HEC
HAYES ENVIRONMENTAL CONSULTING

ABN 32 295 203 367

PUMP OUT WATER MANAGEMENT PLAN

RESIDENTIAL DEVELOPMENT AT 132-138 KILLEATON STREET, ST IVES NSW 2075

Hayes Environmental Consulting Pty Ltd
Report No. MP135 AD

22 August, 2011

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CONTENTS

1.0 INTRODUCTION

Hayes Environmental Consulting Pty Ltd (HEC) was engaged by Meriton Apartments Pty Ltd to develop a management plan for water to be pumped from the basement of the residential development at 132-138 Killeaton Street, St Ives, in New South Wales (henceforth referred to as 'the site').

At the time of completing this plan, the site was in the early stages of a major development (MP 10_0057), approved by the NSW Department of Planning. This development included (*Ref.* Appendix A):

- demolition and excavation;
- construction of six residential buildings of four to six storeys in height, comprising a total of 298 apartments;
- adaptive reuse of an existing monastery building for communal facilities, including a pool and gymnasium;
- a common, stepped basement car parking facility underneath the apartment buildings (requiring bulk excavations to depths of 3-6m below ground level (BGL); and
- landscaping works.

This document provides a plan for the on-going management of a proposed basement dewatering (pump out) system. It addresses the request made by Ku-ring-gai Council (*Ref.* S08190; dated 11 August, 2011), for the "details of the proposed treatment system", so that due consideration can be given to the suitability of groundwater disposal into the local stormwater system. The aim is to ensure that all related discharge will not adversely affect Council's stormwater system and any receiving waterways, both in terms of quantity and quality of water.

2.0 SITE DESCRIPTION

The site is located on the southern side of Killeaton Street, approximately 150m east of its intersection with Mona Vale Road. The greater site is L-shaped, covering an area of about 22,000m^2, and is further identified as Lot 2 in Deposited Plan 748682, in the Parish of Gordon and County of Cumberland. The northern (Killeaton Street) frontage is approximately 175m in length and the land extends to the south by about 250m at the furthest point.

The property lies within an undulating landscape that generally slopes down to the east. Surface levels range from approximately RL158m in the southern section to RL160m in the northern section.

Prior to commencement of the current development, the majority of the site was vacant and grassed. Scattered trees and shrubs were located in the vicinities of the property boundaries. A two storey, brick building, understood to have been a former monastery, was situated in the central portion, while a circular, brick well was present in the southern portion.

The surrounding land was predominantly made up of residential and recreational properties, with a college located to the south.

3.0 PREVIOUS INVESTIGATIONS

Geotechnical and groundwater quality investigations of the site have been completed by Jeffery and Katauskas Pty Ltd (JK), as follows:

- "*Report to Karimbla Construction Services Pty Ltd on Hydrogeological Assessment for Proposed Residential Development at 132-138 Killeaton Street, St Ives, NSW*" (*Ref.* 23765Z2rpt; dated 5 August, 2011);

- "*Report to Karimbla Construction Services Pty Ltd on Groundwater Screening for Temporary Dewatering During Construction at 132-138 Killeaton Street, St Ives, NSW*" (*Ref.* E23765Krpt1.1; dated August, 2011); and

- "*Proposed Amendment to DOP Condition C35(a); Proposed Residential Development; 132-138 Killeaton Street, St Ives, NSW*" (*Ref.* E23765KPletV1; dated 16 August, 2011).

Sub-Surface Conditions

Based on the findings from the geotechnical investigations, the site was "underlain by a surficial topsoil/fill, over residual silty clays then shale bedrock at relatively shallow to moderate depth". Perched groundwater was found at "a relatively shallow level" (from 0.5-1.2m BGL) and the hydraulic gradient had "an overall slope down towards the south-east of about 1.5-2°", ultimately draining into Middle Harbour Creek, located about 1.4km to the (south) east in Garigal National Park.

Based on the data from their borehole pump-out tests, JK estimated "average permeability values of about $5x10^{-8}$ m/sec and 10^{-7} m/sec" for "the clays and underlying upper rock mass, respectively".

Groundwater Quality

The findings from the groundwater quality screening included the following:

- only "three registered groundwater bores lie within 1km of the site", all of which were up- or cross-gradient, indicating that groundwater is not a significant resource in the immediate area;

- marginally acidic pH conditions (4.1-5.4), outside the adopted stormwater assessment criteria (SWAC), were identified; and

- elevated concentrations of some heavy metals (cadmium, copper, nickel, zinc and iron), above the adopted SWAC, were identified; although

- "the heavy metal concentrations are likely to be consistent with regional/background levels and are not the result of an on-site contamination source".

JK were "of the opinion that the proposed intermittent pumping [of basement seepage water] is unlikely to impact on the groundwater conditions from a contamination viewpoint". It was also concluded, however, that "as a result of the acidic pH conditions and the concentrations of some heavy metals above the adopted SWAC, treatment of the groundwater would most likely be required prior to disposal into the stormwater system".

Estimate of Groundwater Inflow

The proposed basement will generally extend into bedrock and intersect the groundwater table (*Ref.* Appendix B). JK estimated "a groundwater inflow rate into the proposed basement excavation of between about 2500L/day to 4000L/day"; however, as "the site is located at the crest of a hill and as such, there is a very limited catchment over which surface water can feed the groundwater", while "shales are tight aquifers which generally comprise a complex of perched water tables", JK also suggested that "the rate of inflow will decrease once the excavation has initially drained the local area".

Groundwater inflow into the completed (i.e. paved) basement will therefore be derived from the bedrock exposed by the bulk excavation. Hence, most of the infiltration will be derived from the rock layer below the basement slab, forced upwards by via hydrostatic pressure. Assuming a mass rock permeability of 10^{-7} m/sec, the total inflow rate of groundwater is expected to be less than 2.5 m^3/day (i.e. <2500 L/day), which is relatively low.

Implications for Pump Out Management

JK identified that "temporary dewatering will be required during construction" and it was recommended that "the completed basement should be designed as drained with pump-out facilities". Features of the pump out system were to include, or take into account, the following:

- "the limited groundwater volumes must be collected in sumps and pumped to the stormwater system"; and

- "the groundwater would need to be tested and, depending on groundwater quality, treatment may be required prior to offsite disposal".

Due to limited data being available at the time of completing this plan, it is also recommended that monitoring of basement water quantity and quality be initiated once the pump out system has been installed (i.e. well in advance of building occupation). A more comprehensive data set will enable a more informed judgement as to whether further monitoring and/or treatment are required. Should treatment be deemed necessary, JK suggested "the addition of flocculants and/or coagulants to promote precipitation of the metals out of solution", while "a dosing unit could also be used to adjust the pH to an acceptable range prior to disposal".

4.0 MANAGEMENT PLAN

4.1 Overview

The primary aims of this management plan are to ensure that:

- all basement water is discharged to Council's stormwater drainage system in accordance with the requirements of the *Protection of the Environment Operations Act 1997*; and

- discharges derived from basement dewatering do not cause adverse impacts on any receiving waterways, both in terms of quantity and quality of water.

This Management Plan (MP) describes the relevant procedures for proper containment and disposal of pump out waters to the stormwater pipe entry drain that is located in the north eastern site corner. Also presented are a water monitoring program and contingency measures that would be implemented should failures of the dewatering system be encountered.

4.2 Site Specific Compliance Issues

The dewatering shall be undertaken with due regard for the environment and in accordance with all relevant statutory requirements. In particular, all pump out water will comply with the requirements of the following NSW Acts:

- *Environmental Planning and Assessment Act 1979;*
- *Contaminated Land Management Act 1997*;
- *Protection of the Environment Operations Act 1997;*
- *Environmental Protection & Biodiversity Conservation Act 1999;*
- *Environmental Offences and Penalties Act 1997*;
- *Water Management Act 2000*; and
- *Occupational Health and Safety Act 2000.*

Meriton and its licensed contractor(s) will be responsible to ensure that basement dewatering also complies with the following relevant conditions:

1. No water containing suspended matter, or any other contaminants, is to leave the site in a manner which could pollute (as defined by the *Protection of the Environment Operations Act 1997*) nearby water courses, such as the Council's stormwater drains and the nearby Middle Harbour Creek.

2. The pH of any discharge water is to be between 6.5 and 8.5, as per Condition 13(A) of the NSW Office of Water *Conditions Statement on Bore License.*

4.3 Methodology for Basement Dewatering

Summary

Plans for the proposed basement are presented in Appendix A. The basement dewatering (pump out) system shall involve an integrated pit and pipe network.

All water that accumulates in the lower basement will be collected and drained into a pit containing a functioning oil-water separator (*Ref.* Appendix A). Treated water is then pumped into the local stormwater system. The discharge point shall be the 300mm stormwater entry drain closest to Killeaton Street (i.e. Line A, in the north eastern site corner; *Ref.* Appendix C). This stormwater pipe runs in an easterly direction, parallel with Killeaton Street, ultimately draining water into the Council's stormwater system.

Hence, all pump out water will be subjected to treatment (purification), prior to release. The treatment will involve gravity sedimentation, as well as oil-water separation.

Note that the local road network, both internal and external to the site, contributes substantial volumes (>>2.5 m^3/storm) of runoff into the local stormwater system. This water is largely untreated, and potentially more contaminated by oil, grease and metals etc., compared with the pump out water (most of which shall be natural, groundwater up-seepage).

Estimate of Daily Discharge

The total volume of water that will be discharged from the basement is expected to be low, ≤2.5 m^3/day (i.e. ≤2500 litres). In terms of quantity, such volume will have no, or minimal, impact on any receiving waterway (e.g. Middle Harbour Creek).

The main source of this water will be groundwater inflow (i.e. up-seepage); however, there will also be contributions from vehicle and surface runoff. The actual inflow rate should be monitored, however, to confirm this estimate.

Pump Out Pit

The concrete-lined pit (with oil-water separator) will be an industry standard device, designed to discharge groundwater that enters the basement via hydrostatic pressure within the building area. Once collected within the pit, the water is not pumped directly off-site. Rather, the pump is activated automatically, by an integrated float mechanism (or switch), once the pit fills to the designated capacity (which is about 25%). This allows a secondary level of purification (via gravity sedimentation).

The pump out pit on this site will have a holding capacity of approximately 24m^3, or 24,000L, which greatly exceeds the expected daily inflow rate (*Ref.* Section 3). Note, however, that the pump would normally be activated well before the maximum (24m^3) is reached, to prevent an over-flow.

Visual inspections of the pump out pit are to be integrated into the sampling (monitoring) program, as part of the system maintenance, with repairs to be performed as required. The surface water (effluent) in the pit is to be colourless and clear (i.e. transparent), indicating that the supernatant is suitable for off-site discharge. If the water is discoloured, the automatic switch is to be turned off until the water is colourless and clear.

All estimates of volume and inspection notes (including colour and appearance) are to be logged on the monitoring checklist. A copy of each checklist is to be submitted as part of the on-going (monthly), monitoring reporting. Further details relating to the measurement (quanitation) of pH and concentrations of suspended matter are provided in Section 4.6.

Contingency Measures

During operation of the system, water discharge will be monitored, as part of the water sampling and maintenance program. Recommended check points include the pump out pit grates and the corresponding release point, or stormwater entry drain. The information to be recorded shall include estimates of volume, colour and appearance. It is understood that the contracted environmental consultant or the building manager / caretakers shall be responsible for this monitoring and record keeping.

Some $24m^3$ of pit storage capacity will be available within the basement area (*Ref.* Appendix A). This will allow up to 10 days of storage, should a failure of the dewatering system occur, such that it requires temporary shut down until investigations and maintenance are completed.

In the event that the pit pump malfunctions, repairs would be conducted as soon as possible. The capacity of the pit ($24m^3$) is considered to be sufficient to enable repairs without overflow; however, a back-up pump would be engaged where necessary, which may only be used subject to adoption of the procedure in this plan. Flexible containment bunds will be employed to contain any pit overflows, should they arise.

In the event of an increase in sediment load (i.e. observed discoloration or >50 mg/L total suspended solids), discharge of water will cease for additional treatment to be implemented. This may require diverting the water, by pumping it into a trade waste vehicle.

Details of the system maintenance schedule are to be recorded, as part of the monitoring checklist. The pump out pit and oil-water separator should be emptied and cleaned at least once per month whilst in use. The resultant sediment is to be removed and dried as best as practicable, before off-site disposal as solid waste. Pit cleaning water will be retained on-site and treated in a similar manner to the groundwater seepage.

4.4 Water Quality Monitoring Program

It is critical that the performance of the dewatering system is routinely monitored. This sampling program provides a practical framework for the monitoring and reporting of basement water quality across the site. The following measures will be of particular relevance to the proposed system:

- completion of monthly inspections and monitoring checklists of the pump out pit (to confirm the inflow rate and check water clarity);
- monthly inspections of the release point (i.e. stormwater entry drain); and
- mechanisms for enacting remedial measures, should faults or non-compliance occur.

Monthly sampling and laboratory analysis of basement water are to be initiated immediately after the pump out system has been installed, well in advance of any building occupation. Once a comprehensive data set has been collated (i.e. at least 3-6 rounds of sampling), a judgement on further monitoring and/or treatment requirements shall be made.

Recommended Sampling Locations and Analysis

For each (monthly) sampling event, at least one representative discharge water sample is to be collected from the release point (i.e. the north eastern stormwater entry drain). The relevant, or key, parameters that should be tested (as a minimum) are:

- total filtered metals (arsenic, cadmium, chromium, copper, iron, lead, mercury, nickel and zinc);
- C_6-C_{36} total petroleum hydrocarbobs (TPHs);
- polycyclic aromatic hydrocarbons (PAH)s;
- pH;
- electrical conductivity (EC; allowing calculation of total dissolved solids (TDS));
- total suspended solids (TSS);
- total Kjeldahl nitrogen (TKN);
- ammonia;
- oxides of nitrogen (i.e. dissolved nitrate and nitrate); and
- total phosphorus (TP).

In order to capture (isolate) any impacts posed by the proposed dewatering system, an additional location is the pump out pit. Sampling at the pit would be necessary if quality breaches are identified at the downstream release point.

Recommended Sample Containers

Discharge water 'grab' samples will be collected into laboratory-supplied, glass and plastic (HDPE) bottles.

Reporting

The results of the monthly water sampling and analysis must be included as part of the (site) reporting program.

4.5 Recommended Water Quality Criteria

In accordance with Condition 13(A) of the NSW Office of Water *Conditions Statement on Bore License*, the pH of any discharge water is to be between 6.5 and 8.5. As no further numerical standards are included in this statement, the corresponding ANZECC and ARMCANZ (2000) thresholds, or appropriate default criteria, should apply.

With respect to the ANZECC and ARMCANZ (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, criteria relating to the protection of 95% of species in freshwater aquatic ecosystems and slightly disturbed lowland rivers in south-east Australia are considered the most appropriate for this site. Note that the latter provide the trigger values for nitrite, total nitrogen, total phosphorus, EC, turbidity and TSS (presented under Tables 3.3.2-3.3.3 of the publication).

For the purposes of this management plan, these criteria will be referred to as the *Discharge Acceptance Levels* (DALs). A summary of the DALs is presented in Table 1.

Table 1. Summary of the recommended Discharge Acceptance Levels.

ANALYTE	DALs
Total Filtered Metals (µg/L)	
arsenic	13
cadmium	0.2
chromium (as CrVI)	1.0
copper	1.4
iron	300 [1]
lead	3.4
mercury	0.6
nickel	11
zinc	8.0
TPHs (µg/L)	
C_{10}-C_{14}	total 600 [2]
C_{15}-C_{28}	
C_{29}-C_{36}	
PAHs (µg/L)	
total PAHs	3.0 [3]
benzo(a)pyrene	0.05 [4]
pH	6.5-8.5 [5]
EC (µS/cm)	125-2200
TDS (mg/L)	500 [1]
Total Suspended Solids (mg/L)	≤50 [6]
Oxides of Nitrogen (mg/L)	
nitrate	0.7
nitrite	0.04
Ammonia (mg/L)	0.9
Total Nitrogen (mg/L)	0.5
Total Phosphorus (mg/L)	0.05

Footnotes:

Filtered metals correspond to the dissolved fraction (0.45µm membrane filtered sample)

TDS may be determined by calculation (i.e. 0.65 x EC value (in µS/cm))

Discharge Acceptance Levels (DALs) are the ANZECC & ARMCANZ (2000) *Trigger Values* for protection of 95% of species in marine ecosystems, or slightly disturbed lowland rivers in south-east Australia, unless otherwise indicated

[1] NHMRC & ARMCANZ (1996) *Australian Drinking Water Guideline* (aesthetic based)

[2] Netherlands (1994) *Groundwater New C (Intervention)* value for mineral oil, which includes the C_{10}-C_{36} fraction

[3] NEPC (1999) *Groundwater Investigation Level for Aquatic Ecosystems (Fresh Waters)*

[4] Netherlands (1994) Groundwater New C (Intervention) value

[5] as per Condition 13(A) of the NSW Office of Water *Conditions Statement on Bore License 10BL604529*

[6] TSS is referred to as suspended particulate matter in Table 3.3.3 of the ANZECC & ARMCANZ (2000) *Guidelines*

4.6 Contingency Measures Triggered by Failures of the Dewatering System

Only non-acidic / non-alkaline (i.e. pH 6.5-8.5), non-turbid (≤50 mg/L TSS) water will be discharged into the local drainage system. Should acidic (pH <6.5) or alkaline (pH >8.5) or turbid (>50 mg/L TSS) water be encountered, it will be retained within the pump out pit. It will then be treated with lime or hydrochloric acid (HCl), respectively, to display a pH level of 6.5-8.5, prior to release.

Powdered lime will be added to the water by shovel (or similar), then mixed. Liquid HCl will be poured into the pit, then mixed. Field pH and turbidity testing on representative samples will be performed to ensure that sufficient neutralisation and/or sedimentation has occurred.

If discharge water is found to contain significant levels of floating product, odour and/or (in)organic compounds (e.g. metals, TPHs and PAHs), the water will be pumped into a licensed liquid waste transporter and disposed at the Lidcombe Liquid Waste Plant, Hill Road, Homebush Bay (or an equivalent liquid waste facility).

Should there be non-compliance with a requirement of this Management Plan in relation to the discharge of water and its quality, corrective actions shall be immediately implemented:

- the discharge of basement water into the local drainage (stormwater) system shall immediately cease and not re-commence until water quality meets the DALs in Table 1 and the Environmental Health section of Ku-ring-gai Council has been notified by email or facsimile;

- an investigation will be undertaken by the relevant contractor/consultant, assisted by site management, to determine the cause of the problem;

- the work practices for the suspected activity shall be modified, as necessary, by recommendations made in writing to eliminate or reduce non-compliance, and those recommendations are to be adopted as if they form part of this plan;

- if water containment structures or sediment control devices are not operating effectively, they will be repaired or replaced at the direction of the consultant;

- additional water quality monitoring will be undertaken, where required by the consultant, to establish efficacy of the corrective action; and

- Ku-ring-gai Council and the NSW Office of Water will be notified within 24 hours of the incident occurring.

4.7 System Improvements

The integrity of the dewatering system will be maintained and improved by:

- the continuation of monthly system checks;
- recording the details of all system maintenance;
- retaining all contingency measures on-site;
- training site personnel, especially when new/additional methodology is to be implemented; and

- conducting water quality testing when instances of non-compliance are suspected, or confirmed.

4.8 Conclusions

In summary, the total volume of water that will be pumped from the basement on a daily basis is expected to be very low ($\leq$2.5 m^3, or $\leq$2500 litres). Prior to discharge into the local stormwater system, all such water will be subjected to treatment (purification), including a sedimentation pit with an oil-water separator. Prior to building occupation, sampling and testing shall be performed on a monthly basis, to monitor the initial performance of the dewatering system and trigger remedial measures, should a breach in quantity and/or quality be identified.

It is therefore expected that the proposed basement pump out system will not adversely affect any receiving waterway, both in terms of quantity and quality of water.

5.0 STATEMENT OF LIMITATIONS

No warranties are made as to the information provided in this plan. All recommendations are the professional opinions of the HEC personnel involved with the project and while normal checking of the accuracy of data has been conducted, any circumstances outside the scope of this plan or which are not made known to HEC personnel and which may impact on those opinions are not the responsibility of HEC.

Should you require additional information or clarification regarding any aspect of this plan, please call the undersigned on (02) 9529 3344 or 0413 356 802.

For and on behalf of,
HAYES ENVIRONMENTAL CONSULTING PTY LTD

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Environmental Chemist / Toxicologist

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MRACI C.Chem, MAIBiol, MAPESMA, MEIANZ

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Dr Warwick Hayes
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THE ROYAL AUSTRALIAN CHEMICAL INSTITUTE

REFERENCES

ANZECC and ARMCANZ (1992) *Summary guidelines for the protection of fresh water aquatic ecosystems*, published under the *Australian Water Quality Guidelines for Fresh and Marine Waters*. Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand.

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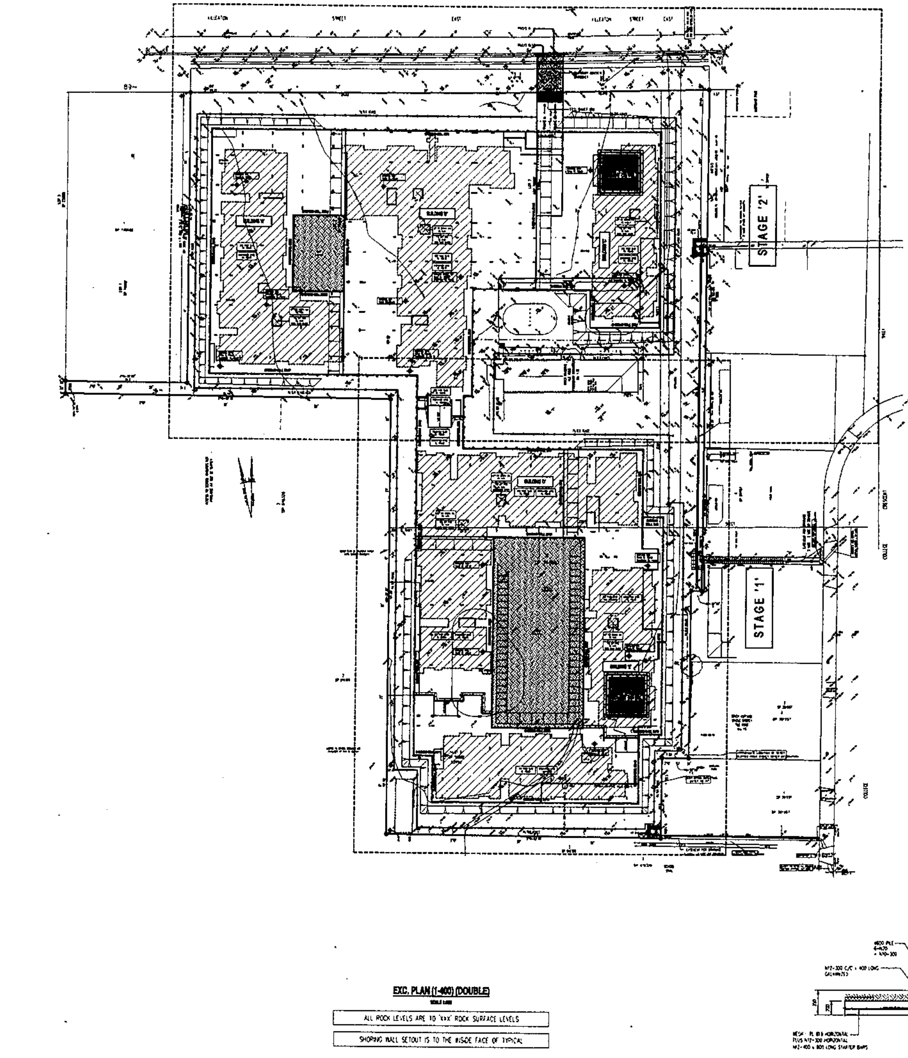
APPENDIX A

PLANS OF THE PROPOSED BASEMENT
(supplied courtesy of Meriton Apartments Pty Ltd)



EXC. PLAN (1-400) (DOUBLE)

ALL ROCK LEVELS ARE TO 'XXX' ROCK SURFACE LEVELS

SHORING WALL SETOUT IS TO THE INSIDE FACE OF TYPICAL

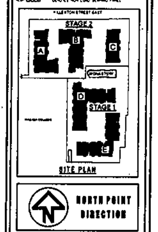
BULK EARTHWORK AND SHORING NOTES

SHORING WALL DESIGN SCOPE:

GENERAL NOTES:

NOTES:

LEGEND:



TENDER NOTES:

ISSUED FOR TENDER ONLY

NOTE:

- PROOF ROLL SUB-GRADE UNDER RAFT FOUNDATIONS.
- TEST SAND IN TOP 300mm LAYERS TO ACHIEVE 90% OF STANDARD DENSITY.

NOTE:

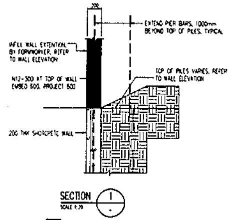
SHEETPILE WALL TO BE DESIGNED AND CONSTRUCTED BY CONTRACTOR. SHORING WALLS SHOULD BE DESIGNED TO WITHSTAND APPROPRIATE HYDROSTATIC WATER PRESSURES INCORPORATING RECOMMENDATIONS IN THE THE GEOTECHNICAL REPORT PREPARED BY JEFFERY AND KATAUSKAS PTY LTD (REPORT No. XXXrpt)

NOTE:

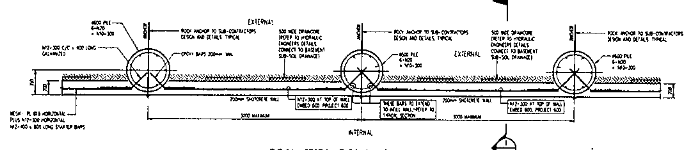
THE CONTRACTOR SHALL SATISFY THEMSELVES TO THE CORRECTNESS, OR OTHERWISE, OF THE ESTIMATED TOP OF ROCK LEVEL GIVEN IN THE GEOTECHNICAL REPORT. THE CONTRACTOR SHALL MAKE ALL ALLOWANCES NECESSARY TO COVER FOR VARIANCE BETWEEN ESTIMATED ROCK LEVEL AND ACTUAL ROCK LEVEL. NO TIME OR COST VARIATION WILL BE GIVEN SHOULD THERE EXIST A DIFFERENCE BETWEEN ACTUAL ROCK LEVEL AND ESTIMATED ROCK LEVEL.

LEGEND:

BH1 DENOTES LOCATION OF JEFFERY AND KATAUSKAS P/L BORE HOLE



SECTION 1
SCALE 1:20



TYPICAL SECTION THROUGH SOLDIER PILE WALL
SCALE 1:20
(FINAL DESIGN TO SUB-CONTRACTORS DESIGN AND DETAILS)

ISSUE	DATE	REVISION	BY

Meriton Apartments Pty. Ltd.
Builders & Developers

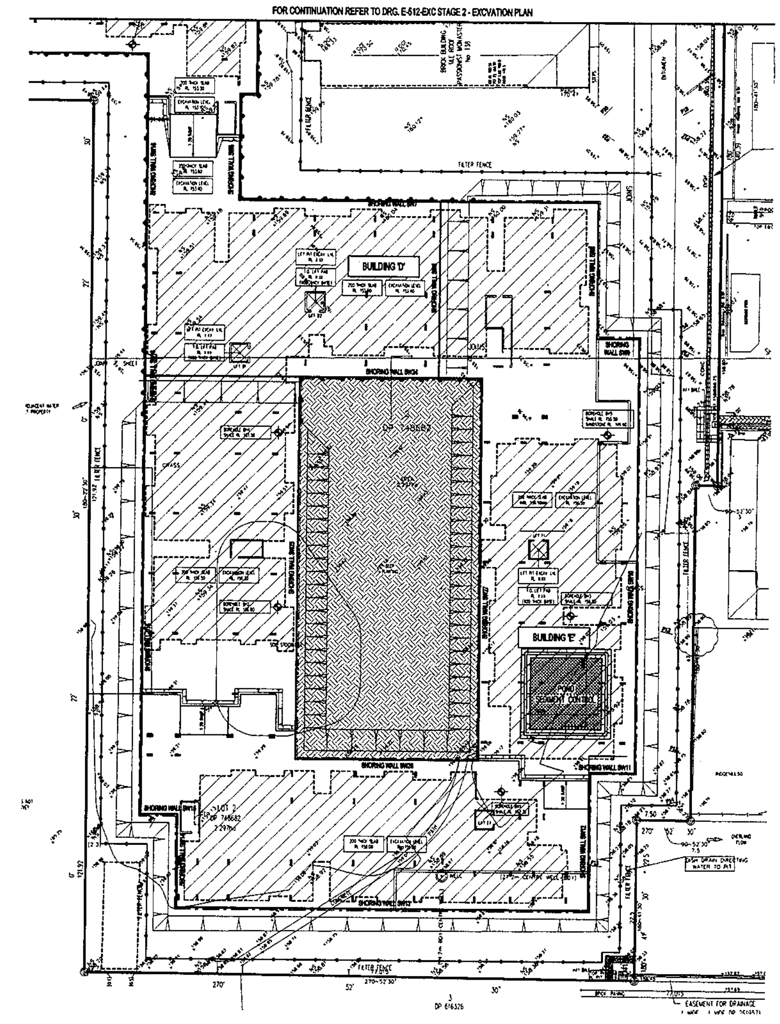
PROJECT:
PROPOSED RESIDENTIAL AND COMMERCIAL DEVELOPMENT
STAGE 2
131 - 138 KILLEATON STREET
ST. IVES, NEW SOUTH WALES 2075

DRAWING TITLE:
EXC. PLAN (1-400) (DOUBLE)

DATE	SCALE	DRAWING No.	REV.
	AS SHOWN	E-520-EXC	2

DO NOT SCALE

A0



STAGE 1 - EXC. PLAN (DOUBLE)

ALL ROCK LEVELS ARE TO 'xxx' ROCK SURFACE LEVELS

SHORING WALL SETOUT IS TO THE INSIDE FACE OF TYPICAL

GENERAL NOTES:

NOTES:

LEGEND:

STAGE 2

STAGE 1

SITE PLAN

NORTH POINT DIRECTION

TENDER NOTES:

ISSUED FOR TENDER ONLY

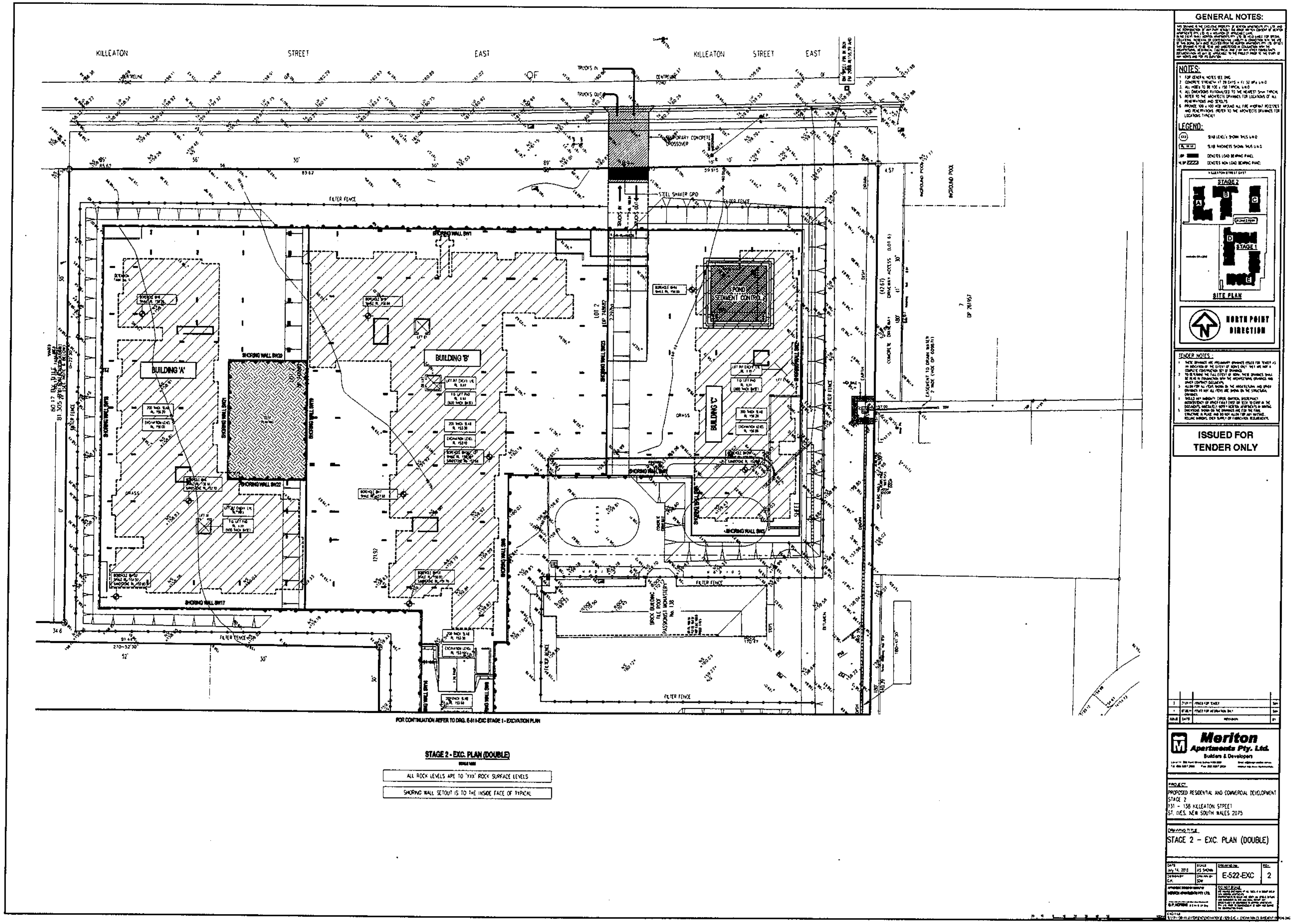
Meriton Apartments Pty. Ltd.
Builders & Developers

PROJECT:
PROPOSED RESIDENTIAL AND COMMERCIAL DEVELOPMENT
STAGE 2
131 - 138 KILLEATON STREET
ST IVES, NEW SOUTH WALES 2075

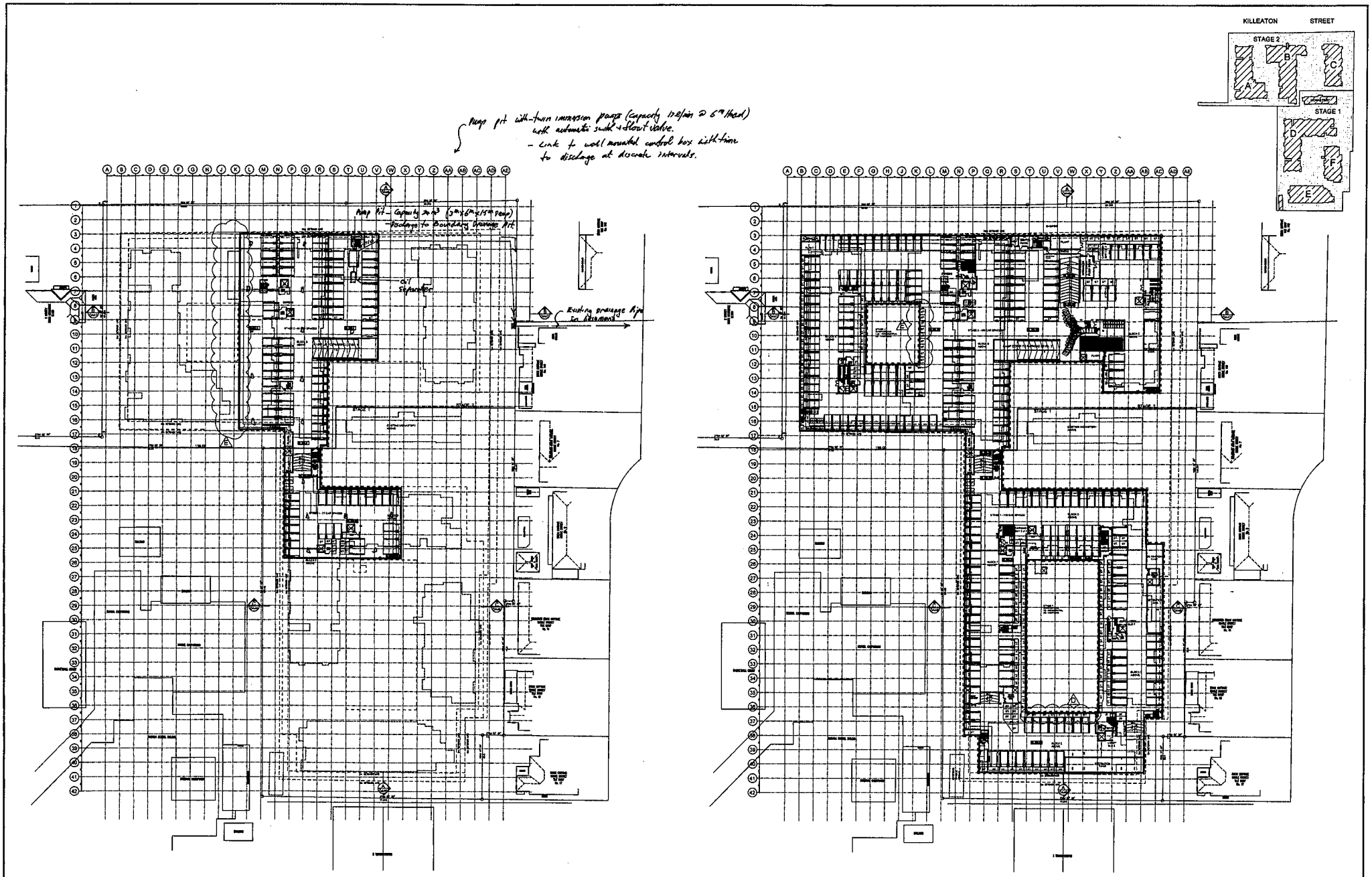
DRAWING TITLE:
STAGE 1 - EXC. PLAN (DOUBLE)

E-521-EXC | 2

A0



KILLEATON STREET EAST
KILLEATON STREET EAST
TRUCKS IN
TRUCKS OUT
TEMPORARY CONCRETE CROSSOVER
STEEL SHAKER GRID
FILTER FENCE
SHORING WALL
BUILDING 'A'
BUILDING 'B'
BUILDING 'C'
POND SEDIMENT CONTROLS
GRASS
LOT 2
INGROUND POOL
BRICK BUILDING TILE ROOF PASSIONIST MONASTERY No. 138
FOR CONTINUATION REFER TO DRG. E-511-EXC STAGE 1 - EXCAVATION PLAN
STAGE 2 - EXC. PLAN (DOUBLE)
ALL ROCK LEVELS ARE TO "XX" ROCK SURFACE LEVELS
SHORING WALL SETOUT IS TO THE INSIDE FACE OF TYPICAL
GENERAL NOTES:
NOTES:
LEGEND:
STAGE 2
STAGE 1
SITE PLAN
NORTH POINT DIRECTION
TENDER NOTES
ISSUED FOR TENDER ONLY
Meriton Apartments Pty. Ltd.
Builders & Developers
PROJECT:
PROPOSED RESIDENTIAL AND COMMERCIAL DEVELOPMENT
STAGE 2
131 - 138 KILLEATON STREET
ST. IVES, NEW SOUTH WALES 2075
DRAWING TITLE:
STAGE 2 - EXC. PLAN (DOUBLE)
E-522-EXC
2
A0



CARPARK PLANS
SCALE 1:500

ISSUE	DATE	REVISION	BY
9	26.07.11	BASEMENT EXTENTS REVISED	JW
C	01.07.11	DRAWINGS REVISED FOR P.A.C. REQUIREMENTS	JRW
B	03.12.10	DRAWINGS REVISED FOR D.O.P. REQUIREMENTS	AJH
A	09.07.10	ISSUE FOR DEVELOPMENT APPLICATION	AJH
E	19.08.11	BASEMENT EXTENTS REVISED - 27 VISITOR SPACES DELETED	JW

DO NOT SCALE.
USE FIGURED DIMENSIONS AT ALL TIMES. IF IN DOUBT CHECK WITH MERITON APARTMENTS PTY. LTD. CONTRACTOR'S TO CHECK AND VERIFY ALL LEVELS, DATUMS AND DIMENSIONS ON SITE AND SHALL REPORT ANY DISCREPANCIES OR OMISSIONS TO MERITON APARTMENTS PTY. LTD. PRIOR TO COMMENCEMENT OF WORK AND DURING THE CONSTRUCTION PHASE.

NORTH

Meriton Apartments Pty. Ltd.
Builders & Developers
Level 11, 528 Kent Street Sydney NSW 2000
Tel: (02) 9287 2686 Fax: (02) 9262 2777

PROJECT:
PROPOSED RESIDENTIAL DEVELOPMENT
KILLEATON
132-138 KILLEATON STREET
ST.IVES, NSW 2075

DRAWING TITLE:
CARPARK PLANS - GROUNDWATER DRAINAGE CONCEPT

PROJECT No.	DATE	DRAWING No.	REV.
746 & 750	6/10/2011	DA-02	E
DRAWN BY: AH	SCALE: AS SHOWN		

CAD FILE: k:\138-138-killeaton\arch\DA-02 CARPARK PLAN.dwg

JAMES WILTON - GEOFF - DA-02 CARPARK PLANS.DWF - 8/19/2011 - 15:06

B1

APPENDIX B

HYDROGEOLOGICAL PLAN

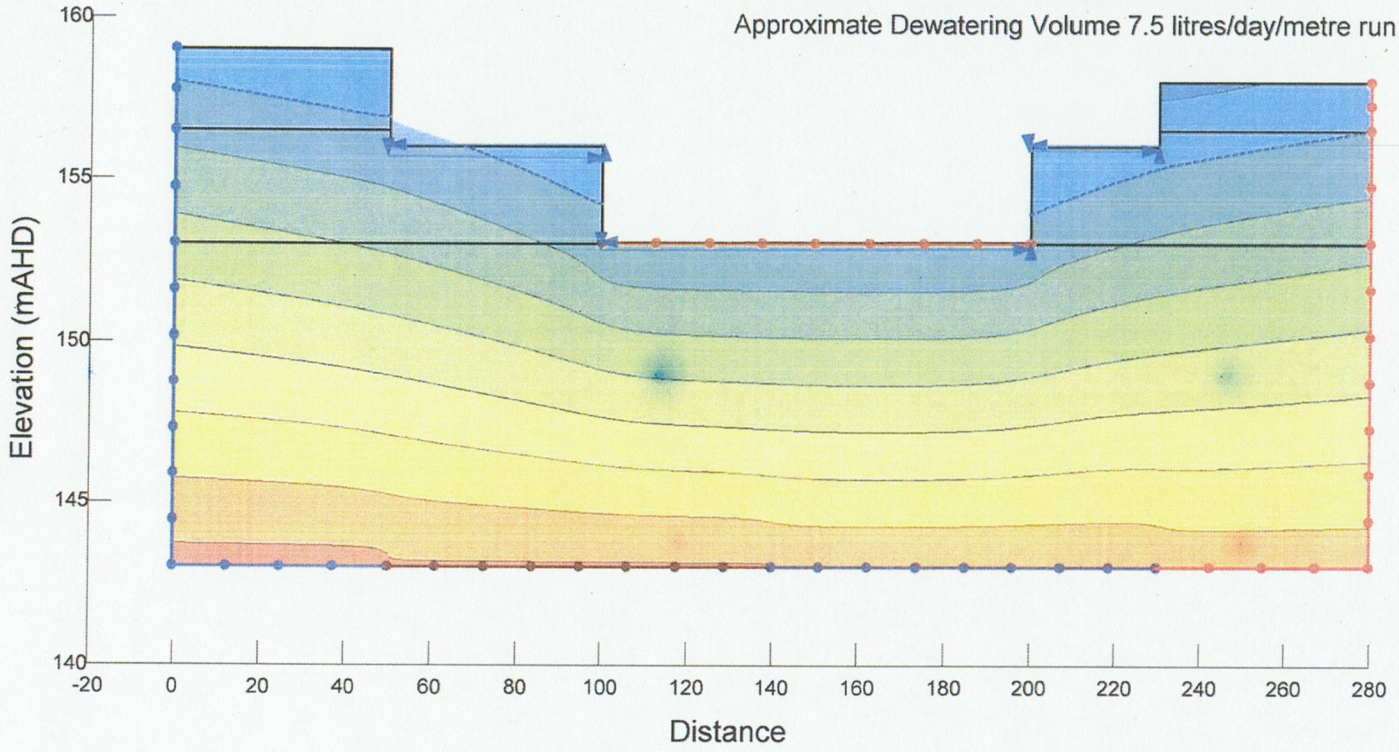
(supplied courtesy of Jeffery and Katauskas Pty Ltd)

Groundwater Seepage Analysis

132 - 138 Killeaton Street, St Ives, NSW

Seepage Flows into Basement Excavation

Approximate Dewatering Volume 7.5 litres/day/metre run

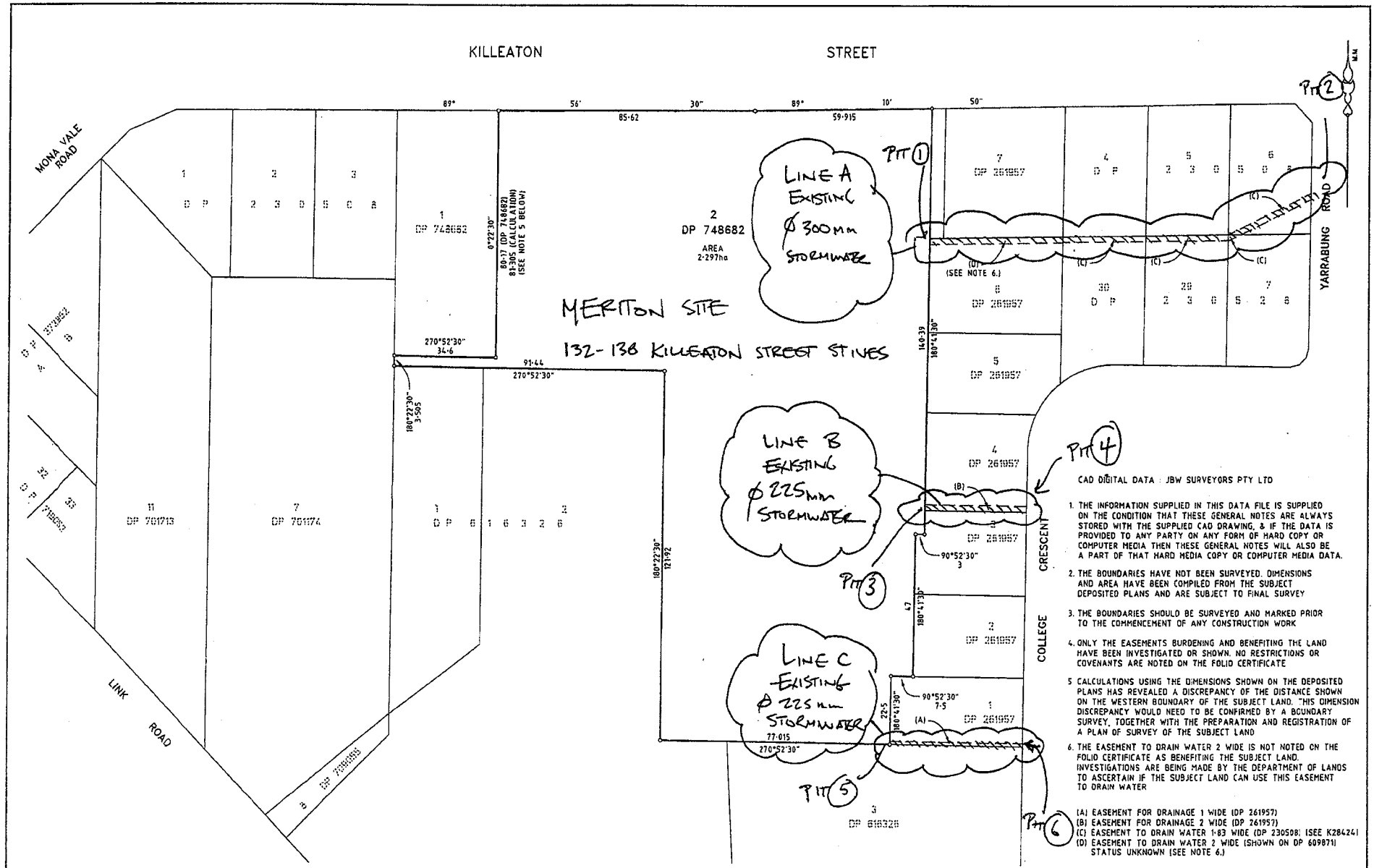


Jeffery and Katauskas Pty Ltd

Report No. 23765Z2 Figure No. 3

APPENDIX C

SITE SURVEY PLAN WITH THE PUMP OUT DISCHARGE POINT
(supplied courtesy of Meriton Apartments Pty Ltd)



CAD DIGITAL DATA : JBW SURVEYORS PTY LTD

1. THE INFORMATION SUPPLIED IN THIS DATA FILE IS SUPPLIED ON THE CONDITION THAT THESE GENERAL NOTES ARE ALWAYS STORED WITH THE SUPPLIED CAD DRAWING, & IF THE DATA IS PROVIDED TO ANY PARTY ON ANY FORM OF HARD COPY OR COMPUTER MEDIA THEN THESE GENERAL NOTES WILL ALSO BE A PART OF THAT HARD MEDIA COPY OR COMPUTER MEDIA DATA.
2. THE BOUNDARIES HAVE NOT BEEN SURVEYED. DIMENSIONS AND AREA HAVE BEEN COMPILED FROM THE SUBJECT DEPOSITED PLANS AND ARE SUBJECT TO FINAL SURVEY
3. THE BOUNDARIES SHOULD BE SURVEYED AND MARKED PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION WORK
4. ONLY THE EASEMENTS BURDENING AND BENEFITING THE LAND HAVE BEEN INVESTIGATED OR SHOWN. NO RESTRICTIONS OR COVENANTS ARE NOTED ON THE FOLIO CERTIFICATE
5. CALCULATIONS USING THE DIMENSIONS SHOWN ON THE DEPOSITED PLANS HAS REVEALED A DISCREPANCY OF THE DISTANCE SHOWN ON THE WESTERN BOUNDARY OF THE SUBJECT LAND. THIS DIMENSION DISCREPANCY WOULD NEED TO BE CONFIRMED BY A BOUNDARY SURVEY, TOGETHER WITH THE PREPARATION AND REGISTRATION OF A PLAN OF SURVEY OF THE SUBJECT LAND
6. THE EASEMENT TO DRAIN WATER 2 WIDE IS NOT NOTED ON THE FOLIO CERTIFICATE AS BENEFITING THE SUBJECT LAND. INVESTIGATIONS ARE BEING MADE BY THE DEPARTMENT OF LANDS TO ASCERTAIN IF THE SUBJECT LAND CAN USE THIS EASEMENT TO DRAIN WATER

(A) EASEMENT FOR DRAINAGE 1 WIDE (DP 261957)
(B) EASEMENT FOR DRAINAGE 2 WIDE (DP 261957)
(C) EASEMENT TO DRAIN WATER 1.83 WIDE (DP 230508) (SEE K284241
(D) EASEMENT TO DRAIN WATER 2 WIDE (SHOWN ON DP 609871) STATUS UNKNOWN (SEE NOTE 6.)

REV.1-ADJOINING LOT AND EASEMENT INFORMATION ADDED (18/06/2010)

JBW Surveyors Pty Ltd.
ACN 001149373
Level 7, 376 Bay Street Brighton-Le-Sands NSW 2216
Phone: (02) 9335 9700 Fax: (02) 9556 3100
www.jbwsurveyors.com.au

CLIENT MERITON APARTMENTS PTY LTD		SHEET Nº 1 OF 1 SHEETS	
TITLE PLAN SHOWING COMPILED BOUNDARY DIMENSIONS OF LOT 2 IN DP 748682 BEING Nº 132-138 KILLEATON STREET, ST IVES		DRAFTED BS	SCALES 1:800
		CHECKED AK	DATE 7/6/2010
LGA KU-RING GAI		AREA OF SITE -	PLAN REF.: 124622 BOUNDARIES REV. 1