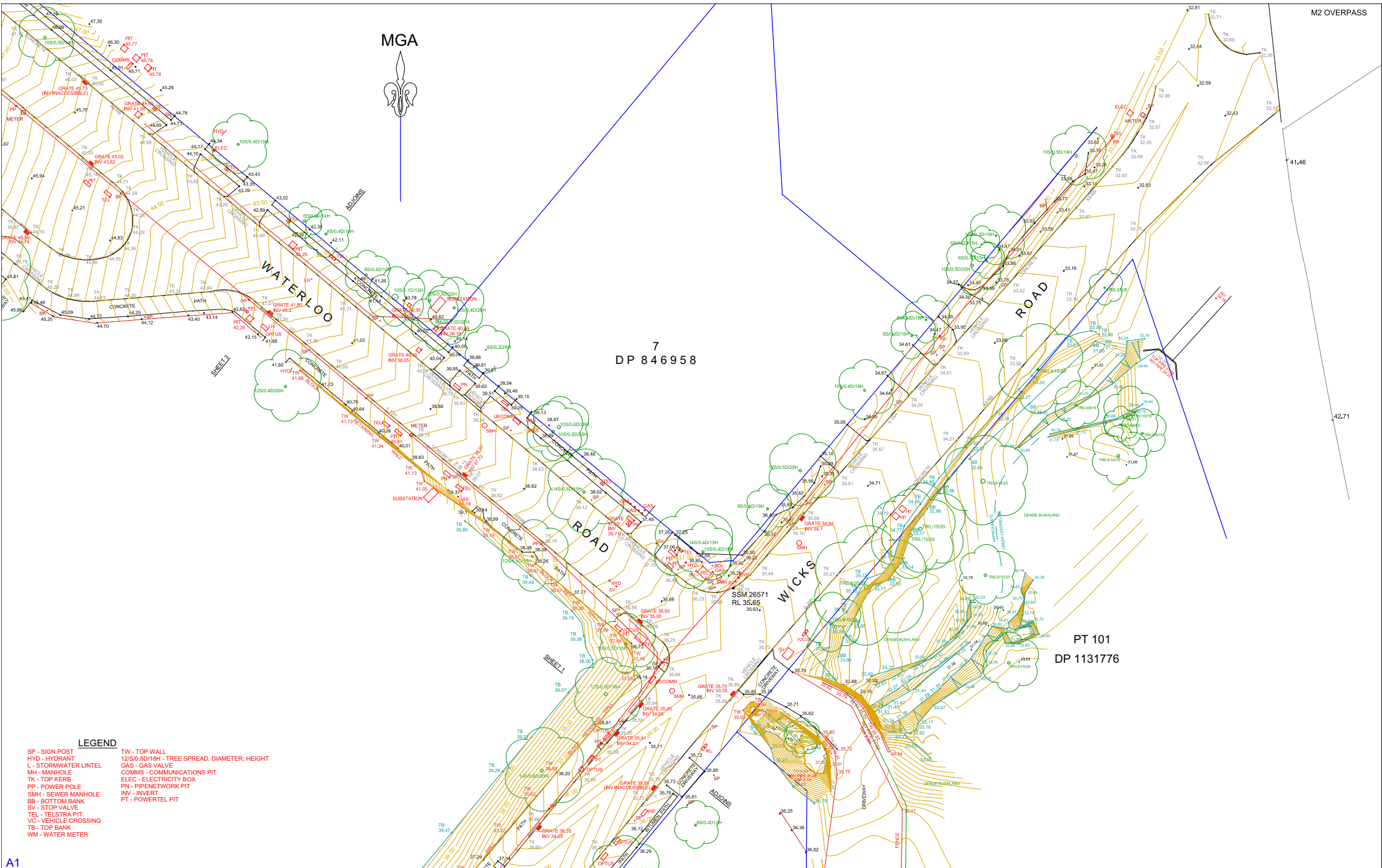




A1

NOTES :

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CLIENT: URBAN GROWTH

PLAN OF: INTERSECTION WATERLOO ROAD & WICKS ROAD NORTH RYDE

SHOWING: GENERAL DETAIL AND SITE LEVELS

PURPOSE: ENGINEERING DESIGN COUNCIL SUBMISSION

SHEET 2 OF 3

SCALE 1:300

SURVEYOR :	AARON B
DATUM :	AUSTRALIAN HEIGHT DATUM
ORIGIN :	SSM 26571 RL35.647
JOB REF. :	B1505
COMPUTER REF. :	B1505
DRAWING NO. :	B1505-WATERLOO
CHECKED :	
DATE OF SURVEY :	12 FEBRUARY 2014
REDUCTION RATIO :	1:300

MACQUARIE PARK

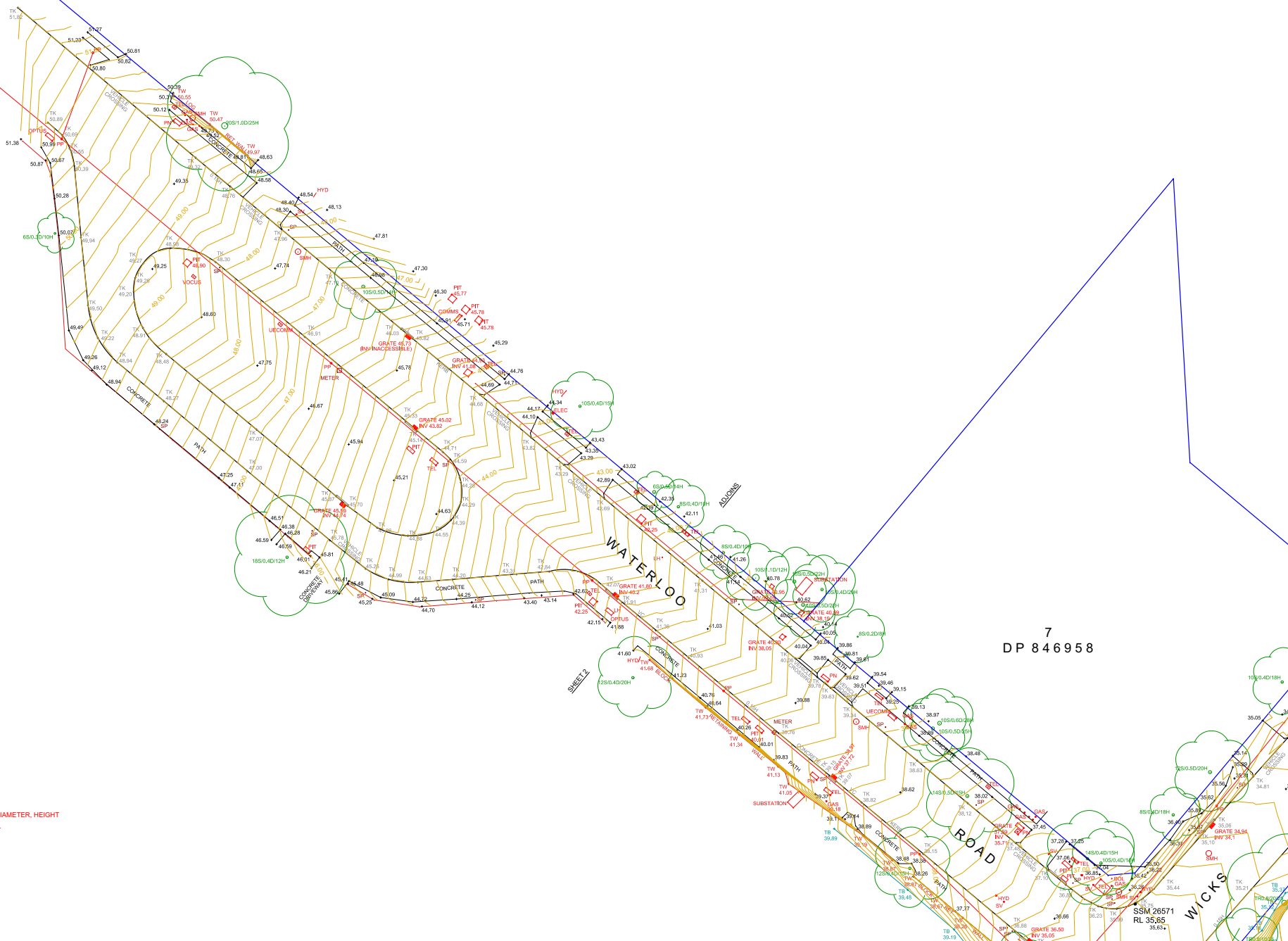
PO Box 4004
MACQUARIE CENTRE NSW 2113
SUITE 404, LEVEL 4
No13-15 LYON PARK ROAD,
MACQUARIE PARK NSW 2113

PHONE : 9888 3848
FAX : 9888 3875
email: office@projectsurveyors.com.au
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LEGEND

SP - SIGN POST
HYD - HYDRANT
L - STORMWATER LINTEL
MH - MANHOLE
TK - TOP KERB
PP - POWER POLE
SMH - SEWER MANHOLE
BB - BOTTOM BANK
SV - STOP VALVE
TEL - TELSTRA PIT
VC - VEHICLE CROSSING
TB - TOP BANK
WM - WATER METER

TW - TOP WALL
12S/0.6D/1BH - TREE SPREAD, DIAMETER, HEIGHT
GAS - GAS VALVE
COMMS - COMMUNICATIONS PIT
ELEC - ELECTRICITY BOX
PN - PIPE NETWORK PIT
INV - INVERT
PT - POWERTEL PIT

A1

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A	CREEK DETAIL ADDED	17.02.14
REV	AMENDMENTS	DATE

CLIENT: URBAN GROWTH

PLAN OF: INTERSECTION WATERLOO
ROAD & WICKS ROAD
NORTH RYDE

SHOWING: GENERAL DETAIL AND
SITE LEVELS

PURPOSE: ENGINEERING DESIGN
COUNCIL SUBMISSION

SHEET 3 OF 3

SCALE 1:300	
0	30
10	20
SURVEYOR :	AARON B
DATUM :	AUSTRALIAN HEIGHT DATUM
ORIGIN :	SSM 26571 RL35.647
JOB REF. :	B1505
COMPUTER REF. :	B1505
DRAWING No.	B1505-WATERLOO
CHECKED :	
DATE OF SURVEY :	12 FEBRUARY 2014
REDUCTION RATIO :	1:300

Appendix B

Cardno TUFLOW Inflow Model



Appendix C

JK Geotechnics Creek Scour Protection Report

3 October 2014
Ref No 27484Srpt2

NPC
PO Box 1060
CROWS NEST NSW 1585



JK Geotechnics
GEOTECHNICAL & ENVIRONMENTAL ENGINEERS

PO Box 976, North Ryde BC NSW 1670
115 Wicks Rd, Macquarie Park NSW 2113
Tel: 02 9888 5000 Fax: 02 9888 5001
www.jkgeotechnics.com.au

ATTENTION: Brian Reeves

Dear Sir

GEOTECHNICAL INVESTIGATION
CREEK SCOUR PROTECTION
PORTERS CREEK, NEAR WICKS ROAD, MACQUARIE PARK, NSW

INTRODUCTION

This letter report presents the results of a geotechnical assessment for the proposed creek scour protection at Porters Creek, near Wicks Road, Macquarie Park, NSW, which was commissioned by Brian Reeves of NPC by email dated 16 September 2014. The limited scope investigation was carried out to satisfy the brief provided by Ross Lucas of Robert Bird Group by email dated 15 September 2014.

We understand that creek scour protection works will be carried out as part of road widening and reconstruction of the adjacent intersection of Wicks Road and Waterloo Road. There is an existing 2.7m diameter culvert that runs under the temporary access road which will be replaced by the new road known as Spine Street. The culvert will be replaced by three rectangular box culverts and the existing road and headwall completely reconstructed.

INVESTIGATION PROCEDURE

The investigation comprised drilling four hand augured boreholes to depths ranging from 1.1m (BH102) to 1.7m (BH101). All boreholes were extended to refusal depth. On completion of the boreholes, detailed creek cross-sectional sketches were prepared.

Soil classification was carried out by visual and tactile inspection of soil samples retrieved from the hand auger head. These soil classifications and other pertinent information is presented on the attached borehole logs. Selected samples were returned to a NATA registered laboratory, Soil Test Services (STS) for grading and Emerson Class testing. The results of this testing are presented in



the attached Tables A and B. The investigation was carried out by our geotechnical engineer who prepared the borehole logs, and section sketches and scheduled the laboratory testing.

INVESTIGATION RESULTS

Site Description

The site comprises Porters Creek and the associated banks, extending from the proposed Spine Street to the M2 motorway. The creek runs to the north-west, meandering gently; the creek originates at the culvert beneath the temporary access road; upstream of this point the water flows in culvert pipes below the Wicks Road properties and from another culvert below Waterloo Road. At the discharge point of the culvert into the creek channel there is a gabion basket headwall, the baskets being filled with basalt spalls. Generally the water in the creek is very shallow but the depth increases adjacent to the culvert. Sandstone and igneous cobbles, bricks and other refuse were located along the creek bed. The creek banks were typically stepped comprising at least one bench and scarp on each side. The site was typically heavily vegetated with limited pedestrian access, mainly by using stepping stones within the creek channel. The banks of the creek are mainly formed in soil that is reinforced with tree roots and scattered sandstone boulders; there are no signs of major erosion though erosion of the soil around tree roots etc is occurring.

At the time of the investigation the water within the deeper sections was murky and it was difficult to determine if sandstone bedrock was exposed at the base of the creeks in the deeper area near the culvert discharge. Probing with a steel rod was inconclusive as there were numerous sandstone cobbles and boulders visible at the bank toes and in the creek bed. Sandstone bedrock was not exposed in the main section of the channel immediately beyond the scour pool near the culverts and this was confirmed by the borehole results as shown on Section B. On the right bank between about 8m and 12m downstream of the headwall there is a sandstone outcrop and towards the north-western end of the site, the creek flows over a sandstone bedrock cliff into a plunge pool adjacent to the M2 culvert and the boreholes suggest the bedrock would be present at shallow depth below the creek bed.

Along the creek the banks typically reveal fill, alluvial and residual clayey sand soils. The observed soil profiles were similar to those encountered in the boreholes.



Subsurface Conditions

Reference to the geological map indicated that the site is underlain by sandstone bedrock. The boreholes encountered a number of soil profiles varying with the distance to the creek and culverts.

BH101 encountered primarily fill comprising sand or sand and gravel. BH102 and BH103 encountered alluvial clayey sands. BH104 encountered residual silty clayey sand. The strength of the soils could not be reliably assessed from the highly disturbed hand auger samples, a lot of which were water affected.

Laboratory Test Results

Gradings

- Fill from BH101: Gravelly silty SAND
- Alluvial from BH102: Silty clayey SAND
- Residual from BH104: Silty clayey SAND.

Emerson Class Numbers

- Alluvial from BH102 – Class 4 – Somewhat dispersive
- Alluvial from BH103 – Class 4 – Somewhat dispersive.

SCOUR VELOCITIES

The stream flow velocity at which scour of river banks occur is dependent on a number of factors, some of which are difficult to define. By way of example Schwab et al in Soil and Water Conservation Engineering advise that for channels with a gradient between 0% and 5% the permissible flow velocity would range between about 0.7m/s and 1.5m/s depending upon the type of vegetation. A CIRIA report (1987) advises that for a channel with a poor grass cover the limiting velocity to avoid erosion would be 2.5m/s for 2 hour duration events and 1.2m/s for 20 hour events. These values are in the same broad range and for the sparse vegetation cover in Porters Creek and the somewhat dispersive and variable soils present it would be prudent to adopt a limiting velocity at the lower end of the range (0.7m/s), above which some form of erosion protection should be provided. It is noteworthy that scour and erosion are not prevalent in the existing channel.

As far as the channel floor is concerned there appears to be sandstone bedrock present either at or just below bed level. Provided flooding does not cause undermining of bank protection works if



scour down to the bedrock level occurs, then it would not seem to be necessary to protect the channel floor.

Any bank protection would need to be founded or extend down to the bedrock level. In this setting the use of sandstone boulder walls or gabion walls such as those already used in the headwall to the culvert would be appropriate. Selection of the size of armour stone must reflect the velocity of the channel flow.

FOUNDATIONS

All footings for the culverts and headwalls should be founded on the sandstone bedrock and may be designed for an allowable bearing pressure of 1000kPa on sandstone of at least Class 4 quality, subject to inspection by a geotechnical engineer. Irregularities in the creek bed can be made good with mass concrete. Stream flows will have to be temporarily diverted until construction is above water level.

GENERAL COMMENTS

Occasionally, the subsurface conditions between the completed boreholes may be found to be different (or may be interpreted to be different) from those expected. Variation can also occur with groundwater conditions, especially after climatic changes. If such differences appear to exist, we recommend that you immediately contact this office.

This report provides advice on geotechnical aspects for the proposed civil and structural design. As part of the documentation stage of this project, Contract Documents and Specifications may be prepared based on our report. However, there may be design features we are not aware of or have not commented on for a variety of reasons. The designers should satisfy themselves that all the necessary advice has been obtained. If required, we could be commissioned to review the geotechnical aspects of contract documents to confirm the intent of our recommendations has been correctly implemented.

A waste classification will need to be assigned to any soil excavated from the site prior to offsite disposal. Subject to the appropriate testing, material can be classified as Virgin Excavated Natural Material (VENM), General Solid, Restricted Solid or Hazardous Waste. If the natural soil has been stockpiled, classification of this soil as Excavated Natural Material (ENM) can also be undertaken, if requested. However, the criteria for ENM are more stringent and the cost associated with



attempting to meet these criteria may be significant. Analysis takes seven to 10 working days to complete, therefore, an adequate allowance should be included in the construction program unless testing is completed prior to construction. If contamination is encountered, then substantial further testing (and associated delays) should be expected. We strongly recommend that this issue is addressed prior to the commencement of excavation on site.

This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose. If there is any change in the proposed development described in this report then all recommendations should be reviewed. Copyright in this report is the property of JK Geotechnics. We have used a degree of care, skill and diligence normally exercised by consulting engineers in similar circumstances and locality. No other warranty expressed or implied is made or intended. Subject to payment of all fees due for the investigation, the client alone shall have a licence to use this report. The report shall not be reproduced except in full.

Should you require any further information regarding the above, please do not hesitate to contact the undersigned.

Yours faithfully
For and on behalf of
JK GEOTECHNICS

P STUBBS
Principal

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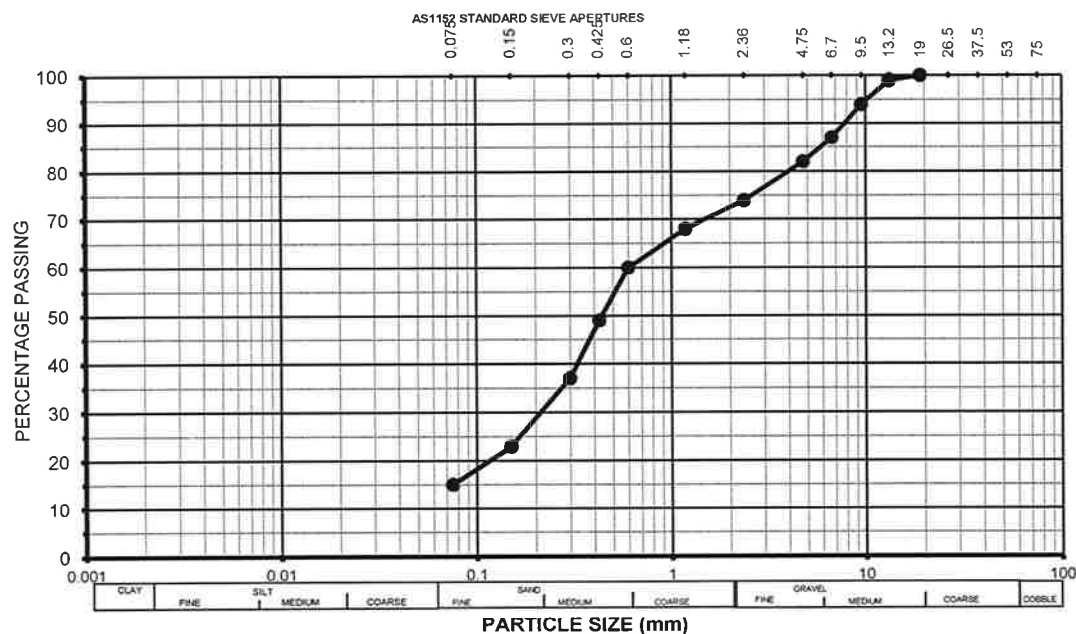
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TABLE A PARTICLE SIZE DISTRIBUTION REPORT

Client: JK Geotechnics
Project: Creek Scour Protection
Location: Porters Creek, Near Wicks Road, Macquarie Park, NSW

Ref No: 27484S
Report No: A
Report Date: 1/10/2014
Page 1 of 3

Borehole Number: 101
Depth (m): 0.20-0.50



SIEVE ANALYSIS RESULTS

SIEVE SIZE	% PASSING
19.0 mm	100
13.2 mm	99
9.50 mm	94
6.70 mm	87
4.75 mm	82
2.36 mm	74
1.18 mm	68
600 µm	60
425 µm	49
300 µm	37
150 µm	23
75 µm	15

Test Method: AS1289.3.6.1 Dry Sieve(washed)

• Notes:

- Please refer to appropriate notes for soil descriptions



NATA Accredited Laboratory
Number:1327

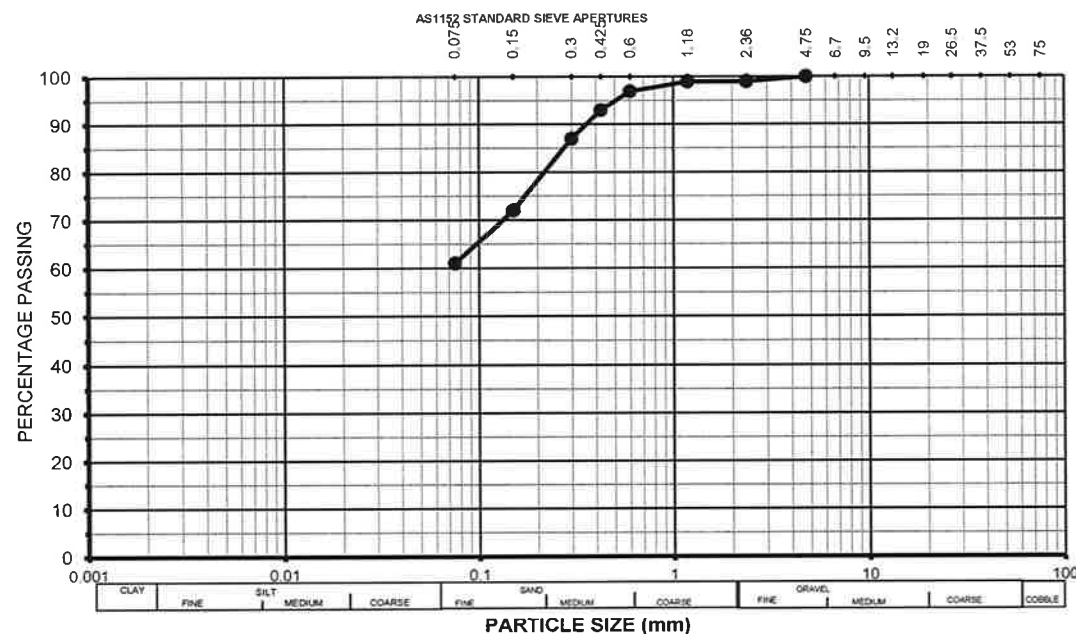
Approved Signature / Date
A. Tatikonda 1/10/14
(A. Tatikonda)

TABLE A PARTICLE SIZE DISTRIBUTION REPORT

Client: JK Geotechnics
Project: Creek Scour Protection
Location: Porters Creek, Near Wicks Road, Macquarie Park, NSW

Ref No: 27484S
Report No: A
Report Date: 1/10/2014
Page 2 of 3

Borehole Number: 102
Depth (m): 0.10-0.40



SIEVE ANALYSIS RESULTS

SIEVE SIZE	% PASSING
4.75 mm	100
2.36 mm	99
1.18 mm	99
600 µm	97
425 µm	93
300 µm	87
150 µm	72
75 µm	61

Test Method: AS1289.3.6.1 Dry Sieve(washed)

• Notes:

- Please refer to appropriate notes for soil descriptions



NATA Accredited Laboratory
Number:1327

Approved Signatory / Date

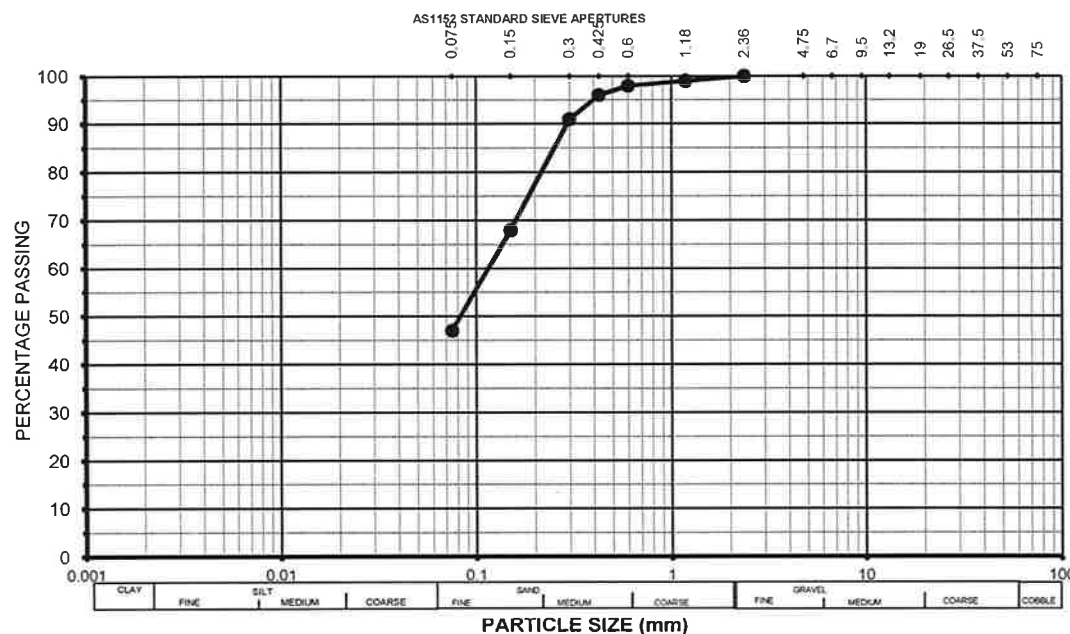
A. Tatikonda 1/10/14
(A. Tatikonda)

TABLE A PARTICLE SIZE DISTRIBUTION REPORT

Client: JK Geotechnics
Project: Creek Scour Protection
Location: Porters Creek, Near Wicks Road, Macquarie Park, NSW

Ref No: 27484S
Report No: A
Report Date: 1/10/2014
Page 3 of 3

Borehole Number: 104
Depth (m): 0.20-0.40



SIEVE ANALYSIS RESULTS

SIEVE SIZE	% PASSING
2.36 mm	100
1.18 mm	99
600 µm	98
425 µm	96
300 µm	91
150 µm	68
75 µm	47

Test Method: AS1289.3.6.1 Dry Sieve(washed)

• Notes:

- Please refer to appropriate notes for soil descriptions



NATA Accredited Laboratory
Number:1327

Approved Signatory / Date
A. Tatikonda 1/10/14
(A. Tatikonda)

TABLE B
EMERSON CLASS NUMBER TEST REPORT

Client: JK Geotechnics
Project: Creek Scour Protection
Location: Porters Creek, Near Wicks Road, Macquarie Park, NSW

Ref No: 27484S
Report: B
Report Date: 1/10/2014
Page 1 of 1

BOREHOLE NUMBER	DEPTH (m)	Air dried soil crumbs in water	Remoulded soil samples in water	Calcite or Gypsum present/ absent	1: 5 Soil/Water Suspension	Emerson Class Number
102	0.10-0.40	Slaking (No Dispersion)	No Dispersion	Present	NA	4
103	0.30-0.40	Slaking (No Dispersion)	No Dispersion	Present	NA	4

NOTES:

- The lowest Emerson Class Number refers to the highest dispersion potential (Range: Class 1 to Class 8)
- Test Method: AS 1289 3.8.1-1997
- All contact water was distilled water, water temperature was 20°C
- Vigorous Shaking causes Dispersion/Flocculation
- Refer to appropriate notes for soil descriptions
- NA refers to not applicable
- Date of receipt of samples: 24/09/2014



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(A. Tatikonda) 1/10/14