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REPORT
on
PHASE 1 CONTAMINATION ASSESSMENT

SOUTH WERRINGTON SUB PRECINCT

Prepared for
UNIVERSITY OF WESTERN SYDNEY AND SOUTH WERRINGTON PLANNING COORDINATION GROUP

Project 43739A Rev1
April 2007

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EXECUTIVE SUMMARY

Douglas Partners Pty Ltd (DP) conducted a Phase 1 Contamination Assessment at the proposed South Werrington Sub precinct, comprising fourteen individual property lots. The work was commissioned by Fitzwalter Group Pty Ltd, acting on behalf of the University of Western Sydney. The assessment comprised a review of available site history documentation and walkover site inspections conducted between 14 February and 10 March 2006.

The objective of this assessment was to assess the potential for contamination resulting from past and present activities conducted at the site. No intrusive soil or water environmental sampling was undertaken as part of this assessment. As such no detailed comments can be made at this stage regarding the subsurface conditions.

A review of available historical information and aerial photographs indicates that site has mainly been used for agricultural purposes since at least the 1840s. Based on the findings of this Phase 1 Contamination Assessment, fifteen separate Areas of Environmental Concern (AEC) were identified across the site.

Given the current proposal for urban redevelopment of the site (including sensitive land-uses), it is recommended that field based investigations are carried out on-site, focusing in particular on each of the identified AECs to confirm the suitability for the proposed land-use. The field based investigations would most likely involve the excavation of test pits or drilling of test bores and sample collection at regular depth intervals. As a minimum the test pits should cover all identified AECs. A suitable sampling density should be used in accordance with the NSW EPA Sampling Design Guidelines, which will be determined by the extent of the investigation area of each AEC at the time of the assessment. The analysis of selected samples should target the potential contaminants identified as heavy metals (As, Cd, Cr, Cu, Hg, Ni and Zn), total petroleum hydrocarbons (TPH), monocyclic aromatic hydrocarbons (Benzene, Toluene, Ethyl Benzene and Xylene – BTEX), polycyclic aromatic hydrocarbons (PAH), organochlorine pesticides (OCP), organophosphorus pesticides (OPP), polychlorinated biphenyls (PCB) and asbestos. It is also recommended that a limited amount of sampling be conducted in non-AEC areas to determine background levels of potential contaminants.

If off-site disposal of any fill / soils is required during the proposed development, prior sampling and testing of such materials will be required for waste classification purposes, in accordance with NSW EPA (1999) *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes*. Any imported fill should comprise VENM and may be required to be validated by laboratory testing unless sufficient documentary evidence can be provided by the supplier, to confirm suitability for the intended use.

The Phase 1 investigations were undertaken in accordance with the *Managing Contaminated Land Guideleines* and is suitable for re-zoning purposes. The investigations are considered to be sufficient for the Council to be satisfied that the land can be made suitable for the uses under the proposed zoning.

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PHASE 1 CONTAMINATION ASSESSMENT
SOUTH WERRINGTON SUB-PRECINCT

1. INTRODUCTION

This report describes the methodology and results of a Phase 1 Contamination Assessment conducted by Douglas Partners Pty Ltd (DP) at the South Werrington Sub-precinct (henceforth 'the site'). The site currently comprises fourteen individual property lots used for a range of purposes including residential, commercial and recreational/open space. The work was commissioned by Fitzwalter Group Pty Ltd acting on behalf of the site owners, the University of Western Sydney, and the South Werrington Planning Coordination Group.

The aim of the assessment was to conduct a preliminary 'desktop study' and visual assessment of the site where possible to evaluate the potential for contamination resulting from past and present uses.

This assessment comprised a review of available site history documentation and walkover site inspections conducted between 14 February and 10 March 2006 and an evaluation of the potential for contamination at the site and its likely suitability for beneficial land-use (including residential, parks and recreational areas).

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2. SCOPE OF WORKS

The scope of the Phase 1 Contamination Assessment included the following works:

- site walkover inspections;
- a search through the EPA Land Information record to confirm that there are no statutory notices on any parts of the release area under the Contaminated Land Management Act (1997);
- a review of available historical aerial photography archived with the NSW Lands Department Department;
- a review of the DLWC registered groundwater bore database for information on the hydrogeological conditions in the vicinity of the site;
- a review of previous site ownership through the Land Titles Office and available historical records;
- a search of the WorkCover NSW Dangerous Goods Database for four of the twelve property lots only to identify whether any dangerous goods have been registered to these areas;
- compilation of a Phase 1 Contamination Assessment report, identifying areas of environmental concern (AEC) and assessing the need for field-based environmental investigations.

3. SITE DESCRIPTION

3.1 Site Identification and Surrounding Land-Use

The site is located about 2 km west of St Marys town centre and 5 km east of Penrith town centre. It lies to the north of the Great Western Highway and to the south of the western railway line, north of Claremont Meadows. A locality map showing the site in relation the surrounding suburbs is presented as Drawing1, Appendix A. The overall site, the outline of which is given on Drawing 2, is identified as fourteen separate property lots, viz:

- Lot 1 in DP 801995 (owned by Detogi Pty Ltd);

- Lot 1 in Deposited Plan 132721 (owned by the Thorndale Foundation Limited);
- Lot 1 in Deposited Plan 527752 (owned by the Thorndale Foundation Limited);
- Lot 3 in Deposited Plan 81099 (owned by The Commissioner for Main Roads);
- PT28 in Deposited Plan 11110 (owned by J & A Rohozynsky);
- Lot 14 in Deposited Plan 707375 (owned by Pared Limited);
- Lot 1 in Deposited Plan 713280 (owned by Garry David Fornari);
- Lot 1 in Deposited Plan 812984 (owned by Detogi Pty Ltd);
- Lot 2 in Deposited Plan 132721 (owned by Pared Limited);
- Lot 11 in Deposited Plan 734612 (owned by Pared Limited);
- Lot 2 in Deposited Plan 218959 (owned by Sydney Water);
- Lot 1 in Deposited Plan 740520 (owned by Sydney Water);
- Lot 1 in Deposited Plan 221780 (owned by Sydney Water); and
- Lot 1 in Deposited Plan 791299 (owned by the University of Western Sydney (UWS)).

The site is bounded:

- to the north by the main Western Railway Line and residential properties on the northern side of the railway line;
- to the west by a Juvenile Correctional facility and open space, vegetated land;
- to the south by the same Juvenile Correctional Facility and the Great Western Highway (with residential and commercial properties on the southern side of the Great Western Highway; and
- to the east by Werrington Road and Rance Road, with vegetated open space and some residential properties on the eastern side of these roads.

It is considered that the potential for on-site migration of contaminants from adjacent land uses is low.

Specific observations of the site, recorded during walkover inspections, are described in Section 4.6.

3.2 Proposed Development

It is understood that a proposal is under consideration for redevelopment of the fourteen lots into a mixed land use urban precinct area, comprising low to medium density housing, schools, commercial premises, and recreational/open space areas. Details of the proposed redevelopment have not been finalised. The current assessment forms part of a feasibility study to assess the general suitability of the site for urban redevelopment.

3.3 Regional Geology and Soil Landscapes

Reference to the *Geology of the Penrith 1:100,000 Sheet* (Ref. 1) indicates that the site is underlain by the Bringelly Shale, the uppermost formation of the Wiannnamatta Group of Triassic age. The Bringelly Shale typically comprises interbedded claystone, siltstone and laminate with minor fine to medium grained sandstone lenses or bands and rare coaly bands. Drawing 3 shows an excerpt of the Geology Map in the vicinity of the site.

Reference to the *Soil Landscapes of the Penrith 1:100,000 Sheet* (Ref. 2) indicates that the area is characterised by the following soils:

Luddenham Soil Landscape – This is an erosional unit with shallow (<1.0 m) brown podsolic soils and massive earthy clays on crests and ridges, moderately deep (0.7–1.5 m) red podsolic soils on upper slopes and moderately deep (<1.5 m) yellow podsolic soils and prairie soils on lower slopes and drainage lines. The soils of this landscape are assessed as having moderate surface movement potential and as presenting a moderate to very high erosion hazard.

South Creek Soil Landscape – in the vicinity of tributary creeks of South Creek only. This is a fluvial landscape and includes often very deep layered sediments. Where pedogenesis has occurred, developed soils include sandy to sandy clay loams, clay loams and brown clays. These soils are typically of low fertility, are generally of low surface movement potential, may be

subject to waterlogging and may present a high (potentially very high to extreme) erosion hazard.

Blacktown Soil Landscape – in the south-east corner of the site only. This is a residual landscape and comprises up to four soil horizons that range from shallow red-brown hard-setting sandy clay soils on crests and upper slopes to deep brown to yellow sand and clay soils overlying grey plastic mottled clay on mid- to lower slopes. These soils are typically of low fertility, are moderately reactive and have a generally low wet bearing strength.

3.4 Regional Hydrogeology

A detailed groundwater study was not undertaken as part of the current scope, however previous studies of areas underlain by the Wiannamatta Group and Quaternary alluvium in western Sydney indicate that:

- the shales have a very low intrinsic permeability and groundwater flow is likely to be dominated by fracture flow with resulting typically low yields (< 1 L/s) in bores;
- the groundwater in the Wiannamatta Group is typically brackish to saline with total dissolved solids (TDS) in the range 4000 – 5000 mg/L (but with cases of TDS up to 31, 750 mg/L being reported), the dominant ions being sodium and chloride and the water being generally unsuitable for livestock or irrigation;
- groundwater flow in unconsolidated Quaternary deposits is likely to be by porous flow in sandy horizon, typically fresh (TDS < 500 mg/L) and dominated by sodium and bicarbonate ions.

A search of groundwater bores in the area registered to the Department of Infrastructure, Planning and Natural Resources (DIPNR) was undertaken for the site. The location of registered bores in relation to the site is provided in Drawing 4. The work summaries for each of the bores is provided in Appendix B. The following points are noted regarding bores within a 2 km radius of the site:

- there are no registered bores within the boundaries of the site;

- a cluster of four bores are located to the south-east of the site. The bores were all drilled to depths of more than 70 m. The bores encountered natural clay soils to a depth of around 10 m, after which shale bedrock with interdispersed clay zones was encountered to the termination depth. Isolated narrow water bearing zones were encountered with the shale bedrock at depth with low yields only. No information on groundwater quality was provided in any of the bore logs;
- a cluster of three bores are located to the north-west of the site. The bores were all drilled to depths of 6-8 m. The bores encountered silty clay soils until the termination depth and no details are provided in relation to water bearing zones or the standing water level in the bores constructed. No information on groundwater quality was provided in any of the bore logs.

It is anticipated that the main groundwater resource underlying the site would be contained in the shale units at depth.

4. SITE CONTAMINATION APPRAISAL

4.1 Historical Title Search

A search of land title ownership information held by Land Titles Office in Sydney was conducted of records dating back to 1847. A copy of titles and survey plans for each of the aforementioned property lots is provided in Appendix C, including information on previous landowners and their respective occupations. A summary of the historical title search specific to each land parcel is as follows:

[redacted]

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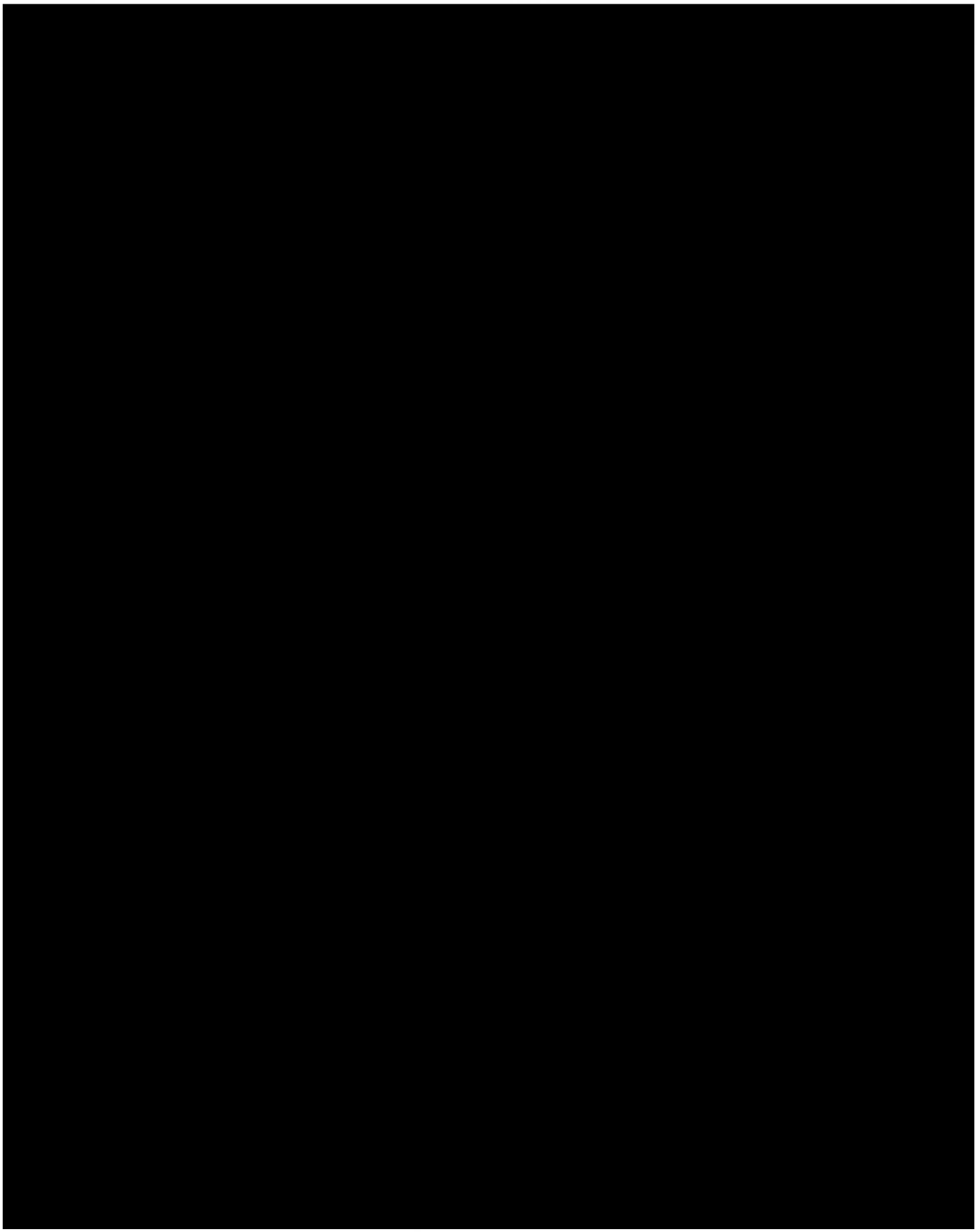

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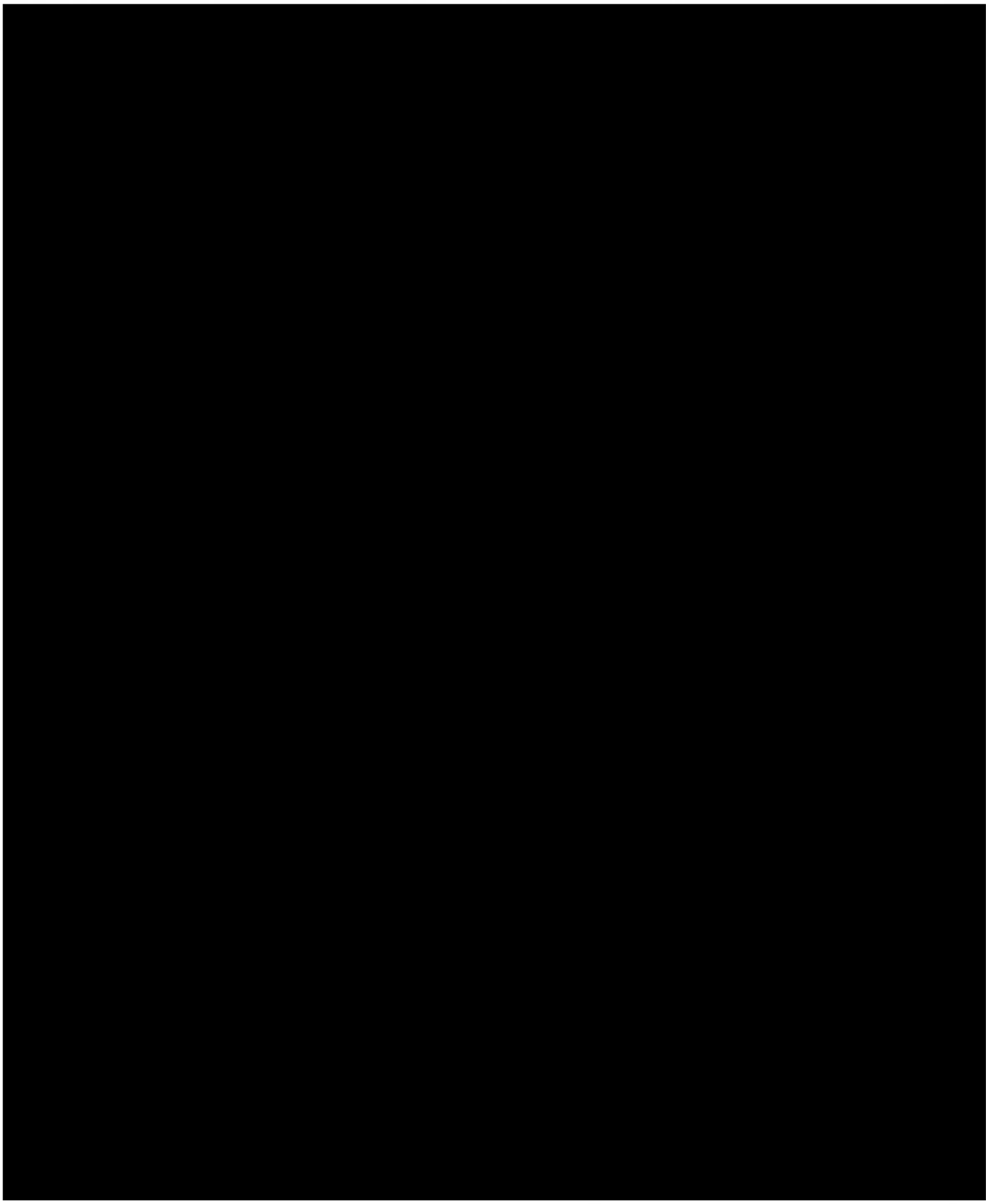

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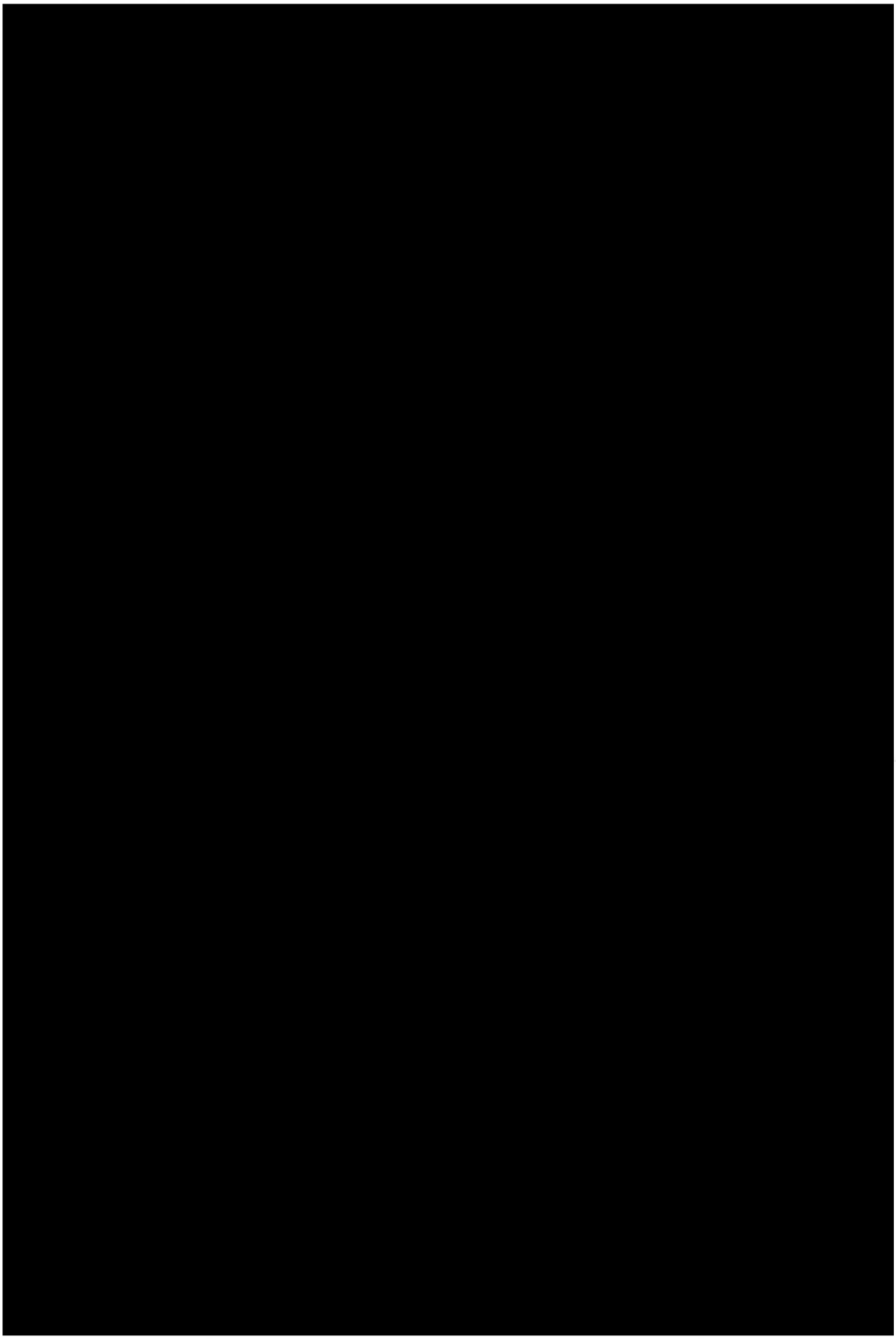

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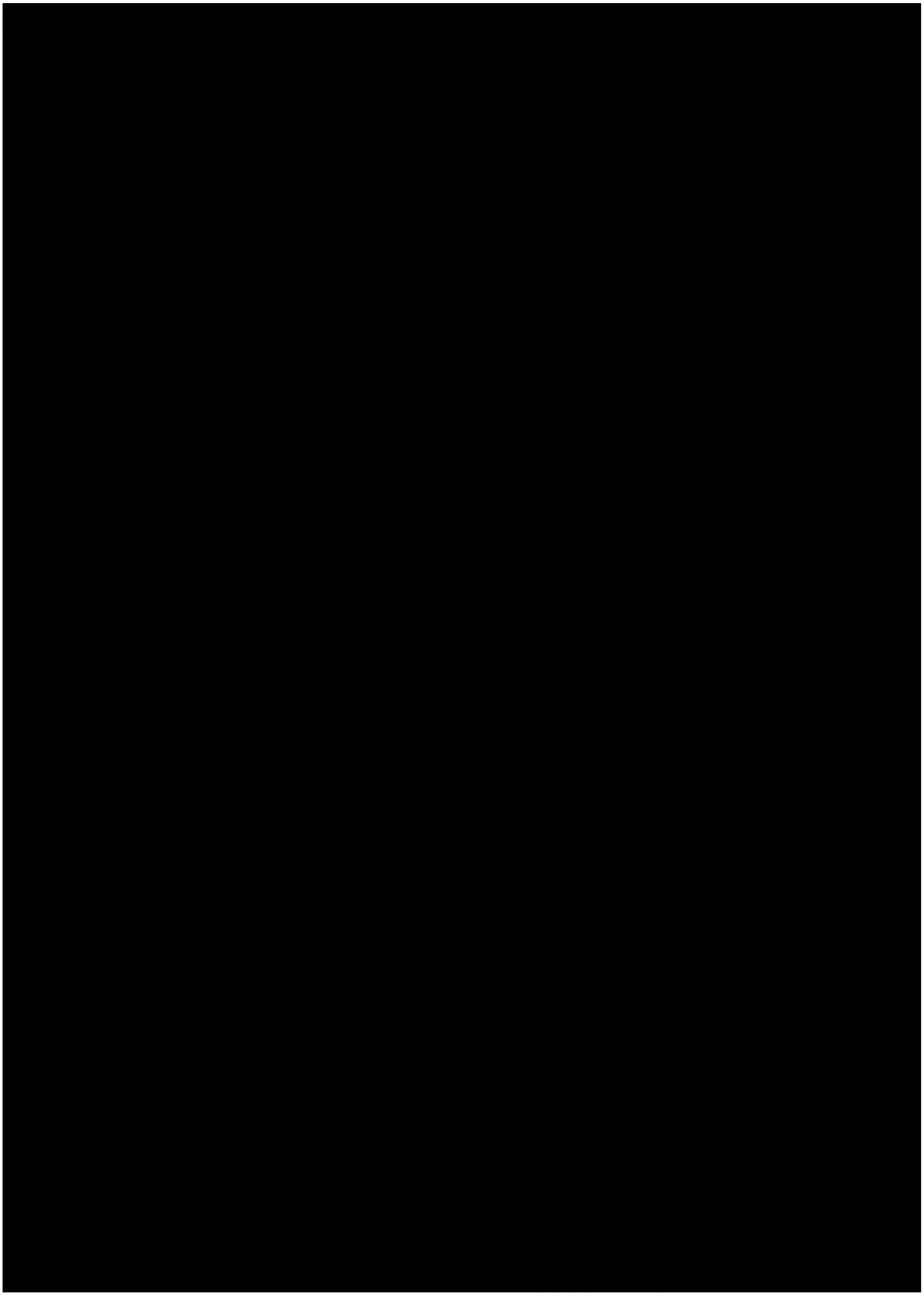

The title deeds are generally consistent with the site titles for the most part being held by private individuals until 1950 onwards. After this time the majority of properties were transferred into the ownership of government departments, commercial operations and/or school trusts.

4.2 Historical Aerial Photography

Historical aerial photographs of the area for six years (1947, 1961, 1970, 1982, 1994 and 2002) were available from the Land Information Centre of the Department of Infrastructure, Planning and Natural Resources. Selected historical images of the site area presented in Drawings 5a and 5b (Appendix A).

Review of the 1947 image (the earliest image available) shows a large oval track on the UWS portion of the site, perhaps used for horses. The oval appears to be bare earth surrounded by low lying vegetation, including uniform rows on the eastern side suggestive of agricultural operations. The presence of the vegetation rows over portions of the track suggests that the oval track was constructed some time before and was no longer in use at the time of the image. Agricultural paddocks occupy the remainder of the site, with some dirt roads visible in the southern portion of the site linking small buildings, presumably sheds, barns, and/or residential premises.

The aerial photograph of 1961 shows little change to the site. Sections of the oval track are still visible, however it is now mainly covered over by vegetation. The remainder of the site still appears to be covered paddocks.

The 1970 image shows little change along the western portion of the site. The oval track is now increasingly obscured by vegetation cover. Two small residential properties are now present in the southern portion of the site in the location of the current Fornari property. To the north east, a bare earth soccer field and small scattered building are visible. The Sydney Water depot is present in the north east corner of the site as a series of buildings, vehicle parking areas, sealed surfaces and landscaped/vegetated areas. Two buildings are present on the current Thorndale site, which appear to be consistent with the dimensions of buildings currently present on this land.

The 1982 and 1994 images show little change to the site. Minor extensions to buildings on the Thorndale site have occurred. The soccer field now appears grassed over and a second playing field is present adjacent to the original soccer field in the 1994 image. A rectangular section of land in the centre of the UWS site appears as cleared land in the 1994 image or is covered in a different species of vegetation. No activities are evident on this section of land and the area is surrounded by vacant vegetated land. Roads surrounding the site appear to be upgraded to sealed surfaces. Along the south-western boundary of the site the juvenile correctional centre is present.

The 2002 image also shows little change, although the bare patch of land observed in the centre of the UWS land is now the location of some different (and irregularly shaped) cleared areas, specifically a long narrow rectangle, a diamond shape and two circles. Once again there appears to be no discernible activity occurring on these areas from the image.

4.3 Regulatory Notices Search

A search of the NSW EPA website on 11 March 2006 indicates that:

- no licenses or notices have been issued for the site under the Protection of the Environment Operations Act (1997);
- no notices have been issued for the site under the Environmentally Hazardous Chemicals Act (1985);
- no notices have been issued for the site under Section 5 of the Unhealthy Building Land Act (1990); and

- no notices or orders to investigate or remediate have been issued for the site under the Contaminated Land Management Act (1997).

4.4 WorkCover NSW Dangerous Goods

A search of the WorkCover New South Wales database for licences to keep Dangerous Goods wa undertaken for the following four property lots only:

- Lot 1 in Deposited Plan 132721 (owned by the Thorndale Foundation Limited);
- Lot 1 in Deposited Plan 527752 (owned by the Thorndale Foundation Limited);
- Lot 1 in Deposited Plan 812984 (owned by Detogi Pty Ltd);
- Lot 2 in Deposited Plan 132721 (owned by Pared Limited);

The search did not locate any records pertaining to the site. A copy of the search results is provided in Appendix D.

4.5 Sydney Water Depot

A Sydney Water Depot occupies the north-eastern corner of the site comprising the following property lots:

- Lot 2 in Deposited Plan 218959
- Lot 1 in Deposited Plan 740520
- Lot 1 in Deposited Plan 221780

These lots, herein referred to as the 'Sydney Water site' are considered separate to the remainder of 'the site' given a series of environmental investigations have been completed on the Sydney Water site, including a site audit statement. The following documents were reviewed as part of this assessment:

- '*Site Decommissioning Report, Rance Road, Werrington NSW 2760*' dated December 1996 and prepared by Flour Daniel, Reference S8867WER.RO4;

- *'Underground Fuel Storage Validation Report, SWC Werrington Depot, Werrington NSW'* dated January 2002 and prepared by PPK, Reference 58P11A;
- *'Soil and Groundwater Contamination Investigation, Werrington Depot'*, dated May 2001 and prepared by Australian Water Technology (AWT), Report 2001/0125;
- *'Stage 2 Environmental Site Assessment, Werrington Depot, Rance Road, Werrington'* dated November 2002 and prepared by Sinclair Knight Merz (SKM); and
- *'Summary Site Audit Statement, SWC Werrington Depot, Rance Road, Werrington'* prepared by HLA Envirosciences, Reference No. WRR132.

The initial assessment by Fluor Daniel documented the decommissioning of 10 underground storage tanks (USTs) at the site. The tanks were reported to extend to around 3 m below ground level at most locations, and on removal of the tanks the resulting three excavations were further extended down into natural clay. Validation samples were collected from each excavation to assess whether all contaminated soil was removed. The report concluded that the tank pits were successfully remediated.

Subsequent to the Fluor Daniel assessment, it is understood that the pits were backfilled with some of the excavated, contaminated material. PPK then undertook a re-validation of these areas by:

- Excavating out the backfilled material;
- 'chasing-out' any residual contamination;
- Re-validating the original pits;
- Off-site disposal of some of the excavated material and landfarming the remainder; and
- Reinstatement of the pits with imported shale (*'ripped blue shale'*) and the landfarmed material.

AWT then undertook an assessment of the remainder of the site. Their assessment encountered fill (comprising roadbase and reworked natural soil to around a depth of 1.5 m) overlying residual silty clay, clay and clayey silt down to the investigation depth of 6 m. Groundwater was not observed during drilling, however bores were installed and groundwater was present at a later date. Groundwater was reported to have a pH in the range of 5.1 - 5.8 and a total dissolved solids (TDS) concentration of around 10,000 - 25,000 mg/L.

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Soil samples were analysed for a range of common contaminants and while minor exceedances of phytotoxicity criteria were contained in several surficial soil samples, the following results were considered the main issues at the site:

- Lead concentration in a soil sample taken adjacent to a drain and down gradient of a former metal foundry (sample depth 0.1 m);
- Chlordane concentrations in a surficial sample taken from beneath a building known to have been fumigated for white ants (sample depth of 0.15 m).

SKM later conducted a Phase 2 assessment of the site. In general contaminant concentrations in soil were low with the exception of the following:

- TPH of 4060 mg/kg in a surface sample collected directly below a concrete hardstand area in a fuel and oil store,
- Pesticides collected in a grab sample taken adjacent to the building sprayed for white ants (confirming the AWT result for chlordane);
- Trace levels of VOCs identified in surficial soils beneath building K; and
- Minor exceedances of the ecological criteria for heavy metals in surficial soils.

A site audit statement was later prepared for the site by HLA Envirosciences. The statement concludes that the site is suitable for continued use as a depot, but that the site has not been assessed for beneficial reuse (e.g. residential, open space parkland or schools). The statement goes on to indicate that further investigation of the areas of contamination identified previously should be undertaken and remediated as required. The audit statement recommends these works be undertaken at the time of building demolition for better assessment of the areas. Other actions required at the site that were raised in the audit statement are:

- Assessment of hazardous materials on and underneath existing buildings on the site;
- Excavation, waste classification and off-site disposal of material in drains, pits and sumps on the site; and
- Waste materials stockpiled on the site should be removed and the underlying areas assessed for contamination and remediated as required.

Further to review of these reports an inspection of the site was undertaken on February 2006. The inside of the buildings on-site were not viewed as part of this inspection. While the majority of the site appeared to be in good condition, it was noted that stockpiles of fill and/or soils, tyres and other waste materials were present at several locations on the site.

Discussions with Sydney Water staff indicated that should Sydney Water transfer ownership of the site to another party, then Sydney water will ensure all buildings are emptied, existing stockpiles on the site are classified and disposed of off-site and the underlying areas are assessed, tested and remediated as required.

While this arrangement would require the new site owner to undertake investigation and remediation of the remaining contamination issues on the site, the data available for the site indicates soil contamination across the site is restricted to the surficial layers and has not impacted the underlying groundwater.

Providing the available data is representative of the conditions on-site, the areas of contamination underlying buildings are assessed as easily remediable using conventional excavation and off-site disposal techniques.

4.6 Site Inspection

Inspections of the site were made by DP between 10 Feb and 14 March 2006. Locations of areas of environmental concern (designated AEC 1 - 11) as observed during the site visits are shown on Drawing 6 (Appendix A). Selected photographs of observed features are provided in Plate 7.

It should be noted that the inspection should be considered as preliminary only as much of the site was covered in overgrown grasses that prevented inspection of the ground surface.

The principal observations made during the inspection were that:

- most of the site is covered in dense overgrown vegetation;

- as evident from the review of investigations at the Sydney Water Depot, pesticide and hydrocarbon contamination is present in surficial soils underneath buildings G, K and the former fuel store. These areas are designated AEC 1 and 2 respectively;
- full inspection on the Thorndale site was not possible as part of the current inspection. The insides of the buildings were not inspected, however it was possible to view the outdoor, western end of the Thorndale site from outside. The back section of the site is used as a car parking area and fragments of combusted material were present on the ground surface in this area, suggesting imported fill is present or burning has occurred in this area. This area is designated AEC 3;
- sections of cleared land were observed in the northern Pared lots (in the centre of the site). The ground surface in these areas were strewn with building rubble (brick pieces, tile pieces, and fibro cement pieces). These observations suggest these areas were the locations of former buildings on the site that have been demolished. The area is designated AEC 4;
- an area of abandoned waste stockpiles were present along the boundary of the UWS and Detogi lots. The material stockpiles at this location included corrugated iron sheets, kitchen cupboards, metal chests and fibro cement. The area is designated AEC 5;
- a 200 L drum with a Shell logo was observed on the Pared site. The drum appeared to be in good condition, was stored directly on the ground, and was noted as containing liquid, although it was not possible to open the drum to asses the contents. The logo on the side of the drum however suggests the drum contains fuel. The area is designated AEC 6;
- a material stockpile was observed in the south-eastern section of the Detogi site. The stockpile was mainly tree trunks, some of which were chopped into firewood. Drums were also present. Three twenty litre drums of oil were observed, the drums were in poor condition, left open and had oil staining on the outside. Another 200L drum was present nearby. The drum was not labelled, and it was not possible to open the drum to assess the contents. A faded diamond-shaped mark was present on the drum similar to the shape of a product warning sticker, suggesting the original contents of the drum was a compound requiring some caution during storage and handling. A small mound of filling was also observed on just north of the stockpiled material. The area is designated AEC 7; and
- fill material was also observed in several sections of the site. These areas have since been covered with vegetation and these areas are designated as AEC 8-12.

Additionally, a number of buildings were noted on-site that, based on on-site observations and apparent building age, may contain potentially hazardous materials (i.e. asbestos, lead based paints and polychlorinated biphenyls). While operational and/or intact these buildings may not be sources of contamination, however, assessment and care will be required to ensure the surrounding groundsurface is not contaminated should these buildings require demolition. These areas have been designated as areas of demolition concern (ADC) on Drawing 6 (Appendix A) and include:

- Buildings on the Sydney Water Depot (ADC – A on Drawing 6;
- Buildings on the Thorndale Depot (ADC – B on Drawing 6);
- Buildings on the Fornari property (ADC - C on Drawing 6); and
- Buildings in the southern corner of the Pared site (ADC - D on Drawing 6).

5. POTENTIAL FOR CONTAMINATION

The results of the site history and inspection indicate that the majority of the site has historically been used for agricultural purposes or remained unoccupied with natural vegetation. More recently some sections of the site have been used for commercial and recreational purposes. On the basis of these findings, the identified areas of environmental concern (AEC) are summarised in Table 15 together with an assessment of the potential contamination associated with each AEC. The locations of the AEC are shown on Drawings 6.

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Table 15 – Summary of Identified AEC

AEC No:	Description:	Potential Contaminants:	Lot and DP
1	Surface soils containing pesticides and VOCs under the Sydney Water Depot buildings G and K	Pesticides and VOCs	Lot 2 DP 217959
2	Surface soils containing hydrocarbons under the Sydney Water Depot former fuel store	TRH/BTEX, lead	Lot 2 DP 217959
3	Combusted material on groundsurface of the carparking area on the Thorndale site	Heavy metals, TRH/ BTEX, PAH	Lot 2 DP 217959
4	Fibro cement on ground surface (Pared Site)	Asbestos	Lot 2 DP 2132721
5	Abandoned waste stockpiles (Pared Site)	Asbestos, Heavy metals, TRH/BTEX, PAH, OCP and PCB	Lot 1 DP 791299
6	Oil drum stored on the ground surface	Asbestos, Heavy metals, TRH/BTEX, PAH, OCP and PCB	Lot 14 DP 707375
7	Oil and chemical drum stockpile	Heavy metals, TRH/BTEX, OCP, PCB and phenols	Lot 1 DP 801995
8-12	Imported fill on site	Heavy metals, TRH/BTEX, PAH, OCP and PCB, herbicides	Lot 3 DP 81099

Notes:
Heavy metals = As, Cd, Cr, CU, Pb, Hg, Ni, Zn
TRH = Total Recoverable Hydrocarbons
BTEX = Benzene, Toluene, Ethyl benzene, Xylene
PAH = polycyclic aromatic hydrocarbons
Asb = Asbestos
OPP = organophosphorus pesticides
OCP = organochlorine pesticides
PCB = Polychlorinated Biphenyls
Herbicides= phenoxy herbicides
VOCs = volatile organic compounds

It is noted that the oval track and areas of agricultural areas shown in th 1947 image in the vicinity of the UWS aite have not been included as an AEC. Given the date of the image is its considered that DDT and other pesticides may not have been heavily used in this area, however it would be prudent to undertaken some limited sampling in this area to confirm the absence of pesticides in these soils.

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6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Recommendations

Based on the findings of this Phase 1 Contamination Assessment, twelve separate AEC were identified across the site. As the proposal under consideration is for rezoning to permit the urban redevelopment including sensitive land-use such as schools and private residences, it is recommended that investigations comprising intrusive sampling and analysis are completed. The investigations should focus on each of the identified AEC areas to confirm the suitability for sensitive land use. As the AECs are discrete and localised, it is anticipated that all identified areas can be remediated for the proposed purpose without significant landform modification.

These field based investigations would most likely involve the excavation of test pits or drilling of test bores with sample collection at regular depth intervals. As a minimum the test locations should focus on all identified AEC. A suitable sampling density should be used in accordance with the NSW EPA '*Sampling Design Guidelines*', 1995 (Ref. 2), which will be determined by the extent of the investigation area of each AEC at the time of the assessment. It is recommended that an appropriate amount of sampling in non-AEC areas should be incorporated in the investigations to determine background levels of potential contaminants. The laboratory analysis of selected samples should target the potential contaminants identified in Table 9 (Section 5).

If off-site disposal of any fill / soils is required as part of the proposed redevelopment, prior sampling and testing of such materials will be required for waste classification purposes, in accordance with NSW EPA (1999) *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes* (Ref. 3). Any imported fill should comprise VENM and may be required to be validated by laboratory testing unless sufficient documentary evidence can be provided by the supplier, to confirm suitability for the intended use.

6.2 Conclusions

The Phase 1 investigations were undertaken in accordance with the *Managing Contaminated Land Guideleines* and is suitable for re-zoning purposes. The investigations are considered to

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be sufficient for the Council to be satisfied that the land can be made suitable for the uses under the proposed zoning.

7. LIMITATIONS OF THIS REPORT

The scope of the site assessment activities and consulting services undertaken by DP were limited to those described in DP Proposal dated 28 November 2005.

DP's assessment is necessarily based upon the result of a limited site history search and site inspection that was set out in the proposal. Neither DP, nor any other reputable consultant, can provide unqualified warranties nor does DP assume any liability for site conditions not observed or accessible during the time of the investigations.

Despite all reasonable care and diligence, site characteristics may change at any time in response to variations in natural conditions, chemical reactions and other events, e.g. groundwater movement and or spillages of contaminating substances. These changes may occur subsequent to DP's investigations and assessment.

This report and associated documentation have been prepared solely for the use of the University of Western Sydney, and the South Werrington Planning Coordination Group. Any reliance assumed by third parties on this report shall be at such parties' own risk. Any ensuing liability resulting from use of the report by third parties cannot be transferred to DP.

DOUGLAS PARTNERS PTY LTD

[redacted]

Lindsay Rockett
Senior Associate

Reviewed by:

[redacted]

Ronnie Tong
Manager, Environmental Services

References:

1. Department of Mines, NSW (1966). Penrith 1:250 000 Geological Series Sheet SI 56-5 (Third Ed.).
2. NSW EPA *Contaminated Sites: Sampling Design Guidelines*, 1995.
3. NSW EPA (1999) *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes.*

APPENDIX A
Drawings

Approximate Extent of Site

Source: UBD 2005

Client: UWS		Project Number: 43739A	Douglas Partners Geotechnics - Environment - Groundwater
		Date: 11 March 2006	
Drawn by: SD	Scale: NTS	Office: Sydney	
Approved by:		Drawing 1	Title: Locality Map Phase 1 Contamination Assessment South Werrington Sub-Precinct

Sydney, Newcastle, Brisbane, Wollongong
Melbourne, Perth, Wyong, Townsville, Cairns
Wollongong, Campbelltown, Darwin

LEGEND

Grid : GDA94 / MGA94

Cadastral boundaries

Site Cadastre

Site Boundary

0 100 200

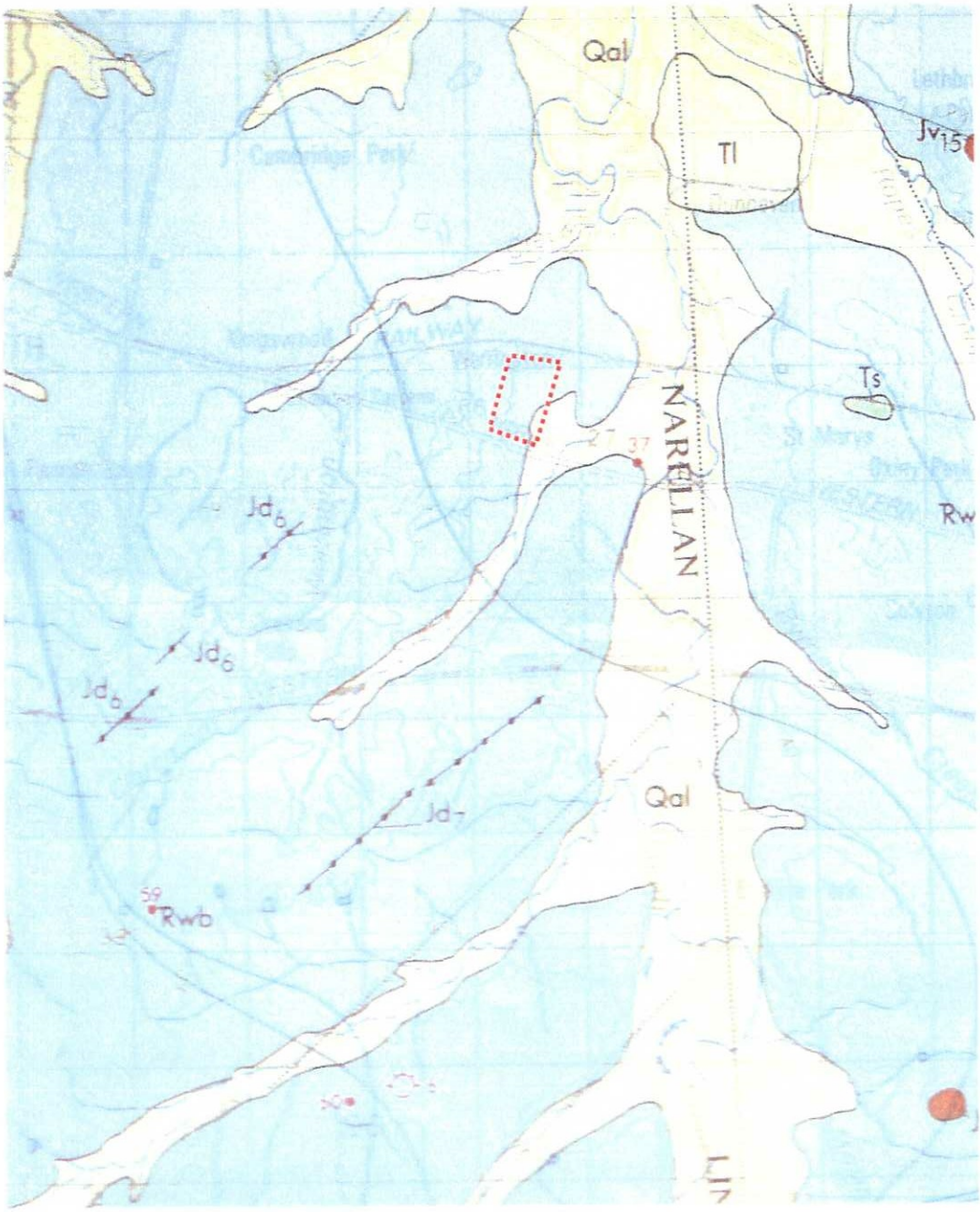
metres

Douglas Partners
Geotechnics · Environment · Groundwater

Sydney, Newcastle, Brisbane, Melbourne, Perth, Wyong, Campbelltown, Townsville Cairns, Wollongong, Darwin

TITLE: **Recent Aerial Image of Site**
Phase 1 Contamination Assessment
SOUTH WERRINGTON SUB-PRECINCT

CLIENT:	The University of Western Sydney / Fitzwater Group Pty Ltd				
DRAWN BY:	AT	SCALE:	As shown	PROJECT No.	43139A
APPROVED BY:				DATE:	15 March 2006
OFFICE:	SYDNEY				
DRAWING No:	2				



Approximate Location of Site

Legend

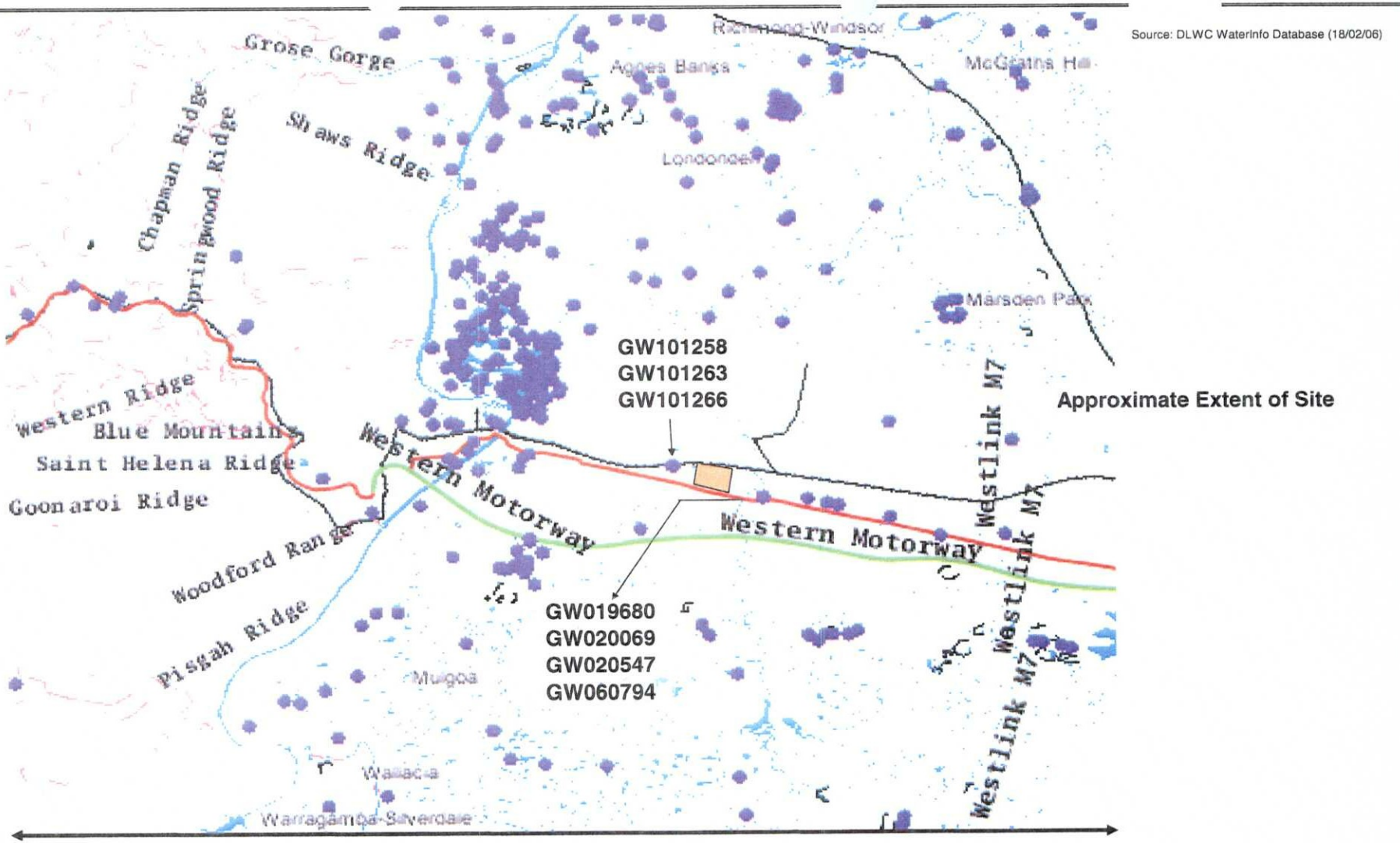
Rwb	Wianamatta Group, shale and carbonaceous claystone, claystone, laminite, fine to medium grained lithic sandstone, rare coal and tuff
Qal	Fluvial, fine grained sand, silt and clay

Douglas Partners
Geotechnics · Environment · Groundwater

Sydney, Newcastle, Brisbane, Wollongong, Campbelltown
Melbourne, Perth, Wyong, Townsville, Cairns, Darwin

Title **Extract of Penrith 1:100 000 Geology Map**
Phase 1 Contamination Assessment
South Werrington Sub-Precinct

Client: USW			**Office: Sydney**
Drawn by: SD	**Scale: NTS**	**Project Number: 43739A**	**Drawing No.3**
Approved by:		**Date: 11 March 2006**	



Client: UWS		Project Number: 43739A Date: 11 March 2006	Douglas Partners Geotechnics · Environment · Groundwater
Drawn by: SD	Scale: NTS	Office: Sydney	
Approved by:		Drawing 4	Title: Location of Nearby Registered Groundwater Bores Phase 1 Contamination Assessment South Werrington Sub-Precinct

Sydney, Newcastle, Brisbane, Wollongong
Melbourne, Perth, Wyong, Townsville, Cairns
Wollongong, Campbelltown, Darwin