Robert Bird Group

PLANS AND DOCUMENTS
referred to in the ULDA
APPROVAL dated 10 / 6 /11

Site Based Stormwater Management Plan

For

Proposed Mixed Use Development at 37 Mayne Road, Bowen Hills

Lot 1 on RP 110079

Prepared For: Metro (Bowen Hills No. 3) Pty Ltd

Revision: A

15th December 2010

Job No.: 10801C

ISO 9001:2008
FS 520893

Report Amendment Register

Issue	Section & Page No.	Issue/Amendment	Author/ Initials		Project Engineer	Reviewer/ Initials		Date
DRAFT	All	Draft	LKT		RJM	BCR		09/12/10
A	All	Issued for DA	LKT	LKT	RJM	BCR	As Rom	15/12/10

ISSUE ACCEPTED BY:

AUTHOR:

.....
LUCAS THEN
Signing for and on behalf of
Robert Bird Group Pty Ltd
Date: 15th December 2010

REVIEWER:

.....
CAMERON RIACH
Signing for and on behalf of
Robert Bird Group Pty Ltd
Date: 15th December 2010

Table of Contents

Appendices

Appendix A: Proposed Level 5 Podium Plan by Bureau Proberts

Appendix B: Concept Stormwater Quality Treatment Plan by Robert Bird Group

Appendix C: Concept Erosion and Sediment Control Plan by Robert Bird Group

Appendix D: Brisbane City Council's Erosion Hazard Assessment Form

Appendix E: BCC's Stormwater Management Code Response

1.0 Purpose of Document

This document has been prepared on behalf of Metro (Bowen Hills No. 3) Pty Ltd as part of the Development Application submission to the Urban Land Development Authority (ULDA) for a proposed mixed use development located at 37 Mayne Road, Bowen Hills.

The purpose of this report is to address the stormwater quantity and quality issues at a conceptual level for the proposed development.

This report was prepared using information obtained from the following sources:

- Detail Survey over Campbell Street, Mayne Road and Hazelmount Street in Bowen Hills prepared by RPS Australia East Pty Ltd, dated 26 October 2010
- Architectural Plans prepared by Bureau Proberts
- Brisbane City Council eBimap information
- Dial-Before-You-Dig (DBYD) services
- Site investigation

2.0 Introduction

2.1 Project Description

The proposed development is for a multi level residential unit tower and retail area. The development consists of a residential tower, podium level, retail outlets and carparking. Refer Appendix A for the proposed Architectural Level 5 Podium Plan by Bureau Proberts.

The proposal also includes an extension of Edgar Street through to Mayne Road. The proposal is for a shared zone for pedestrian and traffic.

The proposed development is located within the Bowen Hills Urban Development Area Development Scheme, particularly Precinct 1 (Bowen Hills Heart) and in accordance with the Urban Land Development Authority Act 2007. The site is located approximately 3km to the north-east of the Brisbane CBD.

Precinct 1 – Bowen Hills Heart, is a mixed use zone category that caters for a range of uses such as commercial, retail, mixed residential and others.

The subject site is bound by Mayne Road to the west, Hazelmount Street to the east, existing commercial lots to the north and to the south. The existing site can be accessed through the existing driveways located along Mayne Road and Hazelmount Street.

Currently the site is fully developed with existing warehouse and on grade car parking area.

The proposed development involves a lot described as Lot 1 on RP 110079.

The existing site area is 2,319m^2.

The approximate area of the final reconfigured site for the purposes of this report in terms of water quality and runoff generated is 1,875m^2. Note, this will be subject to Edgar Street extension final road reserve width and boundary dimensions.

Table 2.1 – Pre Development Land Characteristic Summary

	Roof Area	Impervious Area	Pervious Area	Total Site Area
Area (m^2)	1,086	1,194	39	2,319
% of area	46.8	51.5	1.7	100

Note: The pervious and impervious areas for the existing development are derived from the detail survey plan prepared by RPS dated 26/10/2010. Refer Section 6.3 for more details on the pre development scenario.

Table 2.2 – Post Development Land Characteristic Summary

	Roof Area	Impervious Area	Pervious Area	Total Site Area
Area (m^2)	989	802	84	1,875
% of area	52.7	42.8	4.5	100

Note: The pervious and impervious areas for the proposed development are calculated from the architect's level 5 podium plan, this being the floor level with greatest exposure to the open sky and garden areas. Refer Appendix A for the plan.

2.2 Erosion Hazard Risk Assessment

According to BCC's Subdivision and Development Guidelines and the completed Erosion Hazard Assessment Form, the proposal is classified as a "low risk" development for erosion potential. Refer Appendix D for a copy of the completed form.

2.3 Study Team

The study team preparing this conceptual SBSMP is the Robert Bird Group, consulting engineers and the plan is being prepared on behalf of the developer, Metro (Bowen Hills No. 3) Pty Ltd.

3.0 SITE CHARACTERISTICS

3.1 Location

The street address for the site is 37 Mayne Road, Bowen Hills. The site location is shown in Figure 3.1 below.

Figure 3.1 - Site Location

3.2 Topography and Site Drainage

The subject site is fully developed therefore the site topography is generally flat. Survey information shows the existing carpark adjacent to the western boundary of the site falls westward at around 5% while the existing bitumen carpark adjacent to the eastern boundary of the site falls northward at leas than 3%.

Based on BCC's eBimap contours information, the subject site does not appear to have a distinct upstream catchment area.

3.3 Soils

According to the Brisbane City Council's eBimap system, the site is not flagged as being in an acid sulfate soil (ASS) area. Furthermore, the Butler Partners draft geotechnical report for 29-35 Campbell Street site which is immediate adjacent to this site, comments

that the very limited extent of clay soils encountered in the bores were considered to be residual soils, derived from the in place weathering of underlying rocks of the Brisbane Tuff. As such the soils were not likely to be acid sulfate soils (ASS).

Given that the elevation of the site varies between 17.5m and 20m AHD and excavation for the bottom basement will extend down to approximately RL14.5m AHD, this is well above RL 5m AHD, it is unlikely that ASS's will be encountered.

However, should future testing for ASS's indicate that ASS's do exist on the site, then a suitable Acid Sulfate Soils Management Plan (ASSMP) will be developed and implemented to minimise any potential impacts due to the disturbance of ASS's.

3.4 Waterway Corridor

The site is approximately 400m from Breakfast Creek and is therefore considered to be outside any Brisbane City Council designated waterway corridor (30m from high-water mark in built up areas). Under the Brisbane City Council eBimap, the site is not affected by any other waterway corridors. Therefore, no further consideration of waterway corridor issues has been documented in this SBSMP.

4.0 SITE DATA

4.1 Information

Water quantity and quality assessments have been based upon:

- Brisbane City Council (BCC) eBimap information.
- Brisbane City Council FloodWise Property Report.
- Site inspection.
- Satellite imagery from Google Earth.
- Bureau Probert Architecture Plans.
- Detail Survey over Campbell Street, Mayne Road and Hazelmount Street in Bowen Hills prepared by RPS Australia East Pty Ltd, dated 26 October 2010.

4.2 Existing Stormwater Infrastructure

According to the Survey Plan produced by RPS and Brisbane City Council's eBimap information the following stormwater infrastructure is located in the vicinity of the site.

The existing stormwater system consists of the following:

- A grated inlet is located adjacent at the site's north-western corner. A 375mm diameter pipe runs from this grated inlet to an extended kerb inlet located along the middle of the western boundary of Lot 6 on SL 12311. A 375mm diameter pipe then runs from this kerb inlet to another grated inlet on road before connecting to stormwater manhole (K1602939) located at the Mayne Road and Hudd Street intersection through a 375mm diameter pipe.
- This manhole is then connected to stormwater manhole (K16000051) through a series of pipes and manholes running east along Hudd street.
- From manhole K16000051 the stormwater runs eastwards towards the Hudd and Jamieson Street intersection before running northwards via a 675mm pipe.
- This stormwater drainage line then continues in a north easterly direction which then connects to a stormwater manhole before the Inner City Bypass intersection which eventually then discharges to Breakfast Creek.

- Internally, a 150mm diameter pipe runs north from approximately the centre of the site to a manhole (K16000053) on the adjacent property. A 150mm diameter pipe then runs north connecting to a stormwater manhole (K16000051) located in Hudd Street.

4.3 Water Quantity

The Brisbane City Council's FloodWise Property Report for the site indicates the subject site is not affected by flooding.

4.4 Water Quality

Based on the Queensland Government EPA's "A city-wide assessment of water quality in Brisbane's creeks" October 1999-April 2000, water quality in Breakfast Creek was noted as being poor.

According to the assessment, concentrations of most nutrient fractions were exceeded, and dissolved oxygen concentrations fell below the water quality objectives.

The assessment also indicated that the major source of nutrients in this creek was likely to be water from the Brisbane River via tidal exchange.

Prevention from further water quality degradation is therefore a high priority to ensure protection of Breakfast Creek.

5.0 STORMWATER MANAGEMENT – OPPORTUNITIES AND CONSTRAINTS

5.1 Site Opportunities

The proposed development enables a number of opportunities to address any negative impacts that the proposal may have on the quantity and quality of the stormwater discharging from the subject site. The main limiting factor is the footprint of the development which consists of a basement carpark. This restricts the use of deep planting zones

The opportunities identified are as follows:

- **Stormwater Quantity**
  - The collection of roofwater and stormwater runoff in rainwater tanks may be used for; toilet flushing, landscape irrigation and topping up of swimming pools. Rainwater and stormwater harvesting can reduce the quantity of stormwater being discharged into the natural waterways. This can also assist with reducing the site's demand on an external water supply.

- **Stormwater Quality**
  - It is proposed that all groundwater entering the basement and perimeter subsoil drainage system as well as runoff from access ramps and cars is to be collected and treated in a silt arrestor. The quality of the water is to be tested and if the results are satisfactory, the water will be pumped to the stormwater system. If the water quality results prove unsatisfactory the developer is to either install a package treatment plant or enter a trade waste agreement with Council and discharge the water to the sewer.
  - Implementation of Stormwater Quality Improvement Device/s (SQID's), for this project; litter basket installed in field inlets and rainwater tank as appropriate to reduce the levels of pollutants in stormwater being discharged from site.

5.2 Site Constraints

The proposed mixed use development presents specific constraints. Generally sites of this nature would result in the following:

- Limited areas on site to implement SQID's due to the nature of the development (i.e. the maximum utilisation of space for mixed use, residential/retail floor area and car parking spaces etc).

6.0 STORMWATER QUANTITY ASSESSMENT

6.1 Flooding Objectives

The proposed finished building floor levels and carpark access will be designed to be in accordance with the flood immunity freeboard requirements as documented in Brisbane City Council's Subdivision and Development Guidelines.

6.2 Stormwater Quantity Modelling Approach

Stormwater runoff quantity has been considered for both pre-development and post-development scenarios. Modelling of stormwater runoff has been undertaken using the Rational Method of calculation.

6.3 Pre-Development Scenario

The subject site is currently used for commercial purposes. The pre-development scenario has therefore based on the existing usage of the land.

The existing site consists of approximately 1,086m^2 roof area, 1,194m^2 impervious area and 39m^2 pervious area. Summary of the site's pre-development stormwater discharge parameters used are as listed below:

- Steps for obtaining coefficient of discharge for 1 in 10 year ARI storm event (C10) are listed below:
  - Fraction Impervious (fi) = 0.98
  - One hour rainfall intensity for a 1 in 10 year ARI = 70mm/hr
  - C10 = 0.90 (Queensland Urban Drainage Manual (QUDM) 2007 – Table 4.05.3(a))
- Time of concentration (tc) = 5 minutes

Table 6.3 below summarises peak flows from the existing site.

Table 6.3 - Pre-development Site Hydrology

Average Recurrence Interval - ARI (years)	Rainfall Intensity - I (mm/hr)	Peak Flow - Q (m^3/s)
1	117	0.054
2	151	0.075
5	191	0.106
10	215	0.125
20	248	0.152

50	291	0.187
100	325	0.209

6.4 Post-Development Scenario

The proposed mixed use development will consist of approximately 989m^2 roof area, 802m^2 impervious area and 84m^2 pervious area. The summary of post-development site's stormwater discharge parameters used is as listed below:

- Steps for obtaining coefficient of discharge for 1 in 10 year ARI storm event (C10) are listed below:
  - Fraction Impervious (fi) = 0.96
  - One hour rainfall intensity for a 1 in 10 year ARI = 70mm/hr
  - C10 = 0.89 (Queensland Urban Drainage Manual (QUDM) 2007 – Table 4.05.3(a))
- Time of concentration (tc) = 5 minutes

The following Table 6.4 summarises peak flows from the proposed development.

Table 6.4 - Post-development Site Hydrology

Average Recurrence Interval - ARI (years)	Rainfall Intensity - I (mm/hr)	Peak Flow - Q (m^3/s)
1	117	0.043
2	151	0.060
5	191	0.085
10	215	0.100
20	248	0.120
50	291	0.152
100	325	0.169

The comparison between pre-development and post-development flows has demonstrated there is a small decrease in stormwater runoff from the proposed development. Therefore, detention of stormwater is not considered necessary.

6.5 Legal Point of Discharge

The legal points of discharge for the minor and major storm events for the proposed development are as follows:

- Minor Storm (piped drainage) is proposed to discharge to the existing stormwater infrastructure located in Mayne Road. Further details will be provided at the Operational Works submission stage.
- Major Storm events will discharge via overland flow onto Mayne Road and eventually into the Breakfast Creek.

7.0 STORMWATER QUALITY ASSESSMENT

7.1 Pollutants of Concern

The key pollutants generated by various developments are listed by Brisbane City Council Subdivision and Development Guidelines Part C Water Quality Management Guidelines (2008c). During the operational (post-construction) phase of a mixed use development, Brisbane City Council (Table C4.2, 2008c) identifies the following pollutants as being typically generated:

- Litter
- Sediment
- Nutrients (Nitrogen & Phosphorous)
- Pathogens/Faecal coliforms (bacteria and viruses)
- Hydrocarbons (including oil and grease) - unlikely
- Heavy Metals (often associated with fine sediment)
- Surfactants (e.g. detergents from car washing)
- Thermal pollution (heat)

Brisbane City Council (2008c) recognizes that the heterogeneity of mixed use developments requires that site-specific assessment needs to be undertaken in order to determine which of the potential pollutants is likely to occur and require trapping. Considering that the proposed development involves large area of roof and basement car park, the source points for the above pollutants are fairly limited. Key pollutants which may be of concern in runoff from the podium level and basement include:

- Litter
- Sediments
- Nutrients
- Surfactants
- Hydrocarbons

During the construction phase of a development, the pollutants listed in Table 7.1 have been identified by Brisbane City Council (Table C4.1, 2008c) as being typically generated. Measures should be put in place during the construction phase to manage each of these pollutants.

Table 7.1 - Pollutants Typically Generated During the Construction Phase

Pollutant	Source
Litter	Paper, construction packaging, food packaging, cement bags, off-cuts
Sediment	Unprotected exposed soils and stockpiles during earthworks and building
Hydrocarbons	Fuel and oil spills, leaks from construction equipment
Toxic Materials	Cement slurry, asphalt prime, solvents, cleaning agents, washwaters (e.g. from tile works)
pH Altering Substructures	Acid sulfate soils, cement slurry and washwaters

7.2 Environmental Values and Water Quality Objectives (WQO's)

Based on the nature of the development proposed as described above we have assessed this site to be "low risk" and have identified that the site does not require additional measures to treat stormwater other than those defined in this report to be in accordance with Brisbane City Council Stormwater Management Plan.

7.3 Modelling/Assessment Approach

A quantitative assessment of stormwater runoff quality was considered only for the operational phase of the development.

The pollutants of concern during the construction phase are not readily modelled due to the site-specific nature of typical construction pollutant sources that are dependent largely on site management practices and vary throughout the construction phase depending on the particular activities being undertaken.

A Best Management Practice (BMP) approach was adopted in selecting management options for the construction phase.

8.0 STORMWATER QUALITY MANAGEMENT OPTIONS

8.1 Construction Phase

Best management practices are proposed to be implemented at various stages of the construction to manage the pollutants generated during the construction phase of the development as discussed in Section 7.1.

It is expected that due to the nature of basement excavations, a sump pit will be required to trap sediment in the stormwater runoff, and hence reduce the sediment concentration of the stormwater discharging from the site during the construction period.

In addition to the sump pit mentioned above, it is anticipated that the following erosion and sediment control measures would be implemented either prior to and/or during construction of the development to minimise the impact of stormwater quality discharging from the site.

During the construction phase of the development, an Erosion and Sediment Control Program (E&SCP) will be implemented to minimise water quality impacts.

- **Pre-Construction**

Before construction activities begin, the following measures need to be implemented to ensure minimal disturbance and adverse water quality impacts. These measures may be adopted in a staged approach, and may be implemented prior to construction beginning in any one section of the project.

- Sediment fences constructed to the perimeter of the construction area as required.
- Designation of areas for plant and construction material storage.
- Diversion of upstream stormwater runoff around disturbed areas of the development as required.
- Immediate stabilisation of disturbed areas as required.
- Monitoring of stormwater quality discharging from the development and the implementation of additional measures / modification of existing measures if the quality of stormwater discharging from the site will have a negative impact.

- Monitoring of groundwater quality infiltrating during the excavation and the implementation of additional measures / modification of existing measures if the quality of groundwater discharging from the site will have a negative impact.
- Designation and marking of transport routes across the site to minimise dust disturbance.
- Drainage structure protection devices installed to existing stormwater inlet structures within the site, and within the road ways adjacent to the site.
- Education of site personnel to the sediment and erosion control measures implemented on site.

- **During Construction**

Runoff should be directed through an appropriately sized treatment unit (sump pit) before discharging into stormwater utilities. Measures to mitigate water quality impacts during construction will include:

- Construction of a sump pit and provision of pump out facilities to the satisfaction of Brisbane City Council.
- Construction activities to be confined within the necessary construction area(s).
- Regular inspection and maintenance of the erosion control measures. Following rainfall events greater than 20mm, inspection of erosion control measures and removal of collected material shall be undertaken. Replacement of any damaged equipment shall be performed immediately.
- Monitoring of water quality impacts from construction activities as appropriate.

8.2 Operational Phase

It is proposed to implement stormwater quality Best Management Practices on the developed site.

Best Management Practices were selected by giving due consideration to the proposed development layout, and other unique site characteristics.

Due to the nature of the proposed development, the Best Management Practices presented in Table 8.2 is thought to be most suitable for the proposed site.

Table 8.2 - Stormwater Best Management Practices (BMP's) Selection Matrix

Stormwater Quality BMP's	Discussion
Silt Arrestor	Silt arrestor is recommended for the capture and treatment of all groundwater entering the basement and perimeter subsoil drainage system as well as runoff from access ramp and cars. The quality of the water shall be tested and if the results are satisfactory the water will be pumped to the stormwater system. If the water quality results prove unsatisfactory the developer shall either install a package treatment plant or enter a trade waste agreement with Council and discharge the water to the sewer.
Litter Basket	Litter basket is a solid pollutant filter designed to capture gross pollutants at drainage entry points. It is very effective in capturing gross pollutants and total suspended solids. It is proposed to install a litter basket in all practical stormwater inlet locations.
Rainwater Storage Tank	Rainwater storage tank enables the reuse of roof runoff, primarily for toilet flushing. The main contaminant removal process is the diversion of runoff from roof (impervious) areas to the sewer system (toilet flushing).

9.0 STORMWATER QUALITY MONITORING PROGRAM

Although stormwater from this development will discharge to the existing stormwater system and eventually to the Breakfast Creek, stormwater quality best management practices are proposed and therefore no stormwater quality monitoring has been proposed.

The proposed measures for stormwater quality are reasonably well understood and their effectiveness has been demonstrated at numerous sites throughout Queensland.

10.0 MAINTENANCE PLANS

Maintenance plans are required to be developed for the following stormwater items proposed for the development: consistent with the requirements of this report and the manufacturer's instructions.

- **Rainwater Storage Tank**
  - In accordance with the manufacturer's recommendations / owners manual.
  - Inspect the bottom of the tank for sludge at least every 2 - 3 years. If sludge covers the bottom of the tank, remove it by siphoning or completely emptying.
- **Silt Arrestor**
  - Regular inspection of the bottom of the chamber and removal of silt in accordance with the manufacturer's recommendations / owners manual.
- **Litter Basket**
  - In accordance with the manufacturer's recommendations / owners manual.
  - Regular inspection of the bottom of the basket and removal and disposal of built up rubbish.

11.0 ASSET HAND-OVER

It is intended that the stormwater quantity and quality controls detailed in this document will remain under private ownership and will not become a council asset. Therefore, no further assessment of asset handover is relevant to this site.

12.0 CONCLUSION

This Site Based Stormwater Management Plan demonstrates that under the proposed concept plan, stormwater runoff from the proposed mixed use development will be able to be treated to acceptable levels.

The consideration of the proposed stormwater runoff and drainage demonstrates the viability of the proposed mixed use development, with regards to stormwater quantity and quality.

Further details of the proposed stormwater drainage system will be provided to Council in future applications (i.e. Operational Works submission), however this document demonstrates that sufficient treatment of stormwater runoff from the site is achievable under the current development proposal.

13.0 REFERENCES

Brisbane City Council (2008) Water Quality Management Guidelines

Brisbane City Council (2008) Subdivision and Development Guidelines.

Queensland Urban Drainage Manual (2007).

APPENDIX A

Proposed Level 5 Podium Plan by Bureau Proberts

1 Level 05 Podium Level
1 : 100

bureau proberts

CLIENT: METRO PROPERTY DEVELOPMENT
PROJECT: MAYNE ROAD
ADDRESS: 37 MAYNE ROAD, BOWEN HILLS

SCALE: 1 : 100 [A1]
DATE: 10/12/10
NORTH:
6

PROJECT NO: 10053
PHASE:
DRAWING NUMBER: 108
REVISION: F

10/12/2010 4:39:57 PM

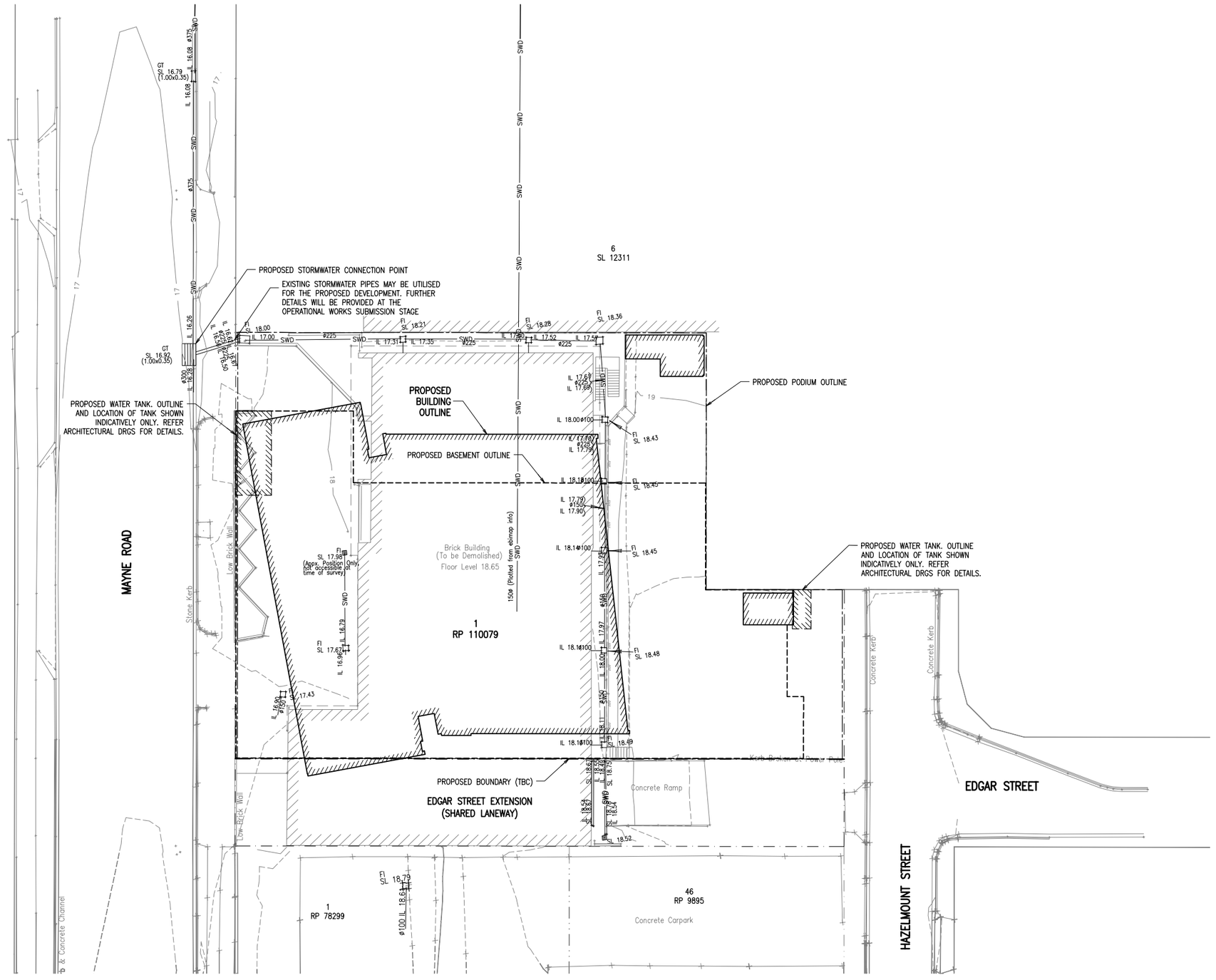
Appendix B
Concept Stormwater Quality Treatment Plan by Robert Bird Group

LEGEND – EXISTING

- SWD — STORMWATER LINE
- S — SEWER
- G — GAS MAIN
- W — WATER MAIN
- T — UNDERGROUND TELECOMMUNICATION
- E — UNDERGROUND ELECTRICITY
- OH — OVERHEAD ELECTRICITY
- ADJACENT BOUNDARY
- PROPERTY BOUNDARY

LEGEND – PROPOSED

- BUILDING
- NEW BOUNDARY
- PODIUM OUTLINE
- BASEMENT OUTLINE
- RAINWATER STORAGE TANK



DO NOT SCALE DRAWINGS, USE FIGURED DIMENSIONS

REFER COVER SHEET FOR NOTES UNLESS NOTED OTHERWISE

SCALE 1:200

0 1 2 5 10m

Rev.	Revision Description	By.	App.	Date
A1	ISSUED FOR DA	LKT	RJM	15.12.2010

Rev.	Revision Description	By.	App.	Date

Structural & Civil Engineering Consultant

RobertBirdGroup

BRISBANE OFFICE:
Robert Bird Group Pty Ltd
PO Box 70315, Riverside Centre,
Brisbane, QLD 4001
Level 5, 333 Ann St
Brisbane QLD

Ph. (07) 3319 2777
Fax. (07) 3319 2799
ACN 010 580 248

Web Site: www.robertbird.com

Client
METRO (BOWEN HILLS NO. 3) PTY LTD

Title
CONCEPT STORMWATER QUALITY TREATMENT PLAN

Project
37 MAYNE ROAD, BOWEN HILLS

NOT FOR CONSTRUCTION

Date	Design	Checked
DEC 2010	LKT	RJM
Scale @ A1	Drawn	Approved
1:200	LKT	---
Job Number	Drawing Number	Revision
10801C	SKC-03	A1

A1

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

Appendix C
Concept Erosion and Sediment Control Plan by Robert Bird Group

LEGEND – EXISTING

- SWD — STORMWATER LINE
- ADJACENT BOUNDARY
- PROPERTY BOUNDARY

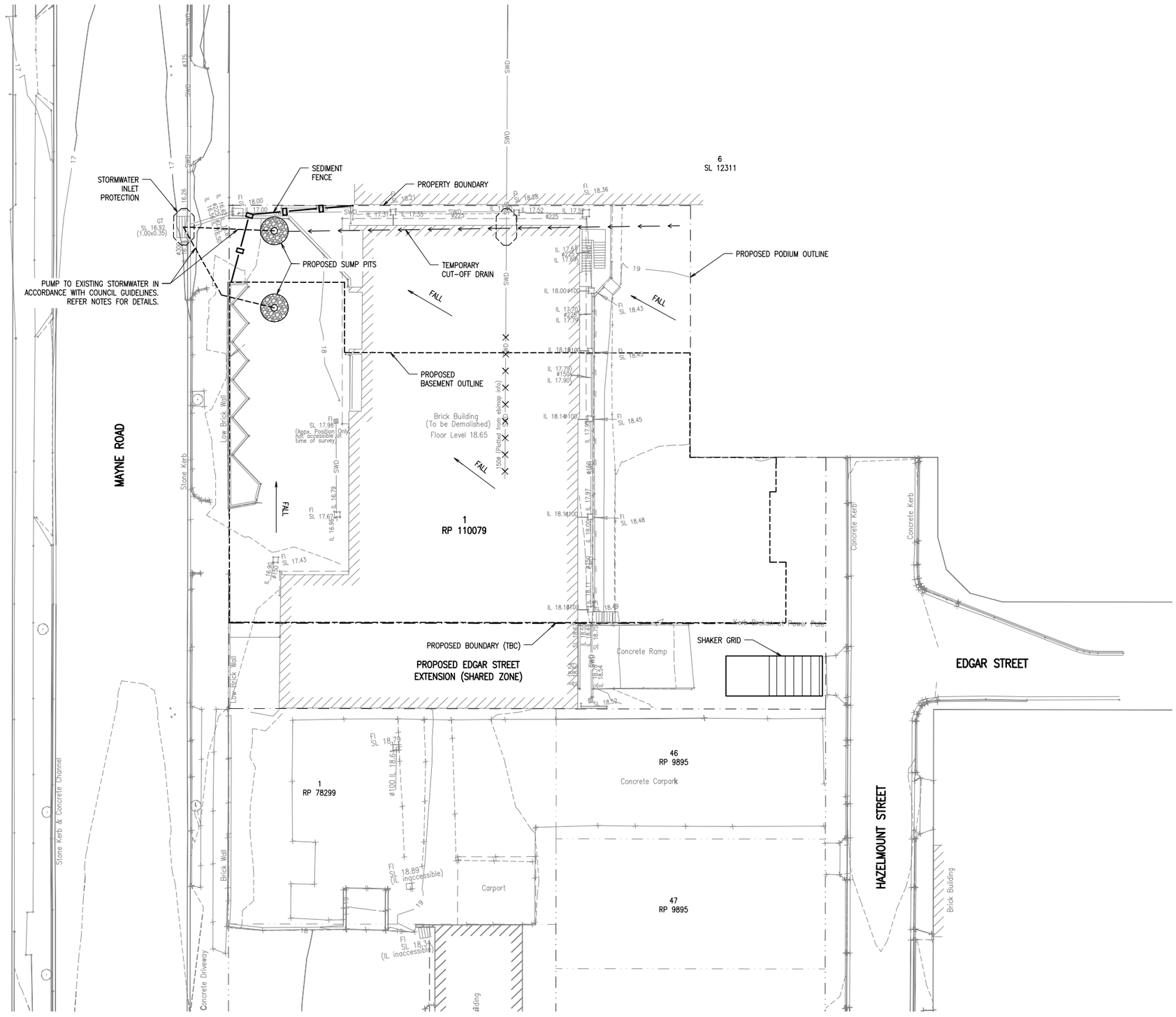
LEGEND – PROPOSED

- NEW BOUNDARY
- BASEMENT
- TEMPORARY CUT–OFF DRAIN
- SEDIMENT FENCE
- SHAKER GRID
- STORMWATER INLET PROTECTION
- SUMP PIT
- FALL — INDICATIVE EARTHWORKS FALL.
- SW — SECTION OF EXISTING STORMWATER LINE TO BE DEMOLISHED AND REMOVED.

EROSION AND SEDIMENT CONTROL NOTES

1. THESE NOTES SHALL BE READ IN CONJUNCTION WITH:
   A. GENERAL NOTES AND DISCLAIMERS FOR PROJECT
   B. ENVIRONMENTAL NOTES FOR THE PROJECT, AND
   C. BULK EARTHWORKS NOTES FOR THE PROJECT.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING A PLAN TO THE LOCAL AUTHORITY SPECIFYING THE STAGING OF THE VARIOUS EROSION AND SEDIMENT CONTROLS DURING THE DIFFERENT CONSTRUCTION PHASES.
3. EROSION AND SEDIMENT CONTROL MEASURES IDENTIFIED BY THE CONTRACTOR AS BEING REQUIRED FOR THE FIRST CONSTRUCTION PHASE ARE TO BE PLACED PRIOR TO ANY CLEARING AND GRUBBING, AND ANY OTHER EARTHWORKS.
4. ALL EROSION AND SEDIMENT CONTROL MEASURES ARE TO REMAIN OPERATIONAL UNTIL THE SITE IS ACCEPTED "ON MAINTENANCE" BY THE LOCAL AUTHORITY.
5. EROSION AND SEDIMENT CONTROL DEVICES MUST COMPLY WITH:
   A. BRISBANE CITY COUNCIL'S EROSION AND SEDIMENT CONTROL STANDARD (VERSION 9 OR LATER).
   B. SOIL AND EROSION CONTROL ENGINEERING GUIDELINES FOR QUEENSLAND CONSTRUCTION SITES PUBLISHED BY THE INSTITUTE OF ENGINEERS AUSTRALIA – QUEENSLAND DIVISION.
6. UNDER NO CIRCUMSTANCES IS SILT TO BE ALLOWED TO LEAVE THE SITE.
7. THE CONTRACTOR IS TO PROVIDE WATER TRUCKS AS REQUIRED TO MINIMISE OR ELIMINATE THE DUST PROBLEMS CAUSED BY ON SITE TRAFFIC MOVEMENT.
8. PRIOR TO THE RELEASE OF ANY STORMWATER FROM THE SITE, WATER QUALITY SAMPLES ARE TO BE TAKEN, AND ARE TO BE ANALYSED. THE QUALITY OF ANY STORMWATER RELEASED FROM THE SITE IS TO MEET THE FOLLOWING CRITERIA:
   A. TOTAL SUSPENDED SOLIDS < 20 N.T.U, AND
   B. pH BETWEEN 6.5 AND 8.5

   ANALYSIS RESULTS ARE TO BE PROVIDED TO THE SUPERINTENDENT AND THE RELEVANT LOCAL AUTHORITY OFFICER WITHIN 48 HOURS OF SAMPLING.
9. AN ON–SITE REGISTER LOGGING RAINFALL DATES, WATER QUALITY ANALYSIS RESULTS, AND DATES OF RELEASE OF STORMWATER FROM THE SITE IS TO BE MAINTAINED. THIS REGISTER IS TO BE AVAILABLE ON–SITE FOR INSPECTION BY LOCAL AUTHORITY OFFICERS UPON REQUEST.
10. ALL EROSION AND SEDIMENT CONTROL DEVICES ARE TO BE INSPECTED WITH A MINIMUM FREQUENCY OF WEEKLY, AND PRIOR TO ANY EXPECTED RAINFALL, AND AFTER ANY RAINFALL. ANY DAMAGE OR DEVICE FAILURE IS TO BE REPAIRED / MANAGED AS REQUIRED.
11. ANY EROSION AND SEDIMENT CONTROL DEVICES NOT PERFORMING ADEQUATELY ARE TO BE SUPPLEMENTED WITH ADDITIONAL MEASURES, THAT COMPLY WITH THE RELEVANT GUIDELINES. THE SUPERINTENDENT IS TO BE ADVISED OF THE DETAILS OF ANY ADDITIONAL MEASURES PROPOSED.
12. ALL EROSION AND SEDIMENT CONTROL DEVICES ARE TO BE MAINTAINED IN WORKING ORDER AT ALL TIMES. ANY DAMAGE TO ANY DEVICE IS TO BE IMMEDIATELY RECTIFIED.
13. THE CONTRACTOR SHALL MINIMISE THE EXTENT OF AREAS DISTURBED BY EARTHWORKS AT ANY ONE TIME, AND SHALL RETAIN EXISTING VEGETATION COVER WHERE POSSIBLE.
14. ALL VEHICLES EXITING THE SITE SHALL BE CLEANED DOWN AND TREATED SO AS TO PREVENT MATERIAL BEING TRACKED OR DEPOSITED ON PUBLIC ROADS.



DO NOT SCALE DRAWINGS, USE FIGURED DIMENSIONS

REFER COVER SHEET FOR NOTES UNLESS NOTED OTHERWISE

SCALE 1:200

0 1 2 5 10m

Rev.	Revision Description	By.	App.	Date
A1	ISSUED FOR DA	LKT	RJM	15.12.2010

Structural & Civil Engineering Consultant

RobertBirdGroup

BRISBANE OFFICE:
Robert Bird Group Pty Ltd
PO Box 7035, Riverside Centre,
Brisbane, QLD 4001
Level 5, 333 Ann St
Brisbane QLD

Ph. (07) 3319 2777
Fax. (07) 3319 2799
ACN 010 580 248

Web Site: www.robertbird.com

Client
METRO (BOWEN HILLS NO. 3) PTY LTD

Title
CONCEPT EROSION & SEDIMENT CONTROL PLAN

Project
37 MAYNE ROAD, BOWEN HILLS

NOT FOR CONSTRUCTION

Date	Design	Checked
DEC 2010	LKT	RJM
Scale @ A1	Drawn	Approved
1:200	LKT	---
Job Number	Drawing Number	Revision
10801C	SKC–02	A1

A1

Appendix D
Brisbane City Council's Erosion Hazard Assessment Form

BRISBANE CITY COUNCIL

ABN 72 002 765 795

Erosion Hazard Assessment - June 2006

10801C

Brisbane City Council (BCC), *Erosion Hazard Assessment* form must be read in conjunction with the *Erosion Hazard Assessment- Supporting Technical Notes* (June 2006 or later version) for explanatory terms and Certification information.

What is an Erosion Hazard Assessment?

Soil erosion and sediment from urban development, particularly during construction activities, is a significant source of sediment pollution in Brisbane's waterways. The Erosion Hazard Assessment determines whether the risk of soil erosion and sediment pollution to the environment is 'low' or 'high', using a point scoring system to assess the risk based on BCC's requirements for stormwater management and Erosion and Sediment Control (ESC).

When is the EHA required?

An *Erosion Hazard Assessment* form must be completed and lodged with BCC for any Development Application (DA), Operational Works ESC application, or Schedule 12 Compliance Assessment ESC application.

Failure to submit this form during lodgement of an application may result in assessment delays or refusal of the application.

Assessment Details

1 Does this development or operational works/detailed design ESC application trigger the Stormwater Management Code or House Code and involve soil disturbance?

No ☐ An Erosion Hazard Assessment is not required. ***Go to 4***

Yes ☒ ***Complete Assesssment Table on reverse side of this form.***

2 Is the total score equal to or greater than 17?

A 'low' risk score

*Generally, if the Erosion Hazard Assessment produces a Total Score of **less than 17** and no individual score is equal to, or greater than its Trigger Score, the development proposal is considered to be 'low risk' with respect to soil erosion and sediment control.*

A 'high' risk score

*If the Erosion Hazard Assessment produces a Total Score of **17 or greater**, or any individual score is equal to or greater than its Trigger Score, the development proposal is considered to be 'high risk' with respect to soil erosion and sediment control. Applicants must lodge, with their Application, sufficient supporting information to demonstrate that the performance criteria of the Stormwater Management Code or House Code in the City Plan 2000 can be achieved.*

No ☒

Yes ☐

Refer to Council's *Erosion Hazard Assessment – Supporting Technical Notes.*

3 Did you answer 'yes' to any Trigger Score questions?

No ☐

Yes ☒

Refer to Council's *Erosion Hazard Assessment – Supporting Technical Notes.*

4 Site Information and Certification

Application number (if known)

Site address

37 Mayne Road,
Bowen Hills,
QLD Postcode 4006

Prepared by *Print name*

LUCAS THEN

Business name

ROBERT BIRD GROUP

I certify that:

1. I have made all relevant enquries and am satisfied no matters of significance have been withheld from the assessment manager; and

Where completion of the EHA Assessment Table was required, that:

2. I am a person with suitable qualifications and/or experience in erosion and sediment control; and
3. the Erosion Hazard Assessment was completed in accordance with the Erosion Hazard Assessment Supporting Technical Notes and the BCC Erosion and Sediment Control Standard (version 9 or later); and
4. the Erosion Hazard Assessment Score accurately reflects the site's overall risk of soil erosion and sediment pollution to the environment.

I acknowledge and accept that the BCC, as assessment manager, relies, in good faith, on this certification as part of its development assessment process and the provision of false or misleading information to the BCC constitutes an offence for which BCC may take punitive steps/ action against me/ enforcement action against me.

Certified by *Print name*

RICHARD MORRIS

Certifier's signature

Date 15/12/10

Stock Code no. 262006

Assessment Table

	Points	Score	Trigger Score	BCC Use Only
[1] AVERAGE SLOPE OF DISTURBANCE AREA • less than 3% (3% = 33H:1V) ..... 0 • more than 3% but less than 5% (5% = 20H:1V) ..... 1 • more than 5% but less than 10% (10% = 10H:1V) ..... 2 • more than 10% but less than 15% (15% = 6.7H:1V) ..... 4 • more than 15% 6		0	▶ Score equal to or greater than **4**? No ☒ Yes ☐	
[2] SOIL CLASSIFICATION GROUP (AS1726) • GW, GP, GM, GC ..... 0 • SW, SP, SM, SC, Pt ..... 1 • MH, CH, OH ..... 2 • ML, CL, OL, if imported fill will be used, or if soils untested 3		3		
[3] EMERSON (DISPERSION) CLASS NUMBER • Class 4, 6, 7, or 8 ..... 0 • Class 5 ..... 2 • Class 3 ..... 4 • Class 1 or 2 6		4	▶ Score equal to or greater than **4**? No ☐ Yes ☒	
[4] DURATION OF SOIL DISTURBANCE (including stabilisation period) • less than 1 month ..... 0 • more than 1 month but less than 4 months ..... 2 • more than 4 months but less than 6 months ..... 4 • more than 6 months 6		2	▶ Score equal to or greater than **4**? No ☒ Yes ☐	
[5] AREA OF DISTURBANCE • less than 1000 m² ..... 0 • more than 1000 m² but less than 5000 m² ..... 1 • more than 5000 m² but less than 1 ha ..... 2 • more than 1 ha but less than 4 ha ..... 4 • more than 4 ha 6		1	▶ Score equal to or greater than **4**? No ☒ Yes ☐	
[6] WATERWAY DISTURBANCE • No disturbance to watercourse, open drain or stormwater pipe ..... 0 • Disturbance to watercourse, open drain or stormwater pipe 4		0	▶ Score equal to or greater than **4**? No ☒ Yes ☐	
[7] REHABILITATION METHOD Percentage of area (relative to total disturbance) stabilised by seeding without mulching (i.e. highest risk stabilisation method) • less than 1% ..... 0 • more than 1% but less than 5% ..... 1 • more than 5% but less than 10% ..... 2 • more than 10% 4		0		
[8] RECEIVING WATERS • Open water body (e.g. creek, river, bay) ..... 1 • Enclosed water body (e.g. lake, boat harbour) 2		1		
[9] SUBSOIL EXPOSURE • No subsoil exposure except for service trenches ..... 0 • Subsoils are likely to be exposed 2		2		
[10] EXTERNAL CATCHMENTS • No external catchment ..... 0 • External catchment diverted around the soil disturbance ..... 1 • External catchment not diverted around the soil disturbance 4		0		
[11] ROAD CONSTRUCTION • No road construction ..... 0 • Involves road construction works 2		0		
[12] pH OF SOILS TO BE REVEGETATED • less than pH 6 ..... 1 • more than pH6 but less than pH 8 ..... 0 • more than pH8, or if pH testing not done at this stage 1		1		

[13] Total Score = 14 *Go to* **2** *(front page)*

Appendix E
BCC's Stormwater Management Code Response

Stormwater Management Code

Performance Criteria and Acceptable Solutions

GENERAL

Performance Criteria	Acceptable Solutions	Proposal Compliance Response
P1 The planning of the stormwater management system must provide for the integrated management of stormwater in order to: • minimise flooding • protect and enhance environmental values of receiving waters • maximise the use of water sensitive urban design principles • maximise the use of natural waterway corridors and natural channel design principles • maximise community benefit • minimise public safety risk	**A1.1** The proposal complies with the **Subdivision and Development Guidelines.** **A1.2** A Site Based Stormwater Management Plan (SBSMP) is prepared for all major and minor stormwater management measures. The SBSMP must provide for the following where applicable: • an underground and/or open drain/overland flow path network maximising the use of natural channel design and water sensitive urban design principles • make provision for detention/retention storage basins • an Erosion and Sediment Control (ESC) Program where required by Council's **Erosion and Sediment Control Standard** • retention of natural waterway corridors • public safety factors and risk management measures • an acceptable level of flood immunity	**R1.1**: The development will be carried out to comply with the guidelines. **R1.2**: A conceptual SBSMP has been prepared by Robert Bird Group (RBG) to support the development application. The SBSMP describes how the design of the stormwater will comply with Brisbane City Council's (BCC's) Subdivision and Development Guidelines. Stormwater will be discharged to the existing stormwater drainage system. The proposed stormwater system will consist of rainwater harvesting from roof areas for reuse. Existing stormwater flows will potentially be reduced. An ESC program will be prepared as per the SBSMP and RBG's concept sketch. Retention of a waterway corridor is not applicable to this development. There is no risk to public safety factors from drainage from the development. All habitable and non habitable levels will have flood immunity in accordance with BCC's standards. *Compliance achieved - further details to be included in the future Operational Works Application*.

Performance Criteria	Acceptable Solutions	Proposal Compliance Response
	A1.3 The proposal complies with any Stormwater Management Plan (SMP), Local Stormwater Management Plan (LSMP), or Waterways Management Plan (WMP) prepared by Council. *Note: The **Subdivision and Development Guidelines** provide guidelines on the level of information required for different development types.*	**R1.3**: The proposal will comply with any BCC plans.

FLOODING

Performance Criteria	Acceptable Solutions	Proposal Compliance Response
P1 The proposed stormwater management system or site works must not adversely impact on flooding or drainage of properties that are upstream, downstream or adjacent to the subject site.	**A1** The proposal meets the requirements of Council's **Subdivision and Development Guidelines** and does not result in an increase in flood level or flood duration on upstream, downstream or adjacent properties *Note:* *Compliance with this acceptable solution can be demonstrated by the submission of a hydraulic and hydrology report (as part of a SBSMP) identifying potential flooding impacts on upstream, downstream or adjacent properties.*	**R1**: The proposal is the re-development of an existing site. Stormwater will be discharged to BCC's existing stormwater drainage system. The development will not alter existing flood levels. *Acceptable solution provided.*
P2 The drainage network must provide capacity to safely convey stormwater run-off resulting from relevant design storm events taking into account increased run-off from roof drainage.	**A2.1** The design demonstrates that a drainage network will be provided that will comply with Council's **Subdivision and Development Guidelines.** *Note:* *Compliance with this acceptable solution can be demonstrated by identifying the conceptual drainage requirements for the proposal in a SBSMP.*	**R2.1**: Runoff from roof areas and developed surfaces will be collected internally and piped to the existing stormwater drainage system. It is estimated that there will be a net reduction in peak stormwater flows from the re-development. Refer the SBSMP prepared for the site. Full details will be submitted with the Operational Works application. The design will be in accordance with BCC's Subdivision and Development Guidelines. *Acceptable solution provided.*
	A2.2 The design allows sufficient area to provide for a drainage network that will comply with Council's **Subdivision and Development Guidelines.** *Note:*	**R2.2**: As above.

Performance Criteria		Acceptable Solutions		Proposal Compliance Response
			Compliance with this acceptable solution can be demonstrated by the submission of a hydraulic and hydrology report (as part of a SBSMP) identifying the area required to accommodate the drainage network.	
P3	Development design must reduce property damage and, where applicable, ensure public safety by ensuring that the development levels are set above the relevant design flood level or storm surge level.	**A3.1**	All development is located above minimum flood immunity levels in accordance with Council's **Subdivision and Development Guidelines.** *Note:* *Compliance with this acceptable solution can be demonstrated by the submission of a hydraulic and hydrology report identifying flood levels and development design levels (as part of a SBSMP).*	**R3.1**: Levels for the proposed development will comply with BCC's current Subdivision and Development Guidelines. *Compliance Achieved.*
		A3.2	Road access is provided in accordance with the flood immunity levels identified in Council's **Subdivision and Development Guidelines.** *Note:* *Compliance with this acceptable solution can be demonstrated by the submission of a hydraulic and hydrology report identifying flood levels and development design levels.*	**R3.2**: Refer R3.1 above. *Compliance Achieved.*
P4	Any channel works that are part of the development, major drainage works or flood mitigation works must maintain and/or enhance the environmental values of the waterway corridor or drainage corridor.	**A4**	Design and construction of channel works incorporate water sensitive urban design and natural channel design features which will comply with: • Council's **Subdivision and Development Guidelines**, and • where applicable any SMP, LSMP or WMP prepared by Council. *Note:* *Compliance with this acceptable solution can be demonstrated by the provision of conceptual details of any channel works (as part of a SBSMP).*	**R4**: Not applicable to this development.
P5	Erosion treatment works along waterway banks and associated drainage structures must maintain or enhance the environmental values of waterways.	**A5**	Design and construction of erosion treatment features incorporate natural channel design features which will comply with: • Council's **Subdivision and Development Guidelines**, and • Council's **Urban Creek Erosion –**	**R5**: Not applicable to this development.

Performance Criteria		Acceptable Solutions		Proposal Compliance Response
			Guidelines for Selecting Remedial Works *Note:* *Compliance with this acceptable solution can be demonstrated by the provision of conceptual details of any erosion treatment works (as part of an SBSMP).*	
P6	Bridges and culverts provided for flood immunity to minimise traffic disruption must improve public safety and allow for fauna movement and recreation corridors where these needs are identified.	**A6**	The design complies with Council's **Subdivision and Development Guidelines.** *Note:* *Compliance with this acceptable solution can be demonstrated by the provision of conceptual details of any bridge or culvert works (as part of a SBSMP).*	**R6**: Not applicable to this development.
P7	The design and construction of detention and retention storage features must: • achieve acceptable impacts on environmental values • provide for recreational use where possible • achieve acceptable risk to public safety and property	**A7**	The design complies with Council's **Subdivision and Development Guidelines** and where applicable any SMP, LSMP or WMP prepared by Council. *Note:* *Compliance with this acceptable solution can be demonstrated by the provision of conceptual details of any detention and retention storage features (as part of a SBSMP).*	**R7**: Refer the prepared SBSMP for the site. None proposed. *Acceptable solution provided.*

WATER QUALITY AND DRAINAGE

Performance Criteria		Acceptable Solutions		Proposal
Low risk development				
P1	Water quality impacts must be minimised using best practice techniques.	**A1.1**	The design provides for stormwater quality best management practices that are sufficient to treat the target pollutants and will comply with Council's **Subdivision and Development Guidelines.** *Note:* *Compliance with this acceptable solution can be demonstrated by indicating the areas that are to be set*	**R1.1**: • Refer to the SBSMP. • The development proposal is classified as a 'low risk' category development. Utilising BMP's water quality impacts will be minimised.

Performance Criteria	Acceptable Solutions	Proposal
	*aside for water quality best management practices. For most development this can be achieved by determining pollutant loads using hand calculations as set out in Council's **Guidelines for Pollutant Export Modelling in Brisbane** and identifying the type and size of stormwater quality best management practices based on their efficiencies identified in Council's **Subdivision and Development Guidelines.***	• The proposal is not sited within a riparian zone. • The proposal comprises an impermeable surface area (not including roof area) which is less than 2,500m^2. • The proposed reconfiguration creates less than six (6) allotments. • The proposal does not include industrial activities.
	A1.2 Stormwater quality best management practices are designed, constructed and maintained in accordance with Council's **Subdivision and Development Guidelines.** *Note:* *Compliance with this acceptable solution can be demonstrated by providing conceptual detail of how stormwater quality will be managed (as part of a SBSMP).*	**R1.2**: A SBSMP has been prepared and is in accordance with Council's Subdivision and Development Guidelines. *Compliance Achieved*.
P2 Release of sediment laden stormwater is minimised.	**A2** All development complies with Council's **Erosion and Sediment Control Standard.** *Note:* *Compliance with this acceptable solution can be demonstrated by providing conceptual details of how the requirements of Council's **Erosion and Sediment Control Standard** will be met (conceptual SBSMP). This will generally be conditioned and may require the submission of a subsequent detailed SBSMP for operational works.*	**R2**: *Compliance achieved*. A SBSMP has been prepared in accordance with BCC's Subdivision and Development Guidelines. • An ESC Program will be prepared and will be submitted to BCC under an Operational Works Application. A copy of BCC's Erosion and Sediment Control Standard (BCC, 2000a) will be given to the contractor for his reference during the project.

Brisbane Office

Robert Bird Group Pty Ltd
ABN 67 010 580 248 ACN 010 580 248

Level 5
333 Ann Street
Brisbane Qld 4000
PO Box 7035
Riverside Centre
Brisbane Qld 4001
Australia

P: +61 (0) 7 3319 2777
F: +61 (0) 7 3319 2799

www.robertbird.com