling progresses so as to prevent fallback of cuttings into the hole. Samples are taken at a range of depths in the borehole profile.

Construction of the monitoring well may be carried out by the Aargus environmental scientist/engineer or the drilling contractor under the direct supervision of the Aargus environmental scientist/engineer. Typically on completion of drilling, slotted heavy duty PVC pipe (generally 50mm in diameter for the installation of monitoring well) is inserted into the drilled hole. The base of the pipe is capped prior to insertion in order to prevent natural soils entering the well from below. The drilled area surrounding the pipe

screen is filled with coarse-grained sand. Bentonite or cement grout seal plugs may be placed above the screen depending on the hydrogeological setting of the site and sand cement mix. Excess drill cuttings are disposed of in accordance with environmental best practice.

The Aargus environmental scientist/engineer will monitor and record drilling activities, and materials encountered during drilling (including visible staining, unusual odours and colours (if any)). They will log the procedures adopted, materials used, and well construction (i.e. location of the screen, placement of sand packs and well seals and general completion details).

3.3 Development of monitoring wells

Development is the process of removing fine sand silt and clay from the aquifer around the well screen in order to maximise the hydraulic connection between the bore and the formation.

Development involves removal of fluids that may have been introduced during drilling operations as well as fines from the sand filter and screens. Well development generally involves actively agitating the water column in the well then pumping water out until, ideally, water pumped comes out visibly clean and of constant quality. Development can be undertaken immediately after installation of the groundwater well or after sufficient time has been allowed for bentonite / grout seals to consolidate.

Bores used for groundwater quality monitoring should be developed after drilling, then left for a period until bore chemistry can be demonstrated to have stabilised, any where between 24 hours and 7 days.

3.4 Purging of monitoring well

In most groundwater monitoring wells, there is a column of stagnant water above the screen that remains standing in the bore between sampling rounds. Stagnant water is generally not representative of formation water because it is in contact with bore construction materials for extended periods, is in direct contact with the atmosphere and is subject to different chemical equilibria.

Purging is the process of removing this water from the well prior to sampling. In newly installed wells, the disturbance cause by drilling may also affect water present in the well, and purging may be carried out concurrently with well development. Ideally wells should be purged at the lowest rate practicable until stable water chemistry is achieved.

Purging is to be performed less than 24 hours before sample collection, but usually it is performed just before sampling. The default procedure for purging a groundwater monitoring well is as follows:

- If required, measure the concentration of volatile organic vapours in the well standpipe headspace.
- Measure the depth to the standing water level in the well standpipe and the total depth of the well relative to a reference mark (generally the top of the groundwater pipe). The depth of any light non-aqueous phase liquids (LNAPL) floating on the standing water should be recorded if present using an interface probe or other suitable device.
- Calculate the volume of the groundwater in the well standpipe. The internal diameter of the well casing and the diameter of the drill hole are used to calculate the volume of water to be removed during development (nominally a minimum of three well volumes, including water present in the sand pack, should be abstracted during purging).
- Samples of water are collected generally following development/purging of each well volume. The samples are measured immediately in the field for water quality parameters, pH, electrical conductivity, redox potential and temperature. Water quality measurement probes are to be calibrated against stock standards on regular basis and decontaminated between wells.
- Pump/bail groundwater from the well until the water quality parameters have stabilised (i.e. within 10% of the previous reading) or the well is pumped/bailed dry. Collect all purged water into an appropriate volume measurement vessel. Purged water is disposed of appropriately.
- Record all appropriate development details on the well development and sampling sheet.
- Decontaminate all equipment used in the purging procedure.

3.5 Groundwater sampling

For each sampling event, starting water levels, purging times and volumes, water quality parameters and sample details are recorded on well development and sampling sheets.

At each groundwater monitoring well, a polyethylene sheet or Eski lid is placed beside the well head and firmly fixed into position. Sampling equipment is placed onto the sheet to avoid cross contamination between the ground surface and the groundwater in the well.

Groundwater samples are collected in a bailer (Stainless Steel or disposable polymer) fitted with a stainless steel emptying device. The bailer is decontaminated prior to use. All groundwater samples are retrieved at an appropriate rate in order for turbulence (which leads to cloudy samples) to be minimised.

When collecting a water sample the bailer is lowered gently into the well, until it is within the screened interval. The bailer is then steadily withdrawn, to minimise agitation of water in the well and disturbance of the surrounding sand filter material.

The procedure for using the bailer is:

- Slowly lower the bailer into the water and allow it to sink and fill with a minimum of disturbance;
- Empty the first bailer sample into a container in order to measure the volume of bailed water and to rinse the bailer with well water;
- Emptying the bailer through the bottom-emptying device (BED) collects the samples. The sample is discharged down the side of the sample bottle to minimise entry turbulence;
- Collect samples for volatile organics first, followed by semi-volatiles, other organics and then inorganics;
- The flow from the BED is adjusted so that a relatively low flow rate is maintained.

3.6 Low flow purging

Purging large volumes of water can be impractical, hazardous or may adversely affect the contaminant distribution in the sub-surface (e.g. through dilution). Low-flow purging involves minimal disturbance of the water column and aquifer ad is preferable to the removal of a number of bore volumes. This method removes only small volumes of water, typically at rates of 0.1 to 1.0L/min, at a discrete depth within the bore.

Low-flow purging consists essentially of the following steps:

- The pump inlet is carefully and slowly placed in the middle or slightly above the middle of the screened interval at the point where the contaminant concentration is required (dedicated pumps are ideal for low-flow sampling). Placement of the pump inlet too close to the bottom of the bore can cause increased entrainment of solids, which have collected in the bore over time.
- Purging begins, typically at a rate of 0.1 to 1.0L/min, although higher rates may be possible provident the rate of purging does not cause significant draw down in the bore.

- During purging, groundwater stabilisation parameters should be measured and recorded to determine when they stabilise.

- When parameters have stabilised, the sample may be collected, at a rate slower or equal to purge rate.

3.7 Field measurements

Field measurement of groundwater parameters provides a rapid means of assessing certain aspects of water quality. They are generally taken to:

- Ensure that formation water is being sampled

- Provide on-site measurements for water quality parameters that are sensitive to sampling and may change rapidly (e.g. temperature, pH, redox and dissolved oxygen (DO)).

- Compare with laboratory measurements of these parameters to assist in the interpretation of analytical results of other parameters (e.g. check for chemical changes due to holding time, preservation and transport).

Field measurements may be taken either in-situ or after groundwater has been extracted from a bore. Field measurements should be taken immediately before collecting each sample.

pH and dissolved oxygen meters need to be calibrated before every use, in accordance with the manufacturer's instructions. If field meters are to be used over several hours, periodic readings of a reference solution must be made to ensure calibration is stable.

3.8 Labelling of water samples

The water samples are identified with the same information than soil samples. GW4/2 is the sample collected from well GW4, and 2 refers to the sample number from this well, i.e. second time the well is sampled.

3.9 Sampling containers

Water samples are generally collected in bottles and containers provided by the laboratory who will analyse the samples. These are generally plastic bottles for inorganic analysis, and amber glass bottles for organic analysis. Vials are used to collect samples to be analysed for volatile organics. Sampling containers have appropriate preservatives added.

The bottles are filled to overflowing so as to remove air bubbles as much as possible prior to firmly screwing on the container cap. When performing purge and trap

analyses, the vials are filled to 100% of their capacity. For headspace analyses, the vials are filled to approximately 75% of their capacity.

3.10 Well surveying

If the survey for location and elevation of a groundwater well is required, it should be done by a licensed surveyor, or alternatively by an Aargus environmental engineer / scientist if the level of precision required can be obtained by the use of Aargus field equipment.

If the location is given by a licensed surveyor, it is generally given to the nearest 0.1m and referenced to the Australian Map Grid (AMG) coordinates.

If the elevation is given by a licensed surveyor, the top of the standpipe and the ground surface adjacent to the standpipe are generally given to the nearest 0.01m and may be referenced to the Australian Height Datum (AHD). Relative levels (RLs) can be used if general contours are required.

4.0 SURFACE WATERS AND STORMWATER SAMPLING

4.1 Surface waters

Surface water samples are collected by hand, using automatic samplers, batch samplers or continuous samplers which can be installed to take samples at discrete time intervals or continuously. For well mixed surface water samples (up to 1m depth) a sample bottle is immersed by hand covered by a glove below the surface. Samples are also taken with sample poles that have extension arms so that more representative samples can be taken. For areas where access is difficult, samples can be collected using a retractable sample extension pole (sample bottle on the end) or in a bucket and transferred to sample bottles immediately following collection. Other methods such as pumping systems, depth samplers, automatic samplers, and integrating systems are all relatively similar with water samples being supplied to a discharge point where samples can be collected in appropriate bottles.

4.2 Stormwater

The monitoring of stormwater quality is generally required prior to reject waters into stormwater drains. Field measurements are generally carried out using a Hanna Multiprobe prior to the discharge of the water to stormwater. The water parameters measured include pH, electrical conductivity (EC, in mS/cm) and Total Dissolved Solids (TDS).

If sampling is required, samples to be analysed for inorganic compounds are collected in plastic bottles, and samples to be analysed for organic compounds are collected in amber glass bottles. The bottles are filled to overflowing so as to remove air bubbles as much as possible prior to firmly screwing on the container cap. Sample containers may have preservatives added, in accordance with the laboratory recommendations.

Vials are used for volatile organic analysis. When performing purge and trap analysis, the vials should be filled to 100% of their capacity, whereas for headspace measurements, the vials should be filled to approximately 75% of their capacity..

4.3 Filtration devices

Water filtration devices may be required to filter surface water before it is discharged to the stormwater network, in order to remove suspended solids in water. One of the most simple and commonly used filtration device consists of between two to four retention sedimentation bays with a geotextile covering the inlet and outlet hoses.

Litter traps (wire or plastic grids or netting) may also be used to remove larger particles or debris. Other techniques to reduce the amount of suspended matter in water include wet basins, artificial wetlands, infiltration trenches and basins, sand filters and porous pavements. Some of these latter methods are also likely to reduce the bacterial levels in water.

The use of these filtration devices does not preclude carrying out monitoring of water quality following treatment and prior to discharge, particularly to the stormwater system.

5.0 PHOTO IONISATION DETECTOR (PID)

Photo Ionisation Detector (PID) measurements are used to provide indicative field measurements of the amount of ionisable vapours released from a soil or water sample into the head space above the sample.

The procedure for field screening of samples using the PID is as follows:

- Prior to testing commencing, the PID is calibrated using standard laboratory calibration gas. The battery of the PID should also be sufficiently charged for the duration of the testing;
- The background concentrations of total ionisable compounds in the ambient air in the vicinity of the work area are established prior to the commencement of site activities. Background measurements are normally taken approximately 5 to 10m upwind of the work area. The readings are observed before and after

each measurement of a sample to ensure that the PID is operating correctly. The maximums, fluctuations and other relevant comments are recorded.

- A glass sample jar is filled with the soil sample to be tested. The jar should not be filled more than 3/4 full;
- The jar is sealed with aluminium foil or plastic wrap and the lid is screwed;
- At least 20 minutes after placing the sample into the sampling jar, check that the PID reading is constant and similar to the background. Insert the top of the PID through the foil or plastic wrap in order to measure the ionisable vapour concentrations in the airspace above the sample;
- Monitor and record the PID readings noting fluctuations and maximum readings;
- Monitor the readings after returning the PID to a location with background concentrations. Interchangeable, clean, in-line filters for the PID probe are available to allow rapid decontamination of the unit in the field if background readings measured by the instrument are significantly greater than the background air concentration initially established;
- If perforations are present in the aluminium foil prior to analysis reseal the jar and test after having waited again for at least 20minutes.

An alternative acceptable method is to place the soil to be tested in a disposable zip loc plastic bag and test the sample by punching a hole in the bag with the PID tube to sample the gas from the bag.

6.0 ACID SULFATE SOILS

6.1 Desktop Classification

An initial review of Acid Sulphate Soils (ASS) Planning Maps is undertaken to identify the likelihood and risk of ASS being present at the site. The following geomorphic conditions of the site are also checked as an indication of the presence of ASS: sediments of recent geological age (Holocene) ~ 6000 to 10 000 years old; soil horizons less than 5m AHD (Australian Height Datum); marine or estuarine sediments and tidal lakes; coastal wetlands or back swamp areas; waterlogged or scalded areas; inter-dune swales or coastal sand dunes; areas where the dominant vegetation is mangroves, reeds, rushes and other swamp tolerant and marine vegetation; areas identified in geological descriptions or in maps bearing sulfide minerals, coal deposits or former marine shales/sediments; and deeper older estuarine sediments >10m below the ground surface.

6.2 Site Walkover

The presence on site of hydrogen sulphide odours, acid scalds, flocculated iron, monosulfidic sludges, salt crusts, stressed vegetation, corrosion of concrete and/or steel structures and water logged soils are noted as cues for the presence of ASS.

6.3 Visual Classification

Visual indicators taken into account for the presence of ASS are the presence of jarosite (pale yellow colour) horizons or mottling, unripe muds (waterlogged, soft, blue grey or dark greenish grey in colour), silty sands and sands (mid to dark grey in colour) and the presence of shells.

6.4 Sample Collection

Samples are collected to at least one metre below the depth of the proposed excavation or estimated drop in the water table, or two metres below ground level, whichever is deepest. Samples are collected from every soil horizon or every 0.25m. Large shells, stones and fragments of wood, charcoal and other matter are noted, but removed from the sample. Small roots are not removed from the sample. If laboratory analysis is required, samples are sent for laboratory testing within 24 hours of sampling.

6.5 Field Testing

The field pH peroxide test (pH_{FOX}) is used to obtain an indication of the presence of oxidisable sulphur in the soil. The procedure for this test is as follows:

- A small sample of soil (<100g) is collected in a glass jar and split into two sub-samples. One sub-sample is made into a 1:5 (soil : deionised water) solution in order to measure field soil pH and electrical conductivity (EC) analysis. If the resulting pH is less than 4 (pH_F<4), the sample is identified as actual acid sulphate soil (AASS)

- The second sub-sample is made into a 1:5 (soil : Hydrogen Peroxide) solution to measure pH of oxidised soil. Sodium Hydroxide (NaOH)-adjusted analytical (30%) grade Hydrogen Peroxide (H_2O_2) is used as the soil oxidising agent. A mobile electronic pH/EC probe is used to measure soil pH.

- The presence of oxidisable sulphides, organic matter or manganese in the sample, will trigger a chemical reaction. The type of effervescence and any colour change is noted with the final pH measured to give an indication of the potential change in pH should the soil remain exposed to oxygen. If the resulting pH is less than 3 (pH_{FOX}<3) or if pH_{FOX} is at least one unit less than the pH_F, this suggests that the soil tested is potential acid sulfate soil (PASS).

6.6 Laboratory Testing

When the field test suggests that the material tested contains ASS or PASS, this should be confirmed by laboratory analysis (POCAS/SPOCAS or TOS testing).

7.0 NOISE MONITORING

Measurements are taken at a range of times during the day in order to assess the trends in noise emission over time. Noise is measured using a hand-held Rion NA-29 Sound Level Meter with digital microphone. Some noise meters change and appropriate equioment which is calibrated is used for all monitoring. The reference level of the meter is checked before and after the measurements using a Rion NC-73 Sound Level Calibrator to ensure there is no significant drift. Noise measurements are made over a 15-minute interval using the "fast" response of the sound level meter. 5dB would be added if the noise is substantially tonal or impulsive in character. Measurements should be adapted to the type of noise being measured i.e. construction, occupation, club, etc.

8.0 DUST MONITORING

Sampling is conducted at locations of potential concern. The deposit gauge static sampler contains a glass funnel measuring approximately 150mm with the angle of the cones sides being 60 degrees, placed into a rubber stoppers in the mouth of a five-litre glass receptacle. The deposit gauge is placed in a stand so that the height of the funnel of the deposit gauge is between 1.8 and 2.2m above ground level. A quantity of 7.8g copper sulfate pentahydrate dissolved in water is placed in the glass receptacle in order to prevent algal growth.

Exposure periods vary depending on the purpose of the investigation but typically the period is 30 ±2 days. Samples are usually analysed for measured soils: total solids, insoluble solids, ash and combustible solids.

Dust can also be measured using a High Volume Air Sampler. Such sampler should be located at least 2 metre away from any structures so that an undisturbed sample can be collected. HVASs can be used indoors or outdoors.

9.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

9.1 Introduction

Inaccuracies in sampling and analytical programs can result from many causes, including collection of unrepresentative samples, unanticipated interferences between elements during laboratory analyses, equipment malfunctions and operator error. Inappropriate sampling, preservation, handling, storage and analytical techniques can also reduce the precision and accuracy of results.

The Australian Standard AS4482.1-2005 *Guide to the Sampling and Investigation of Potentially Contaminated Soil, Part 1: Non-Volatile and Semi-Volatile Compounds* has documented procedures for quality assurance (QA) and quality control (QC) for sampling and analysis to ensure that the required degree of accuracy and precision is obtained. The Australian Standard also recommends the use of two laboratories for the implementation of a QA program for the analyses in addition to the QC procedures followed by the primary laboratory.

9.2 Field QAQC samples

General

Procedures for duplicate sampling should be identical to those used for routine sampling and duplicate samples will be despatched for analysis for the same parameters using the same methods as the routine samples. No homogenisation of samples which may induce the loss of volatile compounds (such as BTEX) should occur. Whenever possible, the selection of samples for duplicate analyses should be biased towards samples believed to contain the contaminant of concern.

Intra-laboratory duplicates

Intra-laboratory duplicate samples, also referred to as Blind duplicates, are used to assess the variation in analyte concentration between samples collected from the same sampling point and / or also the repeatability of the laboratory analyses. Samples are split in the field to form a primary sample and a QC duplicate (intra-laboratory replicate) sample. The intra-laboratory duplicates are taken from a larger than normal quantity of soil collected from the same sampling point, removed from the ground in a single action, and divided into two vessels. These samples are submitted to the laboratory as two individual samples without any indication to the laboratory that they have been duplicated.

Intra-laboratory duplicate samples should be collected at a rate of approximately 1 in 20 soil samples and analysed for the full suite of analytes. At least one intra-laboratory duplicate sample should be included in each batch of samples.

Inter-laboratory duplicates

Inter-laboratory duplicate samples, also referred to as Split duplicates, provide a check on the analytical proficiency of the laboratories. The samples are taken from a larger than normal quantity of soil collected from the same sampling point, removed from the ground in a single action, and divided into two vessels. One sample from each set is submitted to a different laboratory for analysis. The same analytes should be determined by both laboratories using the same analytical methods.

Inter-laboratory duplicates should be collected at a rate of approximately 1 in 20 soil samples and analysed for the full suite of analytes. At least one inter-laboratory duplicate sample should be included in each batch of samples.

Blanks

Rinsate Blanks

Rinsate blank samples provide information on the potential for cross-contamination of substances from the sampling equipment used. Rinsate blanks are collected where cross-contamination of samples is likely to impact on the validity of the sampling and assessment process (e.g. when the investigation level of a contaminant is close to the detection limit for this contaminant). They are prepared in the field using empty bottles and the distilled water used during the final rinse of sampling equipment. After completion of the decontamination process, fresh distilled water is poured over the sampling equipment and collected. The distilled water is exposed to the air for approximately the same time the sample would be exposed. The collected water is then transferred to an appropriate sample bottle and the proper preservative added, if required.

One rinsate blank par day and / or one per piece of sampling equipment are collected during the decontamination process, and analysed for the analytes of interest. At least one rinsate blank should be included in each batch of samples. One rinsate blank should be collected for every 50 samples collected and analysed for the full suite of analytes.

Trip Blanks / Spikes

Trip blanks / spikes are a check on the sample contamination originating or lost from sample transport, handling, and shipping. These are samples of soil or water prepared by the laboratory with a zero or known concentration of analytes.

Field Blanks

Field blanks are a check on sample contamination originating from sample transport, handling, shipping, site conditions or sample containers. These are similar to trip blanks except the water is transferred to sample containers on site.

9.3 Laboratory quality assurance / quality control

The laboratories undertake the analyses utilising their own internal procedures and their test methods (for which they are NATA, or equivalent, accredited) and in accordance with their own quality assurance system which forms part of their accreditation.

Laboratory duplicate samples

Laboratory duplicate samples measure precision. These samples are taken from one sample submitted for analytical testing in a batch. The rate of duplicate analysis will be according to the requirements of the laboratory's accreditation but should be at least one per batch. Precision is reported as standard deviation SD or Relative Percent Difference %RPD, being:

$$\%RPD = \frac{(D1 - D2)}{(D1 + D2)} \times 200$$

where: D1: sample concentration and D2: duplicate sample concentration

Replicate data for precision is expected to be less than 30% RPD at concentration levels greater than ten times the EQL, or less than 50% RPD at concentration levels less than ten times the EQL. Sample results with a RPD exceeding 100% require specific discussion. Note that certain methods may allow for threshold limits outside of these limits.

Matrix Spiked Samples

Matrix spiked samples are used to monitor the performance of the analytical methods used, and to assess whether the sample matrix has an effect of on the extraction and analytical techniques. A sample is spiked by adding an aliquot of known concentration of the target analyte(s) to the sample matrix prior to sample extraction and analysis. These samples should be analysed at a rate of approximately 5% of all analyses, or at least one per batch. Matrix spikes are reported as a percent recovery %R, being:

$$\%R = \frac{(SSR-SR)}{SA} \times 100$$

where: SSR: spiked sample result, SR: sample result (blank) and SA: spike added

Recovery data for accuracy is described by control limits specified by the laboratory (generally ranging between 70% and 130%) and referenced to US EPA SW-846 method guidelines values.

Laboratory Blank

Laboratory blanks are used to correct for possible contamination resulting from the preparation or processing of the samples. These are usually an organic or aqueous solution that is as free as possible of analyte and contains all the reagents in the same volume as used in the processing of the samples. Laboratory blanks must be carried through the complete sample preparation procedure and contain the same reagent concentrations in the final solution as in the sample solution used for analysis. Laboratory blanks should be analysed at a rate of once per process batch, and typically at a rate of 5% of all analyses.

Laboratory Control Samples

Laboratory Control Samples, also referred to as Quality Control Check Samples, are used to assess the repeatability and long term accuracy of the laboratory analysis. These are externally prepared and supplied reference material containing representative analytes under investigation. Recovery check portions should be fortified at concentrations that are easily quantified but within the range of concentrations expected for real samples. Laboratory Control samples should be analysed at a rate of one per process batch, and typically at a rate of 5% of analyses. Laboratory control samples are reported as a percent recovery %R, being:

$$\%R = \frac{(SSR-SR)}{SA} \times 100$$

where: SSR: spiked sample result, SR: sample result (blank) and SA: spike added

Recovery data for accuracy is described by control limits specified by the laboratory and referenced to US EPA SW-846 method guidelines values. Ideally, all calculated recovery values should be within the acceptable limits. However, in the event that control limit outliers are reported, professional judgement is used to assess the extent to which such results may affect the overall usability of data.

Surrogates

Surrogates are used to provide a means of checking, for every analysis, that no gross errors have occurred at any stage of the procedure leading to significant analyte losses. Surrogate are quality control monitoring spikes, which are added to all fields and QAQC samples at the beginning of the sample extraction process in the laboratory. Surrogates are closely related to the sample analytes being measured (particularly with regard to

extraction, recovery through cleanup procedures and response to chromatography) and are not normally found in the natural environment.

Surrogate spikes will not interfere with quantification of any analytes of interest and may be separately and independently quantified by virtue of, for example, chromatographic separation or production of different mass ions in a GC/MS system. Surrogates are measured as Percent Recovery %R expressed as:

$$\%R = \frac{(SSR)}{SA} \times 100$$

where: SSR: spiked sample result and SA: spike added

Recovery data for accuracy is described by control limits specified by the laboratory and referenced to US EPA SW-846 method guidelines values.

10.0 DATA QUALITY OBJECTIVES

10.1 General

Data Quality Objectives (DQOs) are defined to ensure that the data is sufficiently accurate and precise to be used for the purpose of the environmental works. DQOs are defined for a number of areas including:

- sampling methods;
- decontamination procedures;
- sample storage (including nature of the containers) and preservation;
- laboratory analysis, including PQL, recoveries (surrogates, spikes), duplicates;
- preparation of CoC forms;
- document and data completeness; and
- data comparability.

The NSW DEC Contaminated Sites Guidelines for the NSW Site Auditor Scheme (2nd Ed) 2006 also provide a seven step process for Data Quality Objectives (DQOs). These are as follows:

- State the problem

- Identify the decisions
- Identify inputs to the decision
- Define the study boundaries
- Develop a decision rule
- Specify limits on decision errors
- Optimise the design for obtaining data

DQOs must be adopted for all assessments and remediation programmes. The DQO process must be commenced before any investigative works begin on a project.

10.2 Field DQOs

The DQOs for sampling methods, decontamination procedures, sample storage (including nature of the containers) and preservation, preparation of CoC forms, and document and data completeness are the Aargus protocols which have been described in the previous sections of this document.

10.3 Assessment of RPD values for field duplicate samples

The criteria used to assess RPD values for field duplicate samples is based on discussion reported in AS4482.1 1997, a summary of which is presented below:

Table 1: RPD acceptance criteria

Sample type	Typical acceptable RPD
Intra-laboratory duplicate (blind duplicate)	30-50°% (*)
Inter-laboratory duplicate (split duplicate)	30-50% (*)

It is noted that other factors such as sampling technique, sample variability, absolute concentration relative to criteria and laboratory performance should also be considered when evaluating RPD values.

The Australian Standard also states that the variation can be expected to be higher for organic analytes than for inorganics, and for low concentrations of analytes (lower than five times the detection limit). Based on Aargus Pty Ltd experience, RPD up to 70% are considered to be acceptable for organic species. RPD of 100% or more are generally considered to demonstrate poor correlation and should be discussed.

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10.4 Laboratory Data Quality Objectives (DQO)

General

Labmark is the Aargus-preferred laboratory for the analysis of primary samples. Labmark is accredited by the National Association of Testing Authorities (NATA).

The laboratory generally used by Aargus for analysing inter-duplicate samples is SGS.

Analytical methods including detection limits are provided on each laboratory report and are checked as part of the data review process.

Laboratory QA/QC

Specific to Labmark, standard QA/QC data includes LCS, MB, CRM (CRM metals only), Laboratory Duplicate (1 in first 5-10 samples, then every tenth sample) and Spike sample (1 in first 5-20 samples, then every 20th sample), and surrogate recovery's (target organics). All QA/QC is reviewed by a senior chemist prior to customer release and includes a DQO comment on final report. Additional QA/QC maybe performed on batches less than 10 samples; however additional charges shall apply at the appropriate analytical rate/sample.

Laboratory analyses DQOs

The following table summarises Labmark laboratory analyses DQOs.

Table 2: Labmark Data Quality Objectives (DQOs)

Laboratory QA/QC Testing	Laboratory QA/QC Acceptance Criteria
Method Blanks	For all inorganic analytes the Method Blanks must be less than the LOR. For organics Method Blanks must contain levels less than or equal to LOR.
Surrogate Spikes	At least two of three routine level soil sample Surrogate Spike recoveries are to be within 70-130% where control charts have not been developed and within the estimated control limited for charted surrogates. Matrix effects may void this as an acceptance criteria. Any recoveries outside these limits will have comment. Water sample Surrogates Spike recoveries are to within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criteria. Any recoveries outside these limits will have comment.
Matrix Spikes	Sample Matrix Spike duplicate recovery RPD to be <30%. In the event that the matrix spike has been applied to samples whose matrix or contamination is problematic to the method then these acceptance criteria apply to the Control Matrix Spike.

Laboratory QA/QC Testing	Laboratory QA/QC Acceptance Criteria
Laboratory Control Samples	Control standards must be 80-120% of the accepted value. Control standard recoveries are to be within established control limits or as a default 60-140% unless compound specific limits apply.
Laboratory Duplicate Samples	For Inorganics laboratory duplicates RPD to be <15%. For Organics Laboratory duplicates must have a RPD <30%.
Calibration of Chromatography Equipment	The calibration check standards must be within +/-15%. The calibration check blanks must be less than the LOR.

Non-compliances

Exceedances of QAQC results outside the DQO should be thoroughly investigated and discussed with the laboratories concerned, and the outcomes of these investigations should be recorded in the project files.

11.0 USE AND CALCULATION OF THE 95% UCL FOR SITE VALIDATION PURPOSE

Validation of a site at the completion of remediation works should comply with the recommendations of the applicable guidelines. For a site to be considered uncontaminated or successfully remediated, the typical minimum requirement is that the 95% upper confidence limit (UCL) of the arithmetic average concentration of the contaminant(s) is less than an acceptable limit, eg the threshold value of an health-based investigation level.

The calculation of the 95% UCL of the arithmetic average concentration method requires that the probable average concentration and standard deviation of the contaminant be known. This method is most applicable for validation sampling, where the mean concentration and the standard deviation can be estimated from sampling results. The 95% UCL is calculated as follows:

$$95\%\ UCL = mean + t_{\alpha,n-1} \frac{STDEV}{\sqrt{n}}$$

where

mean arithmetic average of all sample measurements

$t_{\alpha,n-1}$ A test statistic (Student's t at an α level of significance and n-1 degrees of freedom)

$\propto$	The probability (in that case chosen to be 0.05) that the 'true' average concentration of the sampling area might exceed the UCL average determined by the above equation
STDEV	Standard deviation of the sample measurements
n	number of samples measurements

12.0 COPYRIGHT

13.0 ABBREVIATIONS

ANZECC	Australian and New Zealand Environment and Conservation Council
ASS	Acid Sulfate Soil
BGL	Below Ground Level
BTEX	Benzene, Toluene, Ethyl benzene and Xylene
CoC	Chain of Custody
DEC	Department of Conservation (formerly EPA)
DIPNR	Department of Infrastructure Planning and Natural Resources
DQO	Data Quality Objective
EIL	Ecological Investigation Level
EPA	Environment Protection Authority
ESA	Environmental Site Assessment
HIL	Health-Based Soil Investigation Level
LGA	Local Government Area
NEHF	National Environmental Health Forum
NEPC	National Environmental Protection Council
NEPM	National Environmental Protection Measure
NHMRC	National Health and Medical Research Council
NSL	No Set Limit
OCP/OPP	Organochlorine Pesticides /Organophosphate Pesticides
PAH	Polycyclic Aromatic Hydrocarbon
PASS	Potential Acid Sulfate Soil
PCB	Polychlorinated Biphenyl
PID	Photo Ionisation Detector
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance, Quality Control
RAC	Remediation Acceptance Criteria
RAP	Remediation Action Plan
RPD	Relative Percentage Difference
SAC	Site Assessment Criteria
SVC	Site Validation Criteria
SWL	Standing Water Level
TCLP	Toxicity Characteristics Leaching Procedure
TESA	Targeted Environmental Site Assessment
TPH	Total Petroleum Hydrocarbons
UCL	Upper Confidence Limit
VHC	Volatile Halogenated Compounds
VOC	Volatile Organic Compounds

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14.0 REFERENCES

- ANZECC (1992) – *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites.*
- ANZECC (1996) – *Drinking Water Guidelines.*
- ANZECC (2000) – *Guidelines for Fresh and Marine Waters.*
- Land and Biodiversity committee (2003) – *Minimum Construction requirements for water bores in Australia.*
- National Environment Protection Council (NEPC) (1999) – *National Environmental Protection (Assessment of Site Contamination) Measure.*
- Netherlands Ministry of Spatial Planning, Housing and the Environment (1994 rev. 2000) – *Environmental Quality Objectives in the Netherlands.*
- New South Wales Environment Protection Authority (1994) – *Guidelines for Assessing Service Station Sites.*
- New South Wales Environment Protection Authority (1995) – *Sampling Design Guidelines.*
- New South Wales Environment Protection Authority (1997) – *Guidelines for Consultants Reporting on Contaminated Sites.*
- New South Wales Environment Protection Authority (1998) – *Guidelines for the NSW Site Auditor Scheme.*
- New South Wales Department of Environment & Conservation (2006) – *Guidelines for the NSW Site Auditor Scheme (2nd Ed).*
- New South Wales Environment Protection Authority (1999) – *Guidelines on Significant Risk of Harm from contaminated land and the duty to report.*
- New South Wales Environment Protection Authority (1999) – *Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-liquid Wastes.*
- New South Wales Environment Protection Authority (2005) – *Guidelines for assessing former orchards and market gardens.*
- QLD Department of Environment (DoE) (1998) – *Draft Guidelines for the Assessment & Management of Contaminated Land in Queensland.*
- QLD EPA – Waste Management Branch, Contaminated Land Section – *Details about investigation thresholds and sampling – sent to Aargus on 14 Nov 2000.*
- Standards Australia AS1726-1993 (1993) – *Geotechnical Site Investigations.*
- Standards Australia AS4482.1-1997 (1997) – *Guide to the Sampling and Investigation of Potentially Contaminated Soil, Part 1: Non-Volatile and Semi-Volatile Compounds.*
- Standards Australia AS5667.11-1998 (1998) – *Water Quality Sampling: Guidance on the Sampling of Groundwaters.*
- Victorian EPA (2000) – *Groundwater Sampling Guidelines*

APPENDIX H

PROJECT TEAM

Aargus

M i c h a e l S i l k

DATE OF BIRTH	9th January 1979
EDUCATION	Bachelor of Environmental Science, University of New England, Armidale, NSW, Australia.
ADDITIONAL COURSES	Certificate Three in Financial Services Operations QSCU Proud to be of Service Training QSCU CUNA Member Care Loan Insure Training St George Government Legislation Training St George Financial Services Trainee Program St George Customer Service Officer Module 1-3 Microsoft Office Level 1 Registered Fitness Leader Austswim Course Essentials Security License St John's Senior First Aid Army Reserve
FIELDS OF SPECIAL COMPETENCY	Indigenous Land Management, Impact Assessments, Ecology, Zoology, Catchment Management
EXPERIENCE	Michael has a strong scientific background in environmental science majoring in indigenous land management.

EXPERIENCE

2008-Present.....	Environmental Scientist *Aargus Pty Ltd*
2008.....	Settlements Officer *Macquarie Bank*
2007	Loan Officer *Qantas Staff Credit Union*
2004.....	Loans Support Officer *ING Bank*

2002.....Customer Service Consultant
St George Bank

SELECTED PROJECTS

Virgin Excavated Natural Material (VENM)
This soil classification includes liaising with site personnel/ contractors, visual site inspections, sampling where applicable (including QA/QC), interpretation of results and assessment against relevant guidelines. Areas where I have completed some of these include; Campbelltown, Coogee, Artamon, Dee Why, Norwest, Bankstown, Warrawee, Hurstville, Flinders

Soil Classification – Clovelly. The classifications included liaising with site personnel/ contractors, visual site inspections, sampling where applicable (including QA/QC), interpretation of results and assessment against relevant guidelines and reporting. The classification of material was assessed with reference to NSW EPA (1999) – *Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-liquid Wastes;* NSW DECC (2006, 2nd Edition) *Guidelines for the NSW Site Auditor Scheme* where suitability of fill was required for a particular land use.

Soil Classification – Porters Creek. The classifications included liaising with site personnel/ contractors, visual site inspections, sampling where applicable (including QA/QC), interpretation of results and assessment against relevant guidelines and reporting. The classification of material was assessed with reference to NSW EPA (1999) – *Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-liquid Wastes;* NSW DECC (2006, 2nd Edition) *Guidelines for the NSW Site Auditor Scheme* where suitability of fill was required for a particular land use.

Soil Classification - Tahmoor. The classifications included liaising with site personnel/ contractors, visual site inspections, sampling where applicable (including QA/QC), interpretation of results and assessment against relevant guidelines and reporting. The classification of material was assessed with reference to NSW EPA (1999) – *Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-liquid Wastes;* NSW DECC (2006, 2nd Edition) *Guidelines for the NSW Site Auditor Scheme* where suitability of fill was required for a particular land use.

Soil Classification – Warriewood. The classifications included liaising with site personnel/ contractors, visual site inspections, sampling where applicable (including QA/QC), interpretation of results and assessment against relevant guidelines and reporting. The classification of material was assessed with reference to NSW EPA (1999) – *Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-liquid Wastes;* NSW DECC (2006, 2nd Edition) *Guidelines for the NSW Site Auditor Scheme* where suitability of fill was required for a particular land use.

Soil Classification – Bonnyrigg. The classifications included liaising with site personnel/ contractors, visual site inspections, sampling where applicable (including QA/QC), interpretation of results and assessment against relevant guidelines and reporting. The classification of material was assessed with reference to NSW EPA (1999) – *Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-liquid Wastes;* NSW DECC (2006, 2nd Edition) *Guidelines for the NSW Site Auditor Scheme* where suitability of fill was required for a particular land use.

Soil Classification – Hinchinbrook. The classifications included liaising with site personnel/ contractors, visual site inspections, sampling where applicable (including QA/QC), interpretation of results and assessment against relevant guidelines and reporting. The classification of material was assessed with reference to NSW EPA (1999) – *Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-liquid Wastes;* NSW DECC (2006, 2nd Edition) *Guidelines for the NSW Site Auditor Scheme* where suitability of fill was required for a particular land use.

Field Sampling and report preparation - Banksmeadow NSW. Work included sampling, including QA/QC, interpretation of results and assessment against relevant guidelines and reporting. The classification of material was assessed with reference to NSW EPA Health based Investigation Levels

Groundwater Sampling – Mascot NSW. Fieldwork included groundwater well development, purging and sampling.

Historical Review – Title Search information – Included researching and collecting historical and cancelled land titles through computer and manual searches from the Department of Lands.

Acid Sulphate Soil Assessment – Bardwell Valley NSW – Development areas within potential Acid Sulphate Soil regions were assessed to determine the presence, absence or extent of potential or actual Acid Sulphate Soils. Duties included site surveys, soil sampling, chemical testing of soils, preparation of borehole logs, liaising with clients and regulatory authorities and report generation

Acid Sulphate Soil Assessment – Earlwood NSW – Development areas within potential Acid Sulphate Soil regions were assessed to determine the presence, absence or extent of potential or actual Acid Sulphate Soils. Duties included site surveys, soil sampling, chemical testing of soils, preparation of borehole logs, liaising with clients and regulatory authorities and report generation

Acid Sulphate Soil Assessment – Banksmeadow NSW – Development areas within potential Acid Sulphate Soil regions were assessed to determine the presence, absence or extent of potential or actual Acid Sulphate Soils. Duties included site surveys, soil sampling, chemical testing of soils, preparation of borehole logs, liaising with clients and regulatory authorities and report generation

Hazardous Materials Assessment – Bondi - Duties included hazardous materials assessments in commercial properties. Duties included surveying buildings for hazardous material such as asbestos (pipes, lagging, roofs, sheeting, electricity backing boards, lift brakes etc), lead and other substances known to be harmful to human health and the environment. Duties included liaising with contractors and regulatory authorities, identification of hazardous materials, sampling of potential hazardous materials and report writing.

Hazardous Materials Assessment – Kogarah - Duties included hazardous materials assessments in residential properties. Duties included surveying buildings for hazardous material such as asbestos (pipes, lagging, roofs, sheeting, electricity backing boards, lift brakes etc), lead and other substances known to be harmful to human health and the environment. Duties included liaising with contractors and regulatory authorities, identification of hazardous materials, sampling of potential hazardous materials and report writing.

Statement of Environmental Effects – St Marys NSW – The purpose of this report was to show the potential impact of the change in operations on the site and on the surrounding environment. Duties included; liaising with contractors and regulatory authorities, identification of production process and proposed development, identification of environmental issues, identification of legal issues, report writing, and a preliminary hazard analysis.

Preliminary Environmental Site Assessment (Phase 1) – Kogarah NSW. Duties included historical searches, analysing aerial photographs liaising with authorities, identification of potential contaminants and areas of concern, sampling design, reporting within strict timeframes and recommendations for remedial works. Duties also included writing proposals for a number of projects.

Preliminary Environmental Site Assessment (Phase 1) – Llandilo NSW. Duties included historical searches, analysing aerial photographs liaising with authorities, identification of potential contaminants and areas of concern, sampling design, reporting within strict timeframes and recommendations for remedial works. Duties also included writing proposals for a number of projects.

Preliminary Environmental Site Assessment (Phase 1) – Mascot NSW. Duties included historical searches, analysing aerial photographs liaising with authorities, identification of potential contaminants and areas of concern, sampling design, reporting within strict timeframes and recommendations for remedial works. Duties also included writing proposals for a number of projects.

Targeted Environmental Site Assessment – Dianella WA. Duties included historical searches, analysing aerial photographs liaising with authorities, identification of potential contaminants and areas of concern, sampling design, soil and groundwater sampling, preparation of borehole logs, decontamination and QA/QC procedures, analysis of

results, reporting within strict timeframes and recommendations for remedial works. Duties also included writing proposals for a number of projects.

Targeted Environmental Site Assessment – Fremantle WA. Duties included historical searches, analysing aerial photographs liaising with authorities, identification of potential contaminants and areas of concern, sampling design, soil and groundwater sampling, preparation of borehole logs, decontamination and QA/QC procedures, analysis of results, reporting within strict timeframes and recommendations for remedial works. Duties also included writing proposals for a number of projects.

Targeted Environmental Site Assessment – Kensington VIC
Duties included historical searches, analysing aerial photographs liaising with authorities, identification of potential contaminants and areas of concern, sampling design, soil and groundwater sampling, preparation of borehole logs, decontamination and QA/QC procedures, analysis of results, reporting within strict timeframes and recommendations for remedial works. Duties also included writing proposals for a number of projects.

Targeted Environmental Site Assessment – St Marys NSW
Duties included historical searches, analysing aerial photographs liaising with authorities, identification of potential contaminants and areas of concern, sampling design, soil and groundwater sampling, preparation of borehole logs, decontamination and QA/QC procedures, analysis of results, reporting within strict timeframes and recommendations for remedial works. Duties also included writing proposals for a number of projects.

Environmental Site Assessment (Phase 2) – Banksmeadow NSW
Duties included historical searches, analysing aerial photographs liaising with authorities, identification of potential contaminants and areas of concern, sampling design, soil and groundwater sampling, preparation of borehole logs, decontamination and QA/QC procedures, analysis of results, reporting within strict timeframes and recommendations for remedial works. Remediation options and duties also included writing proposals for a number of projects.

Environmental Site Assessment (Phase 2) – Mascot NSW
Duties included historical searches, analysing aerial photographs liaising with authorities, identification of potential contaminants and areas of concern, sampling design, soil and groundwater sampling, preparation of borehole logs, decontamination and QA/QC procedures, analysis of results, reporting within strict timeframes and recommendations for remedial works. Remediation options and duties also included writing proposals for a number of projects.

M A R K K E L L Y

DATE OF BIRTH	25th October 1975
EDUCATIONAL QUALIFICATIONS	BAppSc (Geology) (Hons) University of New South Wales, Sydney, Australia Majoring in Soil and Groundwater Resources and Remediation
ADDITIONAL COURSES	Groundwater Hydrology Hydrogeochemistry Analysis and Interpretation of Hydrogeochemical Data Physical Aspects of Contaminated Groundwater Interpretation of Aeromagnetics Structural Interpretation and Analysis
PROFESSIONAL MEMBERSHIP	Geological Society of Australia (GSA)
PROFESSIONAL LICENCES	Senior First Aid Certificate (2006) X-ray Fluorescence (XRF) Metal Detector Operation License (EPA License No 24430) Energy Australia Passport (Service No. 7728)
PROFESSIONAL TRAINING	Asbestos Removal Course (TAFE NSW) XRF Training Course Energy Australia inductions, electrical safety rules, environmental training, safety training, first aid training, CPR training, low voltage release and rescue training and courses, substation entry & safely working near live power cables in EA network courses
FIELDS OF SPECIAL COMPETENCY	**Contaminated Land Assessment and Site Remediation** – management, technical advice, planning, data evaluation, coordinating and supervision of environmental/contaminated site assessments including preliminary and detailed assessments, contaminated site remediation and validation with particular reference to soil, water and groundwater. Acid sulphate soils, salinity and hazardous materials assessments.

EXPERIENCE:

2007 – Present	Senior Environmental Geologist – Aargus Pty Ltd
2006 - 2007	Senior Environmental Geologist – Geotechnique Pty Ltd
1999 – 2006	Environmental Geologist – Geotechnique Pty Ltd

PRACTICAL EXPERIENCE (Office)

- Project management, scheduling laboratory chemical analysis, data evaluation and reporting on environmental/contaminated site investigations including preliminary, detailed assessments, remediation and validation
- Preparation of waste classification, including biosolids from sewage treatment plants
- Salinity Assessments
- Preparation of proposals
- Occupational Health & Safety Issues
- Environmental Management Plans
- Coordinating and corresponding with Principal/Senior Environmental Engineers, Environmental Engineers, field staff, management, clients and contractors
- Liaising and negotiating with relevant government departments, statutory authorities
- Basic Turbocad skills

PRACTICAL EXPERIENCE (Field)

- Site inspections
- Soil and water sampling
- Installation of groundwater monitoring wells
- Assessing the contamination status of land/water
- Site remediation and validation
- Site management including remediation, asbestos removal
- PID calibration and use
- Hazardous material assessment
- Salinity indicators
- Service station works including underground storage tank removal
- Gas monitoring

SITES

Investigations have been carried out on a number of sites across the Sydney Metropolitan area, the greater Sydney area, rural NSW and interstate. The types of sites assessed include:

- Rural residential properties including active and former agricultural (market gardens, orchards, nursery, poultry) lands, farming lands, vacant lands etc
- Residential Properties including residential, townhouse and units
- Commercial / Industrial including activities such as tanneries, printing, tyre storage and manufacture, paint storage and manufacture, metal works, foundries, wheat processing and storage, scrap metal yards, metal recyclers etc

- Service Station Sites including small scale operations to larger sites operated by BP, Caltex etc.
- Schools including pre-development, re-development, refurbishing, hazardous materials assessment.
- Childcare Facilities
- Energy Australia facilities including active sites and decommissioning of sites.
- Sewage Treatment Plants including the assessment of biosolids, installation works and initialization of site management plans and inspections.

PROJECT EXPERTISE

Air Quality Monitoring – Levels of volatile gases were monitored to determine Occupational Health and Safety (OH&S) compliance within an enclosed work environment.

Acid Sulphate Soil Assessment – Development areas within potential Acid Sulphate Soil regions were assessed to determine the presence, absence or extent of Acid Sulphate Soils. Duties included site surveys, soil sampling, chemical testing of soils, preparation of borehole logs, liaising with clients and regulatory authorities and report generation.

Asbestos Monitoring – Dust emissions from the demolition of a building and excavation of soil with known asbestos contamination were monitored in order to measure effects on the neighbouring properties. Duties included the use of technical equipment, liaising with site personnel, analysis of data and report generation.

Asbestos Removal – Work involved monitoring the removal and delineating the extent of contamination of bonded asbestos waste from an excavation site.

Buried Chicken Carcass Removal – Work involved monitoring the removal and delineating the extent of buried of chicken carcasses within an existing poultry farm.

Classification of Excavation Material, NSW – Involvement in classifying excavated material from development sites for removal to an appropriate landfill or assessing suitability for use within a proposed development. Duties included liaising with site personnel / contractors, soil sampling and descriptions, QA/QC and report generation.

Dilapidation Assessment –The assessment entailed a site visit and a written and photographic documentation of all structural cracks on walls, ceilings, pavements, grates and road surfaces in the vicinity of the site. The purpose is to establish the pre-existing condition of the buildings so that any claim made for defects that occur during or after construction can be validated. Duties included liaising with site personnel / contractors, site inspection and report generation.

Due Diligence Reports – Carried out in relation to property acquisition and due diligence. Duties varied from report reviews, comments, costing, desktop studies, sampling and assessment, and reporting.

Dust Monitoring – Dust emissions from construction sites were collected over a period of time in order to assess the specific amount of particulate matter escaping the construction area onto neighbouring properties.

Effluent Disposal – Work was undertaken to assess the suitability of soil material for the construction of an effluent treatment and disposal system. Duties included soil sampling, preparation of borehole logs, calculation of permeability and flow rates and report generation.

Environmental Management Plans – Preparation of how the earthworks program are to be undertaken during the development works, the environmental procedures to be followed during operation and includes an Occupation Health & Safety (OH&S) plan.

Ground Water Well Monitoring – Work involved instructing contractors on where to drill monitoring wells, construction and interpretation of survey data of the wells, measurements of groundwater levels, measurement of the rate of groundwater infiltration, sampling of groundwater, QA/QC, determining groundwater flow direction and report generation

Hazardous Materials Assessment – Structures proposed for demolition were surveyed for hazardous material such as asbestos, lead and other substances known to be harmful to human health and the environment. Duties included liaising with contractors and regulatory authorities, identification of hazardous materials, sampling of potential hazardous materials and report generation.

Lead Assessment – Buildings were surveyed for lead paint, dust and soils and assessed to determine if they were harmful to human health and the environment. Duties included liaising with government, regulatory authorities, identification of lead based materials, sampling of these materials and report generation.

Phase 1 Environmental Site Assessments (desktop) – Duties included historical searches, analysing aerial photographs, liaising with authorities (WorkCover, Council's, EPA etc), identification of potential contaminants and report generation.

Phase 2 Environmental Site Assessments – Duties included desktop study, liaising with clients, contractors and regulatory authorities, identification of potential contaminants, sampling and analysis design, soil and groundwater sampling, preparation of borehole logs, decontamination, QA/QC and report generation.

Remedial Action Plans – Options for the remediation of known contaminated sites were prepared in order to determine the most efficient methods of remediation. Duties included reviewing of previous environmental assessments, data analysis, design and costing of potential remedial options.

Remediation Validation – The collection of data to assess the efficacy of remediation works in decontaminating sites. Duties included liaising with clients, contractors and regulatory authorities, field sampling, QA/QC, data analysis and report generation.

Salinity Assessments – Duties included historical searches, analysing aerial photographs, liaising with authorities, identification of potential contaminants, sampling and analysis design, soil sampling, preparation of borehole logs, decontamination, QA/QC and report generation.

Sampling and Testing Plans – Preparation of sampling location, sampling density and testing program for ESA's and RemVal's that are sent to the Site Auditor for approval.

Site Audit Responses – replying to comments made by NSW Site Auditors on selected jobs to meet final requirements for a full clearance of a site after remedial works have taken place.

Site Based Management Plans – includes detailed management practices, and procedures for all identified environmental issues for every environmentally relevant activity (ERA) within the site. The plans provide the environmental procedures to be followed during operation and are to safeguard the way in which waste is managed.

Soil Vapour Survey – Soil vapours originating from beneath an apartment block development containing known contamination were monitored to assess the affects on human health. Duties included operation of technical equipment, sampling of soil vapours, QA/QC, analysis of data and report generation.

Targeted Environmental Site Assessments – Duties included historical searches, analysing aerial photographs, liaising with authorities, identification of potential contaminants, sampling and analysis design, soil and groundwater sampling, preparation of borehole logs, decontamination, QA/QC and report generation.

Underground Storage Tank Removal – Removal of underground storage tanks in order to satisfy regulatory requirements for the redevelopment of sites. Duties included historical searches, liaising with contractors and regulatory authorities, sampling and analysis design, soil and groundwater sampling, decontamination, QA/QC, data analysis and report generation.

MAJOR PROJECTS

- Auburn Hospital - Various soil classifications and leachate management for an EPA inert and solid licensed landfill.

- Australian Defence Industries site, St Marys – Former defence force lands. An extensive sampling program was managed and the results of soil analysis were reviewed with respect to human heath risk and potential ecological impact. Reports endorsed by accredited site auditor.

- Auburn Catholic Club - Sampling and soil classification of soils, followed by onsite management of the disposal of the soils to licensed landfills.

- Barter & Sons - Former poultry farm, scheduled for industrial / commercial development. Responsible for cost estimating, project management and co-

ordination of site investigation works. Included a review of available site history, and contamination assessment of soils, targeting heavy metals, pesticides and asbestos. Remediation recommended landfill disposal (industrial and solid waste category).

- Brown Consulting (NSW) Group - Newbury Estate, Stanhope Gardens - Former market garden and grazing site developed for low density residential purposes. Responsible for cost estimating, project management and co-ordination of site investigation works, remediation and validation. Included review of site history information, contamination assessment of soils waters and sediment. Remediation recommendations included Landfill disposal and land farming. Reported on site investigations, remediation options (Remediation Action Plan), and validation. Reports endorsed by accredited site auditor.

- Columban Mission Institute, North Turramurra - Duties included desktop study, liaising with clients, contractors and regulatory authorities, identification of potential contaminants, sampling and analysis design, soil and groundwater sampling, preparation of borehole logs, decontamination, QA/QC and report generation.

- Cronulla Sewage Treatment Plant – Classification of biosolids for disposal off site to other land uses or to landfills.

- Deicorp Pty Ltd – Coulson Street, Erskineville – Former clothing factory and workshops with a UST to be redeveloped into a number of multi-storey residential apartment blocks. The collection of data to assess the efficacy of remediation works in decontaminating the site. Duties included liaising with clients, contractors and regulatory authorities, field sampling, QA/QC, data analysis and report generation. Reports endorsed by accredited site auditor.

- Department of Commerce – Assessment of a number of Department of Housing sites for potential hazardous materials within active housing commission units.

- Department of Housing – Lilyfield - Development of a residential area. Duties included desktop study, liaising with clients, contractors and regulatory authorities, identification of potential contaminants, sampling and analysis design, soil and groundwater sampling, preparation of borehole logs, decontamination, QA/QC and report generation.

- Department of Lands – Redfern - Development of a major residential area. Duties included desktop study, liaising with clients, contractors and regulatory authorities, identification of potential contaminants, sampling and analysis design, soil and groundwater sampling, preparation of borehole logs, decontamination, QA/QC and report generation.

- Duffy Kennedy Constructions – Cronulla – A former service station site. Sampling and soil classification of soils, followed by onsite management of the disposal of the soils to licensed landfills.

- EG Property Group / Funds Management –Port Adelaide, SA, Summer Hill and Five Dock, NSW –Active transport company, wheat production plant and silos, former bowling greens, former railway lines, land filling activities, land reclamation. Reports for due diligence and full environmental site assessments, duties included desktop study, liaising with clients, contractors and regulatory authorities, identification of potential contaminants, sampling and analysis design, soil and groundwater sampling, preparation of borehole logs, decontamination, QA/QC and report generation.

- Energy Australia Substations - Various soil classifications and leachate management for an EPA inert and solid licensed landfill.

- Event Project Management - Bundaleer Street, Belrose – An active nursery to be redeveloped as part of extension works to the Covenant Christian School. A Phase 1 and Phase 2 contaminated land investigation with recommendations for remediation techniques and costs.

- Exceland Property Group (NSW) Pty Ltd – The Castellorizian Club at Kingsford. Duties included historical searches, analysing aerial photographs, liaising with authorities (WorkCover, Council's, EPA etc), identification of potential contaminants and report generation.

- Glasson Family Group – Wolli Creek – A large development site comprising a number of industrial properties including factories, warehouses, car yards etc. Conducting sampling and reporting on ASS/PASS and potential management techniques during future development.

- Glenbrook Sewer Installation - Environmental Representative for sewer installation contracts in Glenbrook. Responsible for the preparation of Environmental Management Plans (EMP) and work method statements. Monitored the works undertaken by the contractor, ensuring adequate environmental safeguards are in place and maintained. Prepared inspection reports and EMP status reports for Sydney Water.

- Granville Boys High School – assessment of soils and supervision of remedial works within an existing playing field. Remedial works included removal of soils contaminated with asbestos to an EPA licensed landfill.

- Group Development Services – Carrying out full assessments, from Stage 1 to Stage 4, on numerous rural residential sites in north western Sydney.

- International Speedway, Granville – Assessment of an existing spectator mound for asbestos and other soils analytes and recommendations for capping on-site.

- IWD Pty Ltd - Lyons Road, Drummoyne – A former service station with numerous UST's. The assessment included tank and line tests, gross pollution review, soil

sampling, groundwater sampling, historical review and final data interpretation. Remediation of contaminated soils after the tanks were removed, soil classification and final validating of site surfaces. Reports endorsed by accredited site auditor.

- JK Williams Contracting Pty Ltd - Various soil classifications and leachate management for an EPA inert and solid licensed landfill.

- John Morony Correctional Complex, Berkshire Park – assessment of soils and preparation of remedial costs prior to extension works to the existing prison.

- Landcom - Archbold Road, Eastern Creek and McIver Avenue, Middleton Grange – Former farming lands purchased by Landcom for residential subdivision, school developments, parklands and town centre (shopping facilities etc). Responsible for cost estimating, project management and co-ordination of site investigation works. Preparation of a preliminary RAP and recommendations in remediation techniques and costs.

- Liverpool City Council – Former park lands. Duties included historical searches, analysing aerial photographs, liaising with authorities (WorkCover, Council's, EPA etc), identification of potential contaminants and report generation.

- Mann Group - Various soil classifications and leachate management for an EPA inert and solid licensed landfill.

- Manson Group – Kogarah – Former glass factory with an UST. Preparation of a Remedial Action Plan (RAP), followed by remediation and validation of the site including project management, liaising with contractors and clients, sampling, soil classification and assessment, and final report generation.

- Narwee Boys High School – Preparation of a hazardous materials (HAZMAT) assessment. Analysis involved identifying asbestos materials from lagging, roofing guttering, floor tiles, electricity backing boards, mercury switches, mercury/cadmium lamps, synthetic mineral fibres, lead paint etc.

- Parramatta City Council - Sampling and soil classification of soils, followed by onsite management of the disposal of the soils to licensed landfills.

- Paynter Dixon Constructions Pty Ltd – Homebush – Teachers Credit Union site. Duties included historical searches, analysing aerial photographs, liaising with authorities (WorkCover, Council's, EPA etc), identification of potential contaminants and report generation.

- Penrith City Council - Claremont Meadows Stage 2 – South Western Precinct – Masterplan. Full environmental and salinity assessments were carried out to address the Claremont Meadows Stage 2 DCP - Performance Standards for which is currently under consideration by the Council for the Stage 1 Subdivision Plan of the properties provides for creation of residential allotments, dedication of a Public

Reserve, construction and dedication of new roads and creation of residue lots for future development.

- Proust & Gardner Consulting - Carrying out full assessments, from Stage 1 to Stage 4, on numerous rural residential and residential sites in both the local Sydney and Central Coast regions. Sites included vacant lands, farming lands, market gardens, poultry farms, residential properties and schools.

- Reefway Waste Services – Alexandria and Auburn – Active waste receivers and recyclers. Management of soil quality by analysing soils for reuse. Discussion with DECC on providing a 'gateway' mechanism for removing bona fide resource recovery from the waste regulatory framework.

- Richard Crookes Constructions Pty Ltd – Various soil classifications and leachate management for an EPA inert and solid licensed landfill.

- Robert Moore & Asscoiates - Carrying out full assessments, from Stage 1 to Stage 4, on numerous rural residential and residential sites across Sydney. Sites included vacant lands, farming lands, market gardens and residential properties.

- Royal Botanical Gardens, Sydney – Former works depot. Managing removal of UST's and associated pipelines, sampling and soil classification of soils to an EPA inert and solid waste licensed landfill.

- Sam the Paving Man - Sampling and soil classification of soils, followed by onsite management of the disposal of the soils to licensed landfills.

- Stocklands Mall, Merrylands - Former carpark area. Sampling and soil classification of soils, followed by onsite management of the disposal of the soils to licensed landfills.

- SPAD Pty Ltd – Former chemical factory. Report for full environmental site assessment, duties included desktop study, liaising with clients, contractors and regulatory authorities, identification of potential contaminants, sampling and analysis design, soil sampling, preparation of borehole logs, decontamination, QA/QC and report generation. Preparation of a RAP, managing remedial works and issuing final validation report.

- Sydney Airport Corporation – Soil classification and leachate management for an EPA solid licensed landfill.

- Telstra Depot, Rooty Hill - Report for full environmental site assessment, duties included desktop study, liaising with clients, contractors and regulatory authorities, identification of potential contaminants, sampling and analysis design, soil sampling, preparation of borehole logs, decontamination, QA/QC and report

generation. Preparation of a RAP, managing remedial works and issuing final validation report.

- THG Resource – Kingston, QLD –Active scraps metal and car recycler. Duties included detailing management practices, outlining procedures for all identified environmental issues and providing a plan during operation to safeguard the way in which waste is managed.

- University of Sydney - Various soil classifications and leachate management for an EPA inert and solid licensed landfill.

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8 August, 2013

Ms Linda Zanotto
Senior Environmental Engineer
Benbow Environmental
13 Daking Street
PARRAMATTA NSW 2151

Email: LZanotto@benbowenviro.com.au

Dear Linda,

Re: 126 Andrews Road, Penrith
EIS Submission Response - Traffic

This letter refers to the letter dated 22 July 2013 from Penrith City Council to the NSW Department of Planning and Infrastructure. Its purpose is to address the comments on page 4 of that letter regarding traffic management at the proposed Glass Benefication Plant at 126 Andrews Road, Penrith.

1. Car Parking and Manoeuvring to meet AS2890.1 and AS2890.6

The proposal includes a large car park adjacent to the site entrance on the northern boundary, with parking for up to 106 cars. This area is ideally suited to a car park and can easily accommodate all the requirements of current Australian Standards for off street parking including manoeuvring and access. It is agreed that detail design of car parking should meet the requirements of AS2890.1 and AS2890.6 and there is no objection with this being required as a condition of approval.

2. Sight lines around driveways

It is agreed that the detail design of the access driveway should ensure that fences and landscaping will not restrict sight distances. There is no objection with this being required as a condition of approval.

3. Heavy vehicle layover and access

The planned operation of the site does not involve layover parking of heavy vehicles. See attached advice from Glass Recovery Services Plant Manager, Adam Davies, regarding management of trucks entering the site, which confirms that there is no risk of trucks queuing on street.

There will be no difficulty providing adequate on site space for trucks entering the site, using the weighbridges and loading/unloading. Future detailed design will identify appropriate operation and areas for trucks servicing the site. There is no objection to a condition of approval that requires all truck parking to be accommodated on site.

Regarding truck turning and manoeuvring at the access driveway, it is acknowledged that improvements are required on Andrews Road to facilitate the planned use of trucks up to the size of B-doubles. This is addressed further in response to the following point.

4. Driveway Intersection Upgrade

Council's suggestion for the intersection treatment on Andrews Road at the driveway to the site to be a type CHR-Protected Turn with a deceleration lane and taper for left turns into the property is acknowledged and agreed. The design of this intersection will take into account the potential for use by B-double trucks. There is no objection with this being required as a condition of approval.

I trust this information will be of assistance.

Yours faithfully

Geoff Morris
Senior Traffic Consultant
Transport and Urban Planning Pty Ltd

From: Adam Davies [mailto:Adam.Davies@glassrecovery.com.au]
Sent: Wednesday, 7 August 2013 4:34 PM
To:
Subject: Traffic Management

Hi Brent,

As discussed all trucks are weighed in as they enter the site. The trucks once on the weighbridge would be processed within 2 minutes before entering site to tip-off or load. The truck movements will be spread out throughout the day such that there is generally only one truck using the weighbridge at one time. In the unlikely event that there are a number of trucks wanting to enter the site the outgoing weighbridge can be used to accommodate a second truck to be processed simultaneously. Further to this if there is ever more then 2 trucks using the weighbridges the site has enough roadway internal to the site and before the weighbridges to allow up to a further 5 trucks to wait. There would never be an instance where trucks would obstruct the public road before being able to enter the site.

If you require any further information please contact me.

Regards,

Adam Davies

Plant Manager
Glass Recovery Services
Penrith Plant
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www.glassrecovery.com.au

Brent Winning
Principal Consultant
Claron Consulting
PO Box 115
Castle Hill, NSW 1765

20 August 2013

Attention: Brent Winning

Dear Brent,

RE: Response to Submission for Penrith Glass Beneficiation Project EIS – 126 Andrews Road Penrith

I refer to the email from Linda Zanotto dated 31/07/13 requesting a response for the submission received for the EIS for the Penrith Glass Beneficiation Plant. Please find below our response to Penrith Council's and the NSW Office of Water's submissions.

Penrith City Council:

Waterway/Floodway Management Considerations

- *There is an unnamed waterway adjacent to the western boundary of the site. The EIS states that this waterway is a second order stream. Should any works occur within waterfront land (within 40m of this water) a controlled activity approval is required from the NSW Office of Water, prior to the commencement of any works. The integrity of the riparian corridor is to be preserved and maintained in line with the Office of Water's guidelines and objectives for the riparian corridor management.*
    - Noted, a controlled activity will be applied for.

- *The development includes a substantial increase to the hard surface are as part of the proposal (including hardstand, driveways, parking areas, loading bays, covered storage areas, etc.). A water management plan should be submitted to include an investigation into the feasibility of installing rainwater tanks, and/or stormwater detention systems on the site. Maintaining the natural water balance through such measures, especially for flows to the significant wetland, should be promoted. If any such measures were unable to be implemented the reasons why should be explained and justified. The Environmental Impact Statement (EIS) outlines that potable water (22,300.3ML) will be used for dust suppression on site through water foggers and water sprays. Harvested rainwater from the site could potentially be used to satisfy this purpose.*
    - The areas of the site where the proposed new hardstand areas are to be located are currently within the existing operating zone of the site. These areas currently are of compacted, hard packed earth and not a suitable all weather surface. Replacing these areas with concrete would result in a minimal impact as the existing surface currently behaves in an impervious manner. Any rainwater tank would need to collect runoff from roof areas of the existing building. The size of rainwater tanks would also be restricted by finding a suitable location that isn't restricted by heavy vehicle movements. A smaller tank could be provided to capture some of the flows to provide a portion of mains reduction.

- *It is noted that all water quality modelling performed assumes that the glass cullet material was sufficiently*

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cleaned prior to storage in the outdoor bunkers. This assumption does not appear to be suitably justified within the EIS, and will affect the MUSIC modelling results informing the size of the wetland and GPT's proposed to be installed to treat the stormwater runoff from the site. In order to be completely satisfied that the pollution reduction targets will be achieved, the MUSIC model needs to include a report clearly identifying catchment breakup, splitting of surface types and all other assumptions that have been made in the model. Modelling parameters for the determination of the size and configuration of WSUD elements must be in accordance with MUSIC Modelling Guidelines for New South Wales. Electronic copies of the model should be submitted to the department for interrogation and review.

- A MUSIC model and report can be submitted conforming to the above. A MUSIC model has been prepared as part of Construction Certificate documentation. It should be noted that the glass cullet CANNOT be directly modelled in MUSIC, so whether it is clean or not is academic. The only consideration is that the cullet will behave firstly as a gross pollutant for the larger size component and the as a suspended solid for the further portion.

- *As the development could result in water quality impacts in the nearby regionally significant wetland, the water quality at that wetland should be monitored for pollutants prior to the commencement of works, and at regular intervals during construction and/or operation. Section 5.3.9 of the EIS states that a water monitoring program will be implemented, to ensure that the treatment of stormwater from the site will achieve the desired results in terms of water quality leaving the site, however no details on this program have been provided. A detailed water monitoring program, including procedures and implementation responsibilities, is to be established for the site prior to the commencement of works. All monitoring is to be undertaken in accordance with any relevant guidelines of the Office of Environment and Heritage (or any other applicable guidelines).*
  - Noted

- *No details have been provided on the design parameters of the constructed wetland, such as depth or where macrophyte zones are located. BioDesign's landscape planting plan shows generic detail only. Best practice wetland design incorporates benching or bands of shallow and deep water macrophytes perpendicular to the direction of flow to guarantee contact time with the vegetation. The wetland layout needs to demonstrate that it is fit for purpose and results in biological treatment as well as physical treatment. A comprehensive monitoring regime must also be developed and implemented for the commissioning and ongoing functioning of the wetland to ensure water quality objectives are achieved.*
  - Further details on wetland depths were intended to be presented in Construction Certificate documentation, planting details are proposed by the landscape architect.

- *Specification and installation details of the GPTs and a comprehensive operation and maintenance manual / schedule for all proposed devices and treatment measures are to be submitted prior to the commencement of construction works. This should include the operational capacity criteria that will trigger clean out, location and access details, and inspection and cleaning responsibilities, frequency schedules and checklists. For example, the fabric filters proposed on the stormwater pits will fill quickly with sediment and require a regular monitoring and cleaning regime.*
  - Noted, this is will be provided, such detail was intended to be provided with Construction Certificate documentation once a detailed assessment of stormwater flows was carried out as the size of GPT's is largely dependent on the size of stormwater pipes.

- *Further details on the swales must be provided with regards to their design parameters. The design parameters should be based on the numeric modelling to demonstrate water quality treatment functionality. The swales should incorporate filter media that meets the current specifications of the Bioretention Filter Media Guidelines produced by the Facility for Advancing Water Filtration or demonstrated equivalent and verified by a soil laboratory registered by the National Association of Testing Authorities. The swale design must also consider*

access for cleaning and maintenance. Access requirements should include hard access to base; ease of access to inlet area and adequate access to reach flush points.

- Swales proposed were intended to form part of the wetland and as such are included as part of the wetland detail.

- *Outlets from the GPTs, treatment wetland and swales shall be treated with appropriate measures to dissipate stormwater velocity and prevent erosion.*
  - Inlet pools to the wetland are to be provided at the GPT outlet locations to dissipate velocities, the outlet for the wetland is also to be provided with scour protection. This is a detailed design consideration not for DA.

- *The level of ecological assessment for the proposal does not appear to have adequately considered the function of the regionally significant wetland, given the likely impacts of the development on the wetland habitat, hydrological regime, water quality regime, and substratum, organic matter cycling or other characteristics. The Director General's Requirements specify the need to describe the state of the receiving waters in relation to relevant water quality and flow objectives. This has not been adequately achieved.*
  - Noted, the development proposes no modification to the existing wetland. The development proposes to meet water quality reduction targets through a proposed wetland.

- *The flood assessment undertaken has not addressed the flood runner associated with mainstream flooding in the Nepean River where it backs up Boundary Creek, overtops the bank heading northwards toward this site and beyond. The impact of the proposed development on the flood runner needs to be considered for all events up to the PMF. In this regard the consultants assertion that the property is not 'floodway' has not been sufficiently demonstrated.*
  - Brown Consulting have used the existing 100 year flood level given issued by Council of RL 25.4 which we believe should account for any local flow which contribute to this level. A flood assessment has only been performed in areas where works are proposed which would alter flood storage volumes. No PMF information was supplied by Council when flood level information was requested. Why is this an issue now?

- *The flood assessment has discussed local flooding being directed along the western boundary to the south to Boundary Creek. Information available to Council indicates that part of the local flooding regime will be directed to Farrell's Creek to the North along the drainage channel in Andrews Road. The flood assessment will need to be revised accordingly to consider this aspect.*
  - See above, the current development proposes no work to the western boundary hence now assessment has been performed in this area as no changes to flood storage volumes are to occur.

- *The Brown Smart Consulting Report has discussed the need to upgrade culverts beneath the driveway to the proposed development to provide flood free access and prevent future flooding of the property. Council agrees with this assessment and notes that as this work is in Council's drainage reserve owners consent and a Section 68 Local Government Act approval will be required before the commencement of any works. It should also be noted that Council holds an outstanding works bond for similar work on the previous owner as a result of the original development of the site.*
  - Noted, however the current development application does not propose any upgrade to these culverts as part of the internal works. A separate construction approval will be sort for these works at a future date.

- *The building should be flood proofed up to the flood planning level in accordance with Council's DCP.*

- The building is existing and currently sits 40mm above the existing flood level of RL 25.4 under existing approvals. No works is proposed on the buildings structure.

- *As the storage bunkers are below the 100 year flood level measures must be proposed to ensure that stored glass products or other stored materials are not transported away from the site during the relevant flood events.*
  - Walls are proposed around the perimeter of the concrete hardstand/storage bunker areas to a level 100mm above the 100 year ARI flood level, as such these areas are bounded and the direction of stormwater flow in areas bounded by the walls are directed to GPT's which are capture any glass material before flows exit the site.

NSW Office of Water:

The NSW office of water comments are largely directed towards landscaping issues, however they do comments that all surface drainage be directed to GPT's prior to discharge which our response has been previously documented.

Should you require any further information on this, please do not hesitate to contact either Brendan Hill or myself on 8808 5000.

Yours sincerely
Brown Consulting (NSW) Pty Ltd

Robert Peterson
Manager - Water and Environment

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Attachment 7: X11354 EPA letter Rev01 – Brown Smart Consulting (17 May 2013)

Our Ref: X11354 EPA Letter_Rev01.docx

BROWN
Smart Consulting

Brent Winning
Principal Consultant
Claron Consulting
PO Box 115
Castle Hill, NSW 1765

17 May 2013

Attention: Mr Brent Winning

Dear Brent,

RE: 126 Andrews Road Penrith, EPA Clarification

Introduction

I refer you to the letter from EPA dated 25/03/13 from Jacqueline Ingham titled *Revised Adequacy Assessment – Penrith Glass Beneficiation Project SSd-5267* and also to further conversations with yourself regarding EPA's concern with flood inundation and mobilisation of the recycled glass material in the 100 year ARI storm event.

The letter from EPA requested clarification with certain elements of the design with respect to drainage and water quality. Clarification to the dot points noted in the letter is given below:

- Clarify whether the bunkers will be constructed so that these will not be inundated or discharge waste and/or leachate during a 1 in 20 year ARI flood event and during the 1 in 100 year ARI flood event.
    - The 1 in 20 year ARI flood level was not provided to Brown Consulting from Penrith City Council therefore an assessment on inundation cannot be made without further information. In the 1 in 100 year ARI flood event the bunkers will be inundated however the site is to drain in such a manner that flows are directed to G.P.T's as further explained below.
- Clarify the drainage of this area is to include;
    - Whether the bunker will be designed to drain to the wetlands.
        - The bunkers are designed to drain to the wetlands but not before draining to the proposed G.P.T's as shown in **Figure 1** below.

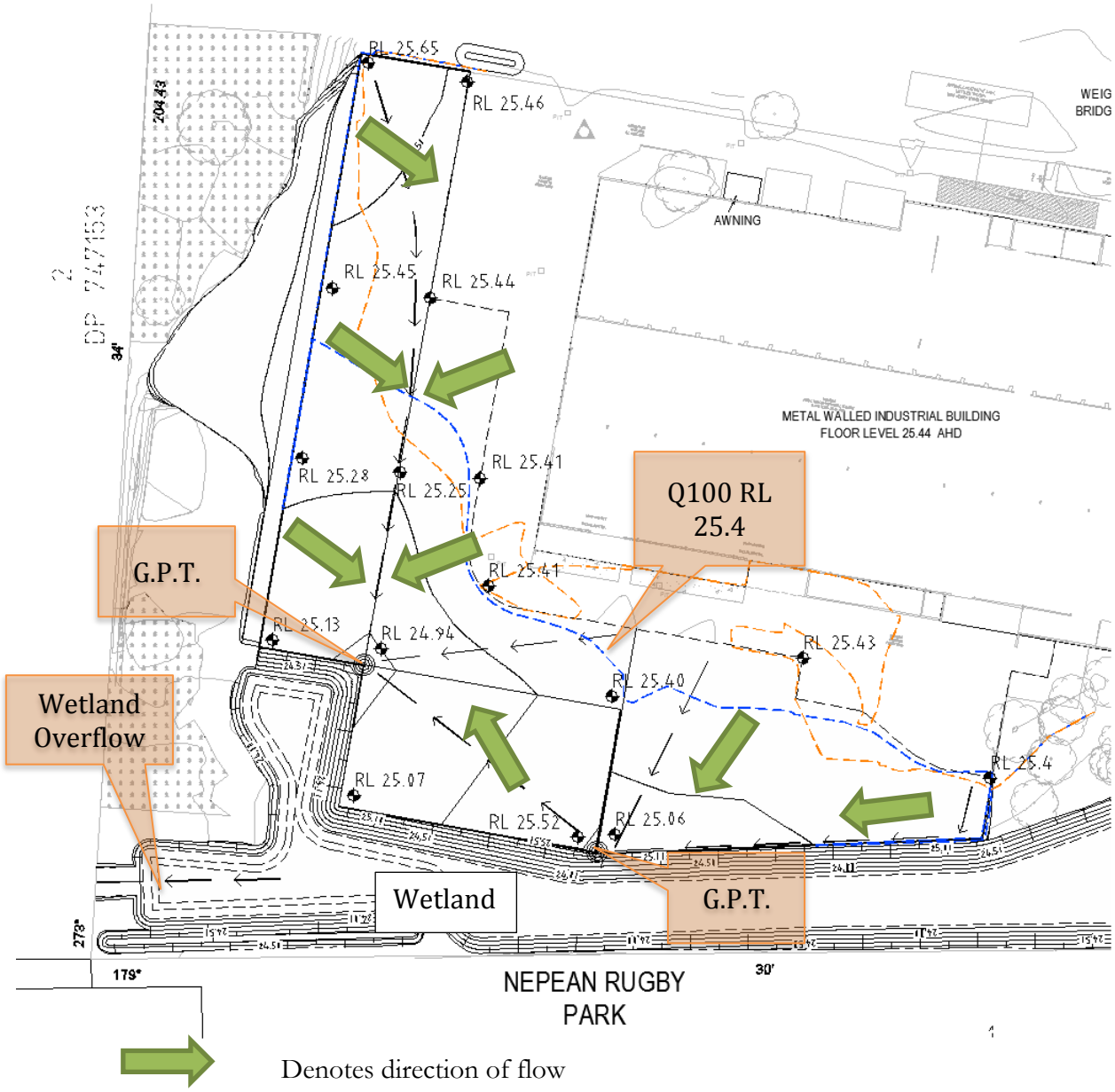


Figure 1: Drainage Concept

- Whether the GPT's constructed at the two low points will collect runoff from the bunkers and will be able to remove entrained glass cullet.
  - The GPT's proposed are CDS type units or equivalent and will be capable to capture any glass cullet carried by runoff before outflowing into the proposed wetland.

- Clarify the design parameters of the constructed wetland, to include polishing of runoff from the bunkers.
  - The wetland was sized in *MUSIC*. The wetland and GPTs were sized in order to meet the pollution reduction targets of 85% reduction of Total Suspended Solid, 45% reduction of Total Phosphorus, and 45% of Total Nitrogen generated from the area of new works on site. Modelled rainfall data used in the *MUSIC* model was modified to suit local Penrith conditions and the catchment pollutant concentration parameters based on those specified in *Draft NSW MUSIC*

Modelling Guidelines (Sydney Metro CMA, August 2010). The pollutant concentration parameters used are given below in **Table 1**.

Table 1: MUSIC Concentration Parameters

Base Flow Concentration Parameters

Concentration (mg/L-log$_{10}$)						
	TSS		TP		TN	
	mean	std. dev	mean	std. dev	mean	std. dev
Land use/zoning						
Residential	1.20	0.17	-0.85	0.19	0.11	0.12
Commercial	1.20	0.17	-0.85	0.19	0.11	0.12
Industrial	1.20	0.17	-0.85	0.19	0.11	0.12
Rural residential	1.15	0.17	-1.22	0.19	-0.05	0.12
Agricultural	1.30	0.13	-1.05	0.13	0.04	0.13
Forest	0.78	0.13	-1.52	0.13	-0.52	0.13
Surface type						
Roofs	n/a	n/a	n/a	n/a	n/a	n/a
Sealed roads (if contains a pervious fraction e.g. verge)	1.20	0.17	-0.85	0.19	0.11	0.12
Unsealed roads[1]	1.20	0.17	-0.85	0.19	0.11	0.12
Eroding gullies[1]	1.20	0.17	-0.85	0.19	0.11	0.12

Storm Flow Concentration Parameters

Concentration (mg/L-log$_{10}$)						
	TSS		TP		TN	
	mean	std. dev	mean	std. dev	mean	std. dev
Land use/zoning						
Residential	2.15	0.32	-0.60	0.25	0.30	0.19
Commercial	2.15	0.32	-0.60	0.25	0.30	0.19
Industrial	2.15	0.32	-0.60	0.25	0.30	0.19
Rural residential	1.95	0.32	-0.66	0.25	0.30	0.19
Agricultural	2.15	0.31	-0.22	0.30	0.48	0.26
Forest	1.60	0.20	-1.10	0.22	-0.05	0.24
Surface type						
Roofs	1.30	0.32	-0.89	0.25	0.30	0.19
Sealed roads	2.43	0.32	-0.30	0.25	0.34	0.19
Unsealed roads[1]	3.00	0.32	-0.30	0.25	0.34	0.19
Eroding gullies[1]	3.00	0.32	-0.30	0.25	0.34	0.19

All water quality modelling was performed on the basis that the glass cullet material was sufficiently cleaned prior to storage in the outdoor bunkers therefore no specific modelling parameters were introduced. All surface drainage on proposed concrete hardstand areas and bunker locations are

designed to be directed to GPT's prior to discharge into the proposed wetland for further treatment.

With regards to EPA's concerns regarding mobilisation of the recycled glass material during the 100 year ARI storm event and possible pollution of the downstream watercourses with the recycled material, it is proposed to contain the material with raised walls around the perimeter of the bunker and hardstand areas. The 100 year ARI flood level provided to Brown Consulting by Penrith City Council at the site location is RL 25.4, the proposed bunker/hardstand area low point is located at RL 24.94 which correlates to a worse case inundation of 460mm, it is understood that EPA is concerned with the mobilisation of the material and possible spillage over proposed kerbing and wall edges and therefore bypassing gross pollutant traps. It is proposed to extend the perimeter walls and kerbing of the bunker and hardstand areas to RL 25.5, 100mm above the 100 year ARI. This will contain any mobilisation of the recycled materials within the hardstand/bunker areas and enforce the original drainage concept as explained previously. Flood waters will still be capable of extending into the hardstand/bunker areas through backwater effects via the proposed gross pollutant traps, all receding flooding will drain back out through the gross pollutant traps. The wall extents can be viewed in the Sketch Plan presented in **Attachment A**.

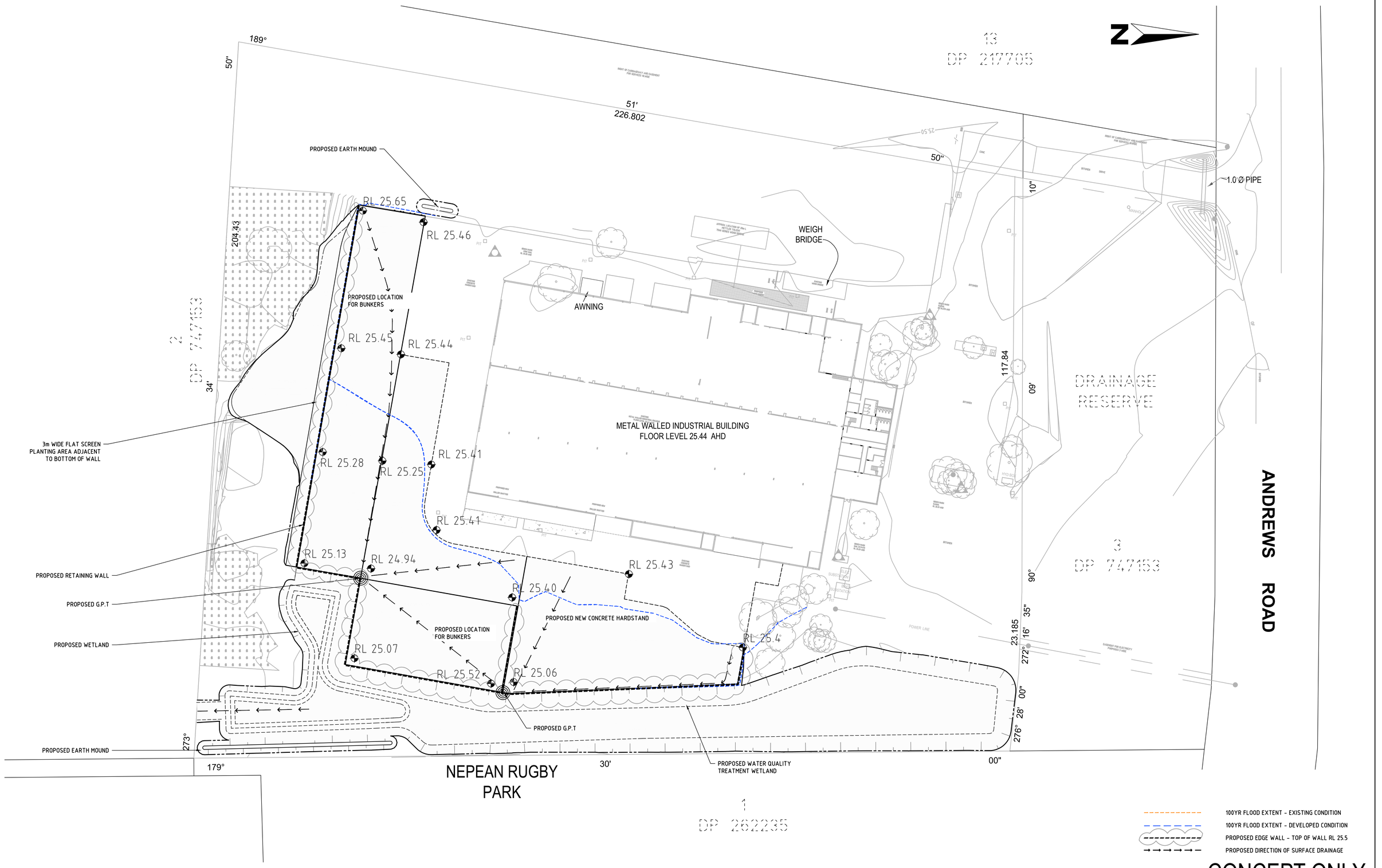
If any further clarification is require in response to EPA comments then please contact Brendan Hill on 8808 500.

Yours sincerely
Brown Consulting (NSW) Pty Ltd

Brendan Hill
Engineer - Water and Environment

Encl.
Attachment A – X11354.W_WE_EPA_SK001

ATTACHMENT A



PLAN
SCALE 1:500 (A1)

0 5 10 15 20 25 30 35 40 45 50
SCALE 1:500 (A1) SCALE 1:1000 (A3)

CONCEPT ONLY

BROWN Smart Consulting

CLARON CONSULTING PTY LTD

126 ANDREWS ROAD PENRITH
EARTHWORKS AND FLOOD VOLUMES

TITLE
DRAINAGE CONCEPT AND WALL PLAN FOR EPA CONCERNS

DRAWING	DATE	REV
X11354.W_WE_EPA_SK001.DWG	17/05/2013	00

Sheet: 07.05.2013, By: brendan.hill, Printed: 17/05/2013 41X11X11354.W - Andrews Road Penrith Water Drawings\Water\Sketches\X11354.W_WE_EPA_SK001.dwg

BioDesign

Brent Winning
Project Manager
Claron Consulting
PO Box 115
Castle Hill NSW 1765

11 May, 2012

Dear Brent,

Subject: Landscape impacts of proposed pavement extensions at 126 Andrews Road Penrith

A visual survey of the portion of the site where works are proposed identified that is has been previously cleared of almost all indigenous vegetation with the exception of a single, large *Eucalyptus tereticornis* specimen. The southern portion of the site where no works are proposed contains some small trees and shrubs that were not surveyed due to their distance from the works but it was noted that they included *Melaleuca* spp. likely indigenous to the area. The whole landscape surrounding the existing development consists mainly of Kikuyu grass that is heavily weed infested with tree plantings along the boundaries. The trees are a mixture of locally indigenous species and species that are indigenous to Sydney. They include a mature *Eucalyptus tereticornis* specimen that appears to be regrowth.

Due to the highly disturbed site conditions and the lack of vegetation layers, a flora survey was not carried out. The proposed works include a landscape plan that will:

1. Control weeds
2. Establish locally indigenous plant species on the site
3. Create layers of vegetation that are consistent with the natural ecological communities in the immediate vicinity of the site (including the wetland area)
4. Retain the large logs of felled trees for habitat
5. Work with the drainage on the site to ensure wetland flows are maintained.

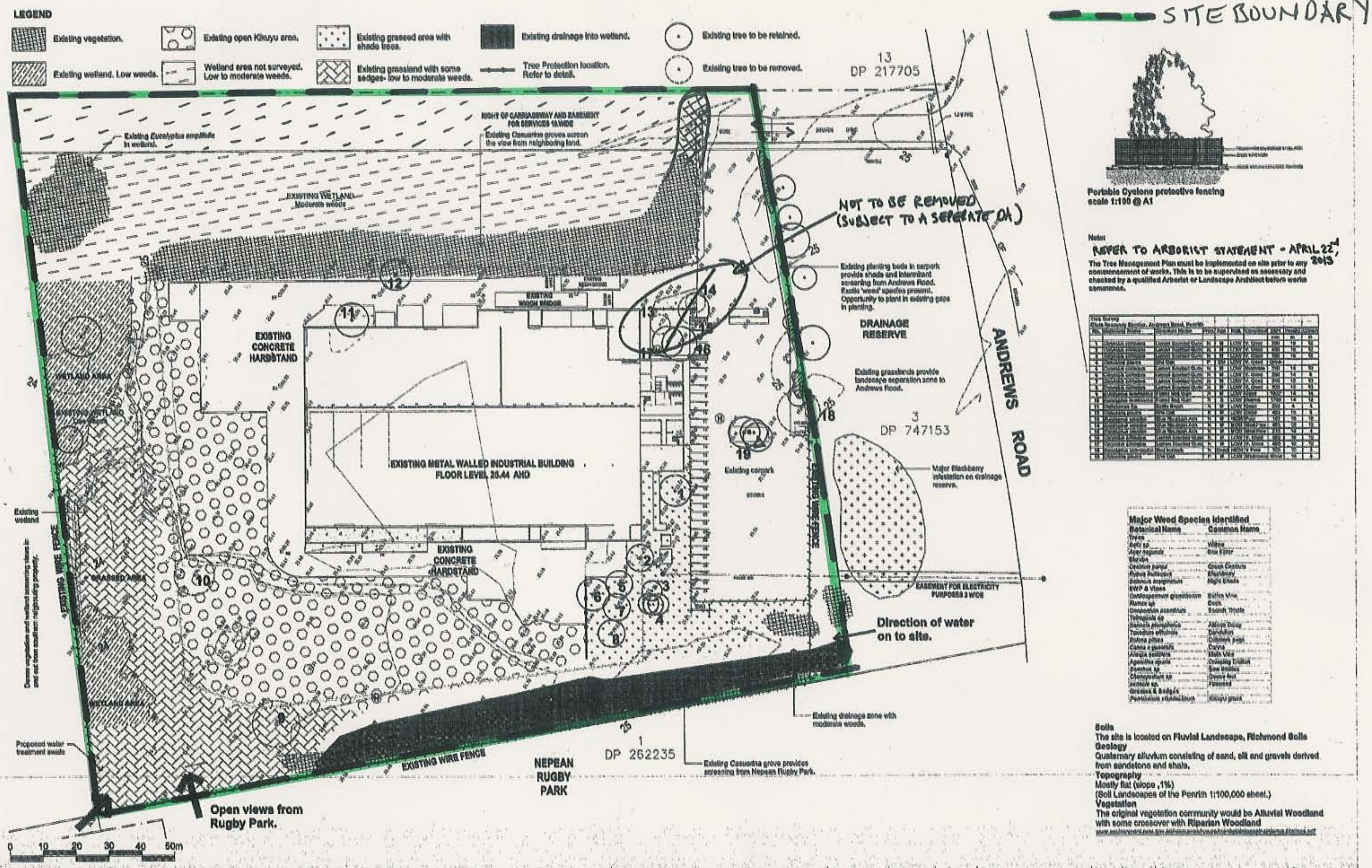
The landscape plan was prepared in close consultation with the hydrological engineer. On the basis that the proposed Flood Storage measures developed by Brown Smart Consulting and detailed in their report of 26 April 2012 will not adversely impact on wetland flows, it can be expected that the ecological values of this site will be greatly enhanced and improved under the proposed landscape and that adverse impacts on the local catchment associated with weeds will be reduced. Over time it can be expected that the habitat values of the site for local fauna species will improve significantly.

Yours sincerely,

Sue Hobley

BSc (Environmental Horticulture), Grad. Dip. Sc.

Attachment 9: Revised A4 Landscape Plan (Sheet 1/3), BioDesign & Associates



LEGEND
Existing vegetation.
Existing wetland. Low weeds.
Existing open Kikuyu area.
Wetland area not surveyed. Low to moderate weeds.
Existing grassed area with shade trees.
Existing grassland with some sedges- low to moderate weeds.
Existing drainage into wetland.
Tree Protection location. Refer to detail.
Existing tree to be retained.
Existing tree to be removed.
SITE BOUNDARY
13
DP 217705
RIGHT OF CARRIAGEWAY AND EASEMENT FOR SERVICES 18 WIDE
Existing Casuarina groves screen the view from neighboring land.
Existing Eucalyptus amplifolia in wetland.
EXISTING WETLAND Moderate weeds
NOT TO BE REMOVED (SUBJECT TO A SEPERATE DA)
Existing planting beds in carpark provide shade and intermittent screening from Andrews Road. Exotic 'weed' species present. Opportunity to plant in existing gaps in planting.
DRAINAGE RESERVE
Existing grasslands provide landscape separation zone to Andrews Road.
ANDREWS ROAD
3
DP 747153
EXISTING CONCRETE HARDSTAND
EXISTING WASH BRIDGE
EXISTING METAL WALLED INDUSTRIAL BUILDING FLOOR LEVEL 25.44 AHD
Existing carpark
Major Blackberry infestation on drainage reserve.
EASEMENT FOR ELECTRICITY PURPOSES 3 WIDE
EXISTING WIRE FENCE
Direction of water on to site.
WETLAND AREA
GRASSED AREA
Existing wetland
Proposed water treatment swale
Existing drainage zone with moderate weeds.
1
DP 262235
Existing Casuarina grove provides screening from Nepean Rugby Park.
NEPEAN RUGBY PARK
Open views from Rugby Park.
0 10 20 30 40 50m
Portable Cyclone protective fencing scale 1:100 @ A1

Note

REFER TO ARBORIST STATEMENT - APRIL 22nd, 2013

The Tree Management Plan must be implemented on site prior to any commencement of works. This is to be supervised as necessary and checked by a qualified Arborist or Landscape Architect before works commence.

Major Weed Species identified

Botanical Name	Common Name
Trees	
Salix sp	Willow
Acer negundo	Box Elder
Shrubs	
Cestrum parqui	Green Cestrum
Rubus fruticosus	Blackberry
Solanum [illegible]	Night Shade
SWP & Vines	
Cardiospermum grandiflorum	Balloon Vine
Rumex sp	Dock
Onopordum acanthium	Scotch Thistle
Tetragonia sp	
Senecio [illegible]	African Daisy
Taraxacum officinale	Dandelion
Bidens pilosa	Cobbler's pegs
Canna x generalis	Canna
Araujia sericifera	Moth Vine
[illegible]	Creeping [illegible]
Sonchus sp	Sow Thistle
Chenopodium sp	[illegible]
[illegible] sp.	Fireweed
Grasses & Sedges	
Pennisetum clandestinum	Kikuyu grass

Soils
The site is located on Fluvial Landscape, Richmond Soils
Geology
Quaternary alluvium consisting of sand, silt and gravels derived from sandstone and shale.
Topography
Mostly flat (slope ,1%)
(Soil Landscapes of the Penrith 1:100,000 sheet.)
Vegetation
The original vegetation community would be Alluvial Woodland with some crossover with Riparian Woodland

BioDesign

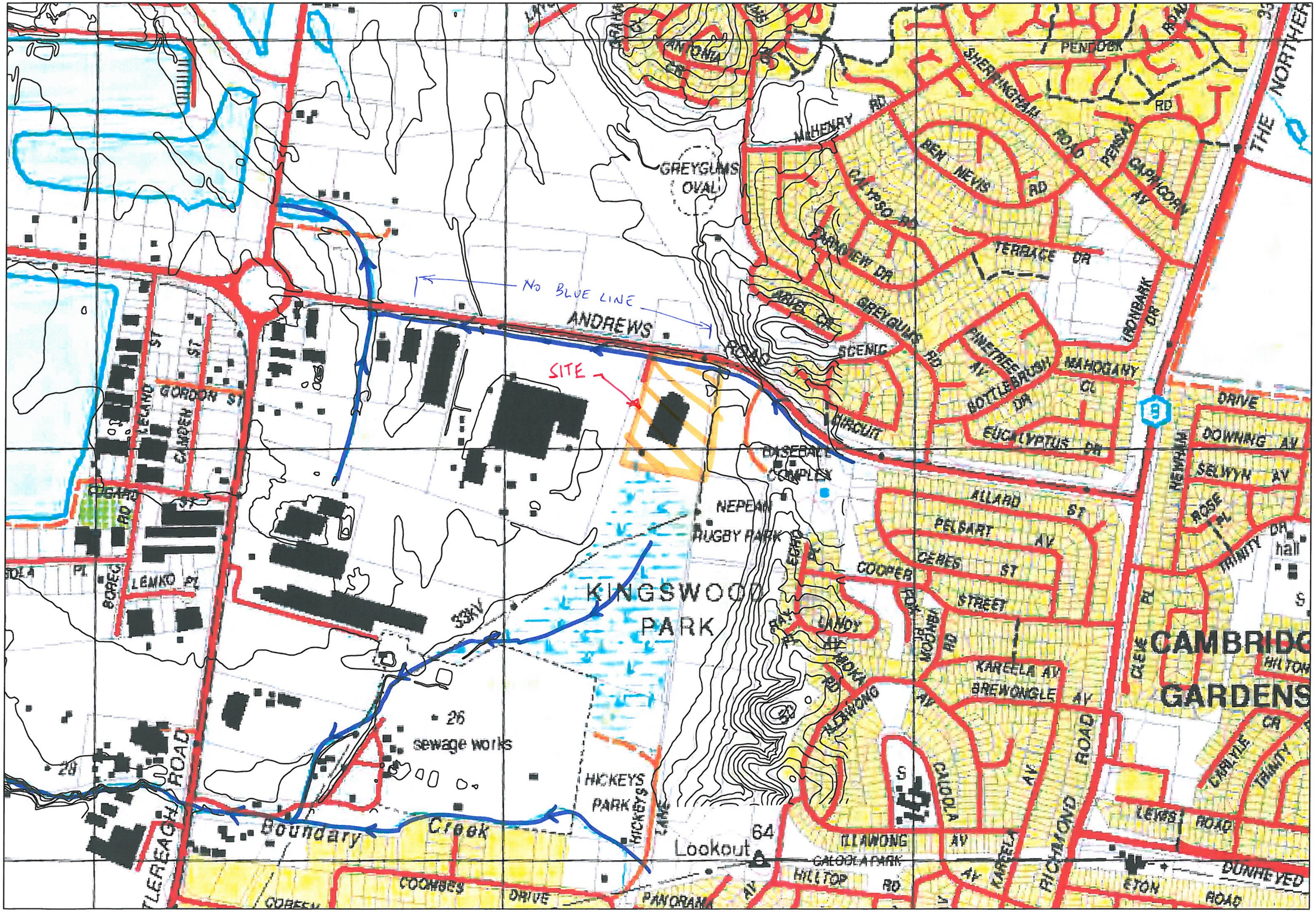
Project: Glass Recovery Service Pty Ltd, 126 Andrews Road, Penrith, Lot 1 DP 747153

Client: CLARON CONSULTING PTY LTD, PO Box 115, Castle Hill NSW 1765

Drawn: AL | Checked: WW | Scale: 1:500 @ A1 | Date: 05/11/12

Drawing: Landscape Plan, Site Analysis, Tree Survey and Assessment | Sheet 1/3

REV. C 26/8/13 (SHOWING SITE BOUNDARY)



No BLUE LINE
SITE
ANDREWS
ROAD
GREYGUMS OVAL
McHENRY RD
PENDOCK
SHERINGHAM ROAD
BEN NEVIS RD
CALYPSO RD
PENSAY
CAPRICORN AV
TERRACE DR
ARIEL CR
GREYGUMS RD
SCENIC
PINETREE AV
BOTTLEBRUSH DR
MAHOGANY CL
EUCALYPTUS DR
CIRCUIT
IRONBARK DR
DRIVE
DOWNING AV
SELWYN AV
ROSE PL
TRINITY DR
BASEBALL COMPLEX
NEPEAN RUGBY PARK
ALLARD ST
PELBART AV
CERES ST
COOPER
STREET
KINGSWOOD PARK
33kV
KARELLA AV
BREWONGLE AV
CAMBRIDGE GARDENS
GORDON ST
CAMDEN ST
LEGANO
LENKO PL
26
sewage works
HICKEYS PARK
HICKEYS LANE
Boundary Creek
Lookout
64
ILLAWONG AV
CALOOLA PARK
HILLTOP RD
COOMBES DRIVE
PANORAMA AV
RICHMOND ROAD
LEWIS ROAD
DUNHEVED
ETON
ROAD
CASTLEREAGH ROAD
THE NORTHERN