ROMA FLOOD LEVEE PROJECT

FINAL DESIGN REPORT

8th July 2014

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1 INTRODUCTION

1.1 Background / Purpose

The Roma Township is located in the Bungil Creek floodplain and has an extensive history of flooding, with a number of major flood events in the past 100 years resulting in minor damage to private property, public infrastructure and utilities. Three significant large flood events have occurred between March 2010 and February 2012, with the February 2012 flood the largest event ever recorded in Roma and resulting in significant damage to over 500 premises.

As a result of the recent major flood events the Roma Flood Study and Mitigation Project was developed to minimise the flood risk to the Roma community and alleviate property inundation from the Bungil Creek catchment regional flooding.

1.2 Previous Studies

A number of previous studies have been undertaken by Maranoa Regional Council to identify the current flooding mechanisms and develop a number of mitigation options to alleviate the flooding in the Roma Community. The proposed levee alignment and levels are based on a number of these previous reports and public consultation the levee alignment seeks to optimise a reduction in flood risk, minimize environmental, social and cultural impacts and be economically efficient. Previous studies and referenced documents forming part of this design include:

- Roma Flood Study and Mitigation Project, ENGENY May, 2012;
- Roma Flood Mitigation Project Hydrology and Hydraulic Assessment Report, GHD April, 2013 and;
- Roma Flood Mitigation Project Principle Project Requirements, GHD April, 2013

The proposed Roma Flood Mitigation Levee selected to form part of this design is based on the above previous studies has an alignment that extends from the airport north of Roma, continuing south to finish north-east of Lovell Street as per Figure 1. The levee levels are based on the 1000 year ARI storm event and the historical 2012 flood event as stipulated in the Project Principal Requirements (PPR).

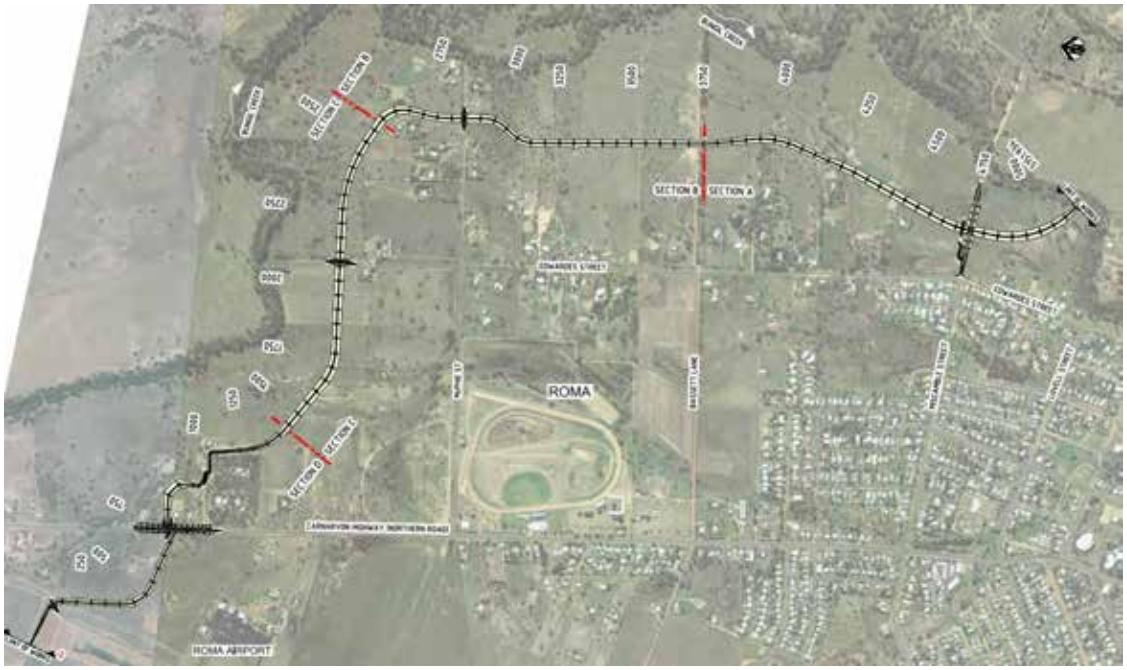

Figure 1 – Locality plan of the Levee

1.3 Objectives and Design Criteria

The levee is to be designed and constructed within the alignment envelope and levels shown in the Principle Project Requirement (PPR) reference drawings and the following design criteria:

- The levee is to consider the historical 2012 flood event and the 1 in 1000 year flood event;
- Have a design life of 100 years;
- Will minimise the ongoing and future operational and maintenance costs;
- Will be designed to satisfy the requirements/standards of the NRM 2002 Dam Safety Management guidelines and ANCOLD guidelines;
- Will be modelled with larger than design floods to determine the point at which overtopping occurs;
- Designed to mitigate against possible failure mechanisms and appropriate design and provision of spillways;
- Ensure access is provided to existing roads, highways and private property owners in accordance with the requirements of any and all Legislative Requirements and the requirements of Council and the property owners;
- Designed so as not to detract from the visual amenity of the local area; and
- Will incorporate provision for local drainage and backflow prevention.

1.4 Queensland Dam Management Guidelines

There is the potential for the levee to be considered referable under the Water Supply (Safety and Reliability) Act (2008) and as a result the levee has been designed with consideration of the requirements this Act.

SMEC have used their extensive dam design and safety monitoring experience to ensure that the proposed levee has been designed to ensure that all potential critical uncertainties are recognised, investigated and resolved to an acceptable risk level to meet all of the applicable design requirements under the Queensland Dam Safety management guidelines relevant to a levee which is planned to be modified and extended in the future. This design process will also ensure that Maranoa Regional Council has a levee which is safe, operable, and maintainable and will address any potential future referable conditions, within reason, if imposed, with minimal impacts to Council.

1.5 Qualifications

The Design team has defined the vertical height of the levee based on modelling of the 2012 flood event and the 1 in 1000 year ARI event with an alignment stipulated by Council. The Design team has endeavored to ensure that the design has been completed with the utmost care to provide the required amount of protection to the town however the levee in stage 1 offers very little protection to the Roma Community until stage 2 of the levee is completed. The second stage of the levee will require stage 1 outcomes to be reviewed as the characteristics of the levee and flood flows will change.

1.6 Scope of this Package

This report has been compiled to outline the design development during the Final Design (100%) stage for the Levee.

1.6.1 Design Documentation

This package consists of the following design documentation:

- This report

- Appendix A – Relevant Design Drawings
- Appendix B – Construction Specifications
- Appendix C – Geotechnical Factual Report
- Appendix D – Geotechnical Interpretive Report
- Appendix E – Environmental Requirements Checklist
- Appendix F – Construction Comments
- Appendix G – Third Party Client Comments
- Appendix H – Safety In Design
- Appendix I – Carnarvon Highway Report
- Appendix J – Mechanistic Analysis
- Appendix K – Scour Design Note
- Appendix L – Flood Report
- Appendix M – Operations and Maintenance Manual
- Appendix N – Certification
- Appendix O – Consequence Assessment
- Appendix P – Catchment Plan

2 DETAILED DESIGN

2.1 General Civil

2.1.1 Earthworks

The civil earthworks have been designed with consideration for the site conditions and geotechnical requirements. These requirements have been detailed in Appendix D – Geotechnical Interpretive Report.

2.1.2 Services

A number of clashes with services have been identified and require treatment. A typical treatment detail is shown on the design drawings included in Appendix A. Underground conduits provide areas of weakness in the levee foundation which are susceptible to seepage of water along the conduit and the backfill material of the trench with the associated increased risk of piping causing failure of the levee. To ameliorate this risk removal and replacement of the trench material with flowable fill and a concrete cut-off wall extending into the existing ground each side of the trench has been detailed for each underground conduit underneath the levee.

This treatment will be required on all formal and informal service conduits crossing the levee.

For overhead power lines less than 33kv clearances of 3m will need to be maintained during construction and maintenance of the levee. Overhead power lines with clearances less than 3m have been identified and are to be raised by the service owner.

2.1.3 Fencing

The levee crosses numerous properties and boundary and internal fencing will need to be removed for construction. The design details the replacement of the impacted fencing on a like for like basis. Gates will be required at the top of the levee to ensure that access along the top of the levee is maintained.

2.1.4 Intra Property Access

Where landowners have requested them, the design has provided for access ramps to safely access across the levee and minimise the impact on the landowners. Details of these crossings have been developed in consultation with the relevant landowners.

2.1.5 Driveways

The levee alignment requires changes to numerous driveways. The driveways being changed are:

Lot 5 on RP880094, Lot 1 on RP87687, Lot 1 on SP148633, Lot 6 on RP880094, Lot 4 on RP802116, Lot 2 on RP204592, Lot 73 on WV1650 and Lot 222 on R863.

2.2 Carnarvon Highway

2.2.1 Design

The design for the Levee crosses over the Carnarvon highway. This design has been developed and presented to TMR Roma. The detailed design report and discussion relating to this element of the design is included in Appendix I.

2.3 Geotechnical Design

2.3.1 Investigation

Geotechnical investigations have been carried out and the results of these investigations are included in Appendix C in the Geotechnical Factual Report.

2.3.2 Interpretation

The geotechnical design in relation to the levee is documented in Appendix D.

2.4 Levee Alignment

2.4.1 Vertical Alignment

The vertical alignment has been designed to consider the 2012 ARI event and the 1 in 1000 year event.

- Average levee height – 2.8m
- Max levee height – 4.0 m

2.4.2 Horizontal Alignment

The horizontal alignment for the levee is approximately 5,151m in length and is located to the northeast of the town and an average of 300 to 400 metres to the west and south of Bungil Creek. The levee starts (Chainage 0) to the north of the Airport building, heads east across the Carnarvon highway and generally follows the course of Bungil Creek terminating (Chainage 5151) at the bank of the creek approximately 500m south of Miscamble St.

For construction and community purposes the levee was decided into four sections:

- Section A – Ch. 3750 to 5151
- Section B – Ch. 2650 to 3750
- Section C – Ch. 1450 to 2650
- Section D – Ch. 0 to 1450

2.4.3 Cross Section

The levee cross section consists of 1 on 4 batters, and a 3m crest width.

2.5 Road Crossings

2.5.1 McPhie Street

The levee alignment crosses McPhie Street approximately 500m to the east of the intersection with Edwardes Street. McPhie Street terminates approximately 200m east of the levee close to Bungil Creek. As there are no residential properties on the Creek side of the Levee at McPhie Street no road way has been provided at the location. An access track with 1 in 8 sloped ramp and a 3m formation width has been developed here. The road will now end with fence and gate provided at this location to prevent access to the creek side in a flood event. Signage has been provided on the town side of the road to indicate the road end.

2.5.2 Miscamble Street

The levee alignment crosses Miscamble Street approximately 100m to the east of the intersection with Edwardes Street. Miscamble Street connects with End Short St to the east of the Bungil Creek and is used as an access to the Rubbish Tip.

Given the current usage and functionality of Miscamble St, the existing design existing design speed, assumed to be 70km/hr, needs to be maintained. With this design speed the new road embankment extends over 100m either side of the levee. The existing road blockage signs will be relocated to the dry side of the levee to allow the road to be closed during a flood event.

2.5.3 Bassett Lane

The levee alignment also crosses Bassett lane but no access is required over the levee at this point.

2.5.4 Carnarvon Highway

Refer to Appendix I for the Carnarvon Highway Design Report.

2.6 Pavement Design Miscamble Street

The levee is to be constructed across Miscamble Street approximately 100m east of Edward Street. Miscamble Street is proposed to also be constructed over the levee to provide access to the town of Roma. Consideration for the new pavement over the levee bank has been based on ensuring that the pavement is designed in such a way as to minimise the pavements sensitivity to moisture and ensure that the road is able to function as a link to the township of Roma during periods of inundation and saturation.

2.6.1 Geotechnical Investigation

As part of the geotechnical investigation component of this project, investigation was undertaken on along Miscamble Street to provide information on the existing pavement profile and geotechnical properties of the existing pavement and subgrade materials. Site investigations in the form of test pits were undertaken by SMEC and Ostwald Brothers, with samples taken for laboratory analysis. An overview of the test pit locations is shown on the drawing titled “Geotechnical Investigation and Borrow Pit Locations Sheet 4” as attached in Appendix A. Test pits along Miscamble Street were undertaken at the following locations:

Test Pit	Location	Chainage (Approx.)	Control Line	Easting (m)	Northing (m)	RL (m) AHD
TPX06	Crossing	236	MCA1	679179.382	7060810.796	297.863
TPX08	East End	331	MCA1	679275.378	7060809.143	298.195
TPX09	West End	96	MCA1	679040.312	7060807.014	297.833

There has been 3 test pits undertaken on Miscamble Street. They include TPX06, TPX08 and TPX09. The existing pavement profile from the test pits is summarised below:

Layer	Test Pits		
	TPX06	TPX08	TPX09
Surfacing	30mm – Asphalt	30mm – Asphalt	15mm – Bituminous Seal
Base	150mm – Sandy Gravel	180mm – Silty Sandy GRAVEL	160mm – Sandy GRAVEL
Natural Fill / Subgrade	Gravelly SILT	Sandy CLAY	Silty CLAY

2.6.2 Design Traffic Loading

The design traffic loading was calculated according to the Capricorn Municipal Development Guidelines - Pavement Design D2. These guidelines stipulate that for a rural street with less than 250 vehicles per day the Design Traffic Loading is 5 x 10^5 Equivalent Standard Axles (ESA's).

2.6.3 Subgrade Assessment

The new pavement for Miscamble Street is to be constructed over two varying subsurface materials. The new Miscamble Street pavement is to be constructed over both imported fill and the existing subsurface material. Material samples were taken from the test pits to determine the likely condition of the existing subgrade material. Laboratory test reports for the existing subgrade material are included in Appendix C.

The geotechnical testing undertaken on Test Pits TPX06, TPX08, TPX09 for Miscamble Street have indicated that the area is characterised by black reactive clay with possible organic content. The results of materials testing indicate that the existing subsurface conditions are generally reactive and have a low bearing strength when wet. Based on the geotechnical testing undertaken, in a soaked condition a design subgrade CBR of 3% is considered representative, with a swell of 3%.

The pavement for Miscamble Street is also to be constructed on imported fill with a Type B Main Roads specification. The imported fill material is considered to be of an equivalent standard to the existing subgrade conditions. Internal Geotechnical advice indicates that settlement of the fill embankment is not expected. It is considered appropriate, therefore, that the imported material is of an approximately the same structural capacity as the existing subsurface materials along Miscamble Street. Therefore a design subgrade CBR of 3% and swell of 3% is considered appropriate for the subgrade over the levee and the existing subgrade.

2.6.4 Pavement Design

Our pavement design has been undertaken in accordance with TMR's Pavement Design Supplement 2013, and has also considered proven North Queensland pavement design practice using a 3 season design approach. The pavement designs produced for this project has considered the existing pavement profile indicated from site investigations, past performance, coupled with design intent to ensure the pavement gravels sensitivity to moisture is minimised.

The recommended pavement composition considers the swell potential of the clay subgrade and utilises two different cemented gravel layers to mitigate against degree of saturation issues of unbound materials and takes a managed risk approach to reflective cracking of the heavily bound cemented layers. The option to use a layer of CBR 35 select fill material has been provided to achieve cover requirements over the expected reactive subgrade.

Mechanistic pavement analysis has been utilised for this design, with a pre-crack and post-crack life for the heavily bound cement treated base material incorporated into the design (refer to Appendix J for further information) and a 3 season design approach has been adopted to accommodate for expected wide ranging design conditions. A managed risk approach has been adopted when considering management of reflective cracking.

This pavement design is considered significantly different to the existing pavement details along Miscamble Street. Project specific pavement design notes have been provided on Drawing No. 30031182-PD-0011, 30031182-DP-1001 and this report is to be read in conjunction with the design drawings and pavement notes provided.

2.7 Pavement Specification for Miscamble Street

Given that this project involves works for the Carnarvon Highway (a TMR asset) as well as a local Maranoa Council roads a consistent specification has been adopted, that being TMR's, so that the contractor can achieve common work practices. Reference should be made to the Pavement Notes for the appropriate Main Roads Specification and Annexures.

2.8 Roma Airport

Roma Airport is owned and operated by Maranoa Regional Council. The levee commences on airport land and travels 730m until it reaches the Carnarvon Highway. The levee does not conflict with the runway, runway clear zone or runway sight distances. The levee has been designed in accordance with the CASA Manual of Standards Part 139 - Aerodromes.

2.9 Hydrological and Hydraulic Analysis

The hydrological and hydraulic analysis is completed and included in Appendix J.

2.9.1 Catchment Description

The Bungil Creek catchment is a small catchment located on the southern foothills of the Carnarvon Range upstream of Roma covering approximately 1400 km2. Bungil Creek flows in southerly direction. Approximately 70 km further downstream from Roma, Bungil Creek joins with the Balonne River which is part of the greater Murray-Darling system.

Annual average rainfall throughout the Bungil Creek catchment is relatively constant. The mean annual rainfall is reported to be approximately 700 [mm]. There is a degree of variability in regard to monthly rainfall, and records show that the summer months dominate rainfall totals within the catchment.

2.10 Local Drainage

The local drainage has been assessed in the vicinity of the levee using the aerial photography, supplied Digital Elevation Model and survey. The intent of the local drainage design is to mimic the existing scenario and use positive drainage paths / grades rather than a formal drainage channel and pipe network. The levee will require adjustments to ground levels and existing flow paths adjacent to the levee. At various locations there is a need to provide cross drainage structures. This has been determined by assessing the existing flow regime, identifying the potential to affect upstream properties, and the potential to damage existing infrastructure. Based on the stormwater assessment undertaken there are two types of stormwater culverts proposed.

One is a drainage culvert that conveys runoff from one side of the levee to the other. This culvert crossings requires the installation of a penstock or equivalent back flow device to prevent backwater

impacting the operation of the levee, a cut off wall, and a suitable backfill material to ensure the levee structural integrity is not comprised and piping failure will not occur.

The second type of culvert specified is a normal culvert configuration for drains, driveways, ramps and accesses not hydraulically impacted on by the levee.

Consultation with property owners has been undertaken to determine any impacts the drainage strategy may have on current farm dams or current water usage.

A hydrologic and hydraulic assessment was completed for the proposed culvert crossings located along the Roma Flood Levee alignment. A desktop study and physical site inspection were undertaken at project inception. The topography of the catchment areas in the vicinity of the Flood Levee alignment was very flat and available data typically did not accurately define waterway characteristics such as channel bed or banks in the vicinity of the Flood Levee. Catchments located on the western side of the Flood Levee alignment generally flowed in a south-westerly direction away from the Flood Levee. Catchments located on the eastern side of the Flood Levee alignment generally flowed in a southern direction adjacent to the Bungil Creek.

Culvert crossing locations were determined using the abovementioned topography assessment to provide drainage relief along the Flood Levee alignment as required. Landowners potentially impacted by the Flood Levee alignment were also consulted throughout the design process.

Hydrologic calculations were completed for the proposed transverse drainage culverts and results are shown in the following table. Catchments were derived using a combination of detailed ground survey and Lidar aerial survey and were delineated using the 12d design software. Flows were calculated using the Rational Method in accordance with the Queensland Urban Design Manual (QUDM). The Rational Method used did not consider rainfall initial and continuing losses which would significantly reduce predicted design flows for large rural / undeveloped catchments, consideration of farm dams that would further attenuate flows have also not been considered. The hydrologic calculations can therefore be considered conservative. Hydrographs were also not developed for the hydrologic assessment.

Hydraulic calculations were completed for the proposed transverse drainage culverts using Manning's Equation in accordance with QUDM and results are shown in the following table. Manning's Equation was used to calculate the capacities of stormwater culverts flowing full, but not under pressure. During significant flood events where the water head level would be above the culvert inlet, more water would be forced through the culvert, increasing the culvert capacity. The Manning's Equation calculations did not take this into account and can therefore be considered conservative. The culvert capacities reported in the following table would likely be higher accounting of pressurised flow.

A summary of the hydrologic and hydraulic results for the transverse culvert crossings is shown in the following table. A catchment plan is included in Appendix P.

Culvert ID	Culvert Structure	Contributing Catchment(s)	Catchment Area (ha)	Contributing Flow (m^3/s)		Culvert Capacity (m^3/s)
				2 year AEP	10 year AEP	
WP01F	600RCP	A	1.4	0.08	0.14	0.04
WP01G	600RCP	B	2.6	0.15	0.28	0.06
WP01H	600RCP	A	1.4	0.08	0.14	0.04
WP02A	600RCP	C	1.2	0.08	0.15	0.13
WP02B	450RCP	D	0.3	0.02	0.04	0.02
WP04A	600RCP	E	2.6	0.14	0.25	0.05
WP05A	600RCP	F	13.9	0.66	1.21	0.04
WP08B	600RCP	G+H	31.5	1.21	2.20	0.03
WP08C	600RCP	H	4.5	0.24	0.43	0.03
WP08D	600x225RCBC	I	0.1	0.01	0.02	0.14

The above table demonstrates that culverts WP01F, WP01G, WP01H, WP02A, WP02B, WP04A and WP08D will adequately convey flows in the vicinity of the 2 to 10 year Annual Exceedance Probability (AEP) flood events.

Culvert WP05A is located on the eastern side of the Flood Levee alignment and is expected to provide relief drainage for minor catchment flows. During regional flooding the culvert penstock is to be closed and zero flows will be conveyed by the culvert.

Culvert WP08B is located underneath Miscamble Street on the eastern side of the Flood Level at the southern end of the alignment. The proposed culvert is a 600mm diameter RCP and replaces an existing culvert approximately 375mm in diameter. The culvert provides relief drainage for flows converging at the intersection of the Flood Levee and Miscamble Street. Flows in major flood events will likely flow adjacent to Miscamble Street to the east and towards the Bungil Creek.

Culvert WP08C is located at the southern end of the Flood Levee alignment adjacent to Miscamble Street. The proposed culvert provides relief drainage for the local catchment drain area located to the west of the Flood Levee alignment. Any major flows in this location are expected to flow to the south and overtop Miscamble Street.

2.11 Environmental Controls and Permits

The Environment team has reviewed the proposed design for the levee and relevant desktop information to identify the potential major environmental impacts associated with the works and any likely permitting requirements.

The main environmental consideration for the proposed levee is associated with the disturbance footprint resulting from excavation and placement of fill. This may trigger clearing permits, permits

to operate an Environmentally Relevant Activity, and building works permits (to allow demolition of structures).

Considering the rural and previously disturbed nature of the site, ecological impacts are expected to be minimal. If works encroach into Bungil Creek, some permitting requirements may apply including permits for clearing regional ecosystem vegetation or construction of waterway barriers.

Permits under Maranoa Regional Council are likely to be required for interference with and alteration of local roads and road reserve, as the proposed levee impacts three local roads.

A summary of the potential environmental approvals for the proposed works, including the typical time frames and responsible party for each, is provided in Appendix E. The need for many of these permits and approvals is currently the responsibility of the contractor.

2.12 Possible Failure Modes

This section sets out the major possible failure modes of an earth embankment levee and details what steps the design team has gone through to prevent those failures. It is not a full list of all cases considered but a high level look into steps taken by the design team to optimise the design to suit local conditions.

2.12.1 Failures related to Culverts and Service Conduits

Penetrations such as culverts and service conduits are potential weak points through the levee. The failure of a levee around a culvert or service conduit through an earth embankment levee can be initiated by development of a piping type failure mechanism along the penetration. Piping failures can occur over time or develop quickly during a flood event.

Current design practice in earth embankment levees and dams includes a sand filter running along the levee to mitigate against the development of a piping failure. Due to concerns regarding material availability and in order to find a more economically viable solution for the project the design team investigated alternative options.

The design that was produced specifies a centrally placed cut-off wall and non-dispersive materials for all penetrations through the levee. The cut off wall includes a ring of hydrotite or similar product to prevent water passing through any shrinkage that may occur between the penetration and the cut off wall.

Culverts passing through the levee have been designed with flowable fill up to the mid-point of the culvert to minimise the possibility of voids. A less dispersive fill material Type C is then placed above this flowable fill. Type C material is to be placed at a 1 on 1 slope into the existing levee in in order to ensure that it integrates with the adjacent Type B material. For more detail on the design of culverts and drainage please see section 2.10.

Services, such as Telstra, passing under the levee are to be exposed, all previous trenching and unsuitable material to be removed and replaced with a non-dispersive flowable fill around the service. For more details on the services please see Section 2.1.2.

2.12.2 Seepage-related Failures

An earth embankment levee is known to be potentially susceptible to failure due to seepage through the levee and underseepage in pervious foundations beneath the levee. There are a number of factors affecting failures due to seepage, including hydraulic gradient, soil plasticity, and particle size, soil dispersiveness, soil permeability and others. In order to evaluate the proposed levee in relation to safety against seepage and seepage control measures to mitigate the effects of seepage, it is important to understand the various modes of potential failure that can occur due to seepage through the proposed levee or its foundation.

The design team has therefore identified possible failure modes related to seepage and presented as follows:

- Tunnelling / Jugging
- Concentrated leak erosion through embankment and/or foundation
- Heave or boiling
- Piping due to high exit gradient

Section 2.12.1 details the design intent with regard to possible tunnelling, piping or boiling failures. The levee profile includes a 3m wide crest, with 1:4 batters minimising any risk of concentrated leak erosion through the embankment and foundation. The O&M manual in Appendix M discusses identification of these types of failures and how to mitigate against them in a flood event.

Please see Appendix D, the interpretive geotechnical report for more detail on how the design has considered these failure mechanisms.

2.12.3 Stability-related Failures

Common failures of an earth embankment levee and relevant structures such as penstocks are also related to geotechnical instability under the various loading conditions to which the levee may be subjected in its life time and which should be accounted for the design e.g. end of construction, long-term, flood event, sudden drawdown and earthquakes. In particular for levees of significant height or where there are concerns regarding qualified embankment material availability or foundation conditions requires extensive stability analysis.

Regarding the stability of the levee and relevant structures, the design team has identified the following possible failure modes:

- Instability of levee under the various loading conditions
- Cracking due to differential settlement, desiccation or other causes
- Progressive failure due to aging of levee materials
- Instability of penstock in terms of sliding, overturning and global stability

Instability of the levee has been considered in Appendix D, the Geotechnical Interpretive Report. The design team featured numerous hold points and inspections to be undertaken by a Geotechnical Representative in order to ensure the suitability and minimise any possible differential settlement of materials. Where possible the use of locally sourced materials has been undertaken to prevent failure due to aging of levee materials. Penstocks have been analysed by both a geotechnical and structural engineer to ensure there is negligible risk of movement at the culvert.

Please see Appendix D, the interpretive geotechnical report for more detail on how the design has considered these failure mechanisms.

2.12.4 External Erosion Related Failures

External erosion related failures include levee failures caused by overtopping, hydraulic actions such as currents and turbulence and human and animal damage. The design has taken a number of steps to ensure that the levee has the structural integrity to resist these failure mechanisms.

The levee has considered a number of flood events and modelled the flood levels in order to gain as accurately as possible the required crest level to prevent overtopping. The levee design level is to be constructed with Type B approved levee fill to prevent overtopping in certain flood events. For more information on this modelling please refer to section 2.9 and Appendix J.

The levee design has examined a number of options to mitigate against high velocity flows predicted by flood modelling in Appendix K – Scour Design Note. The detailed design drawings have prescribed treatments of placed rock and turf reinforced matting with suitable toe protection details to counter these forces.

The levee should not be grazed by animals where possible and should be repaired as soon as possible as described in Appendix M – Operations and Maintenance Manual. The levee is not recommended to be accessed by vehicles or animals at any stage.

In order to prevent the drying and desiccation of the Type B material the design has included the placement of 150mm of topsoil and grass seeding. The topsoil and grass seeding has been specified to maintain moisture content and reduce the risk of desiccation. The Topsoil and grass seeding is to be maintained as per the operations and maintenance manual in Appendix M.

2.13 Design Life

The design of the levee has taken into account fit for purpose measures in relation to a levee and all elements have a 100 year design life where feasible. Erosion protection measures and replaceable elements do not meet the 100 year design life.

The design considers a number of flood events as discussed in the reporting and the design has been development to ensure that future operation and maintenance costs have been minimised.

2.14 Design Changes

2.14.1 Changes between Detailed Design and Final Design

The Final Design differs from the detailed design in the following key areas:

Table 1 – Key Differences between Detailed Design and Final Design

Location	Description	Reason
Section D	Alignment changed between Carnarvon Highway and end of Section D	Landowner Preferences
Section B	Alignment at McPhie Street changed.	Landowner Preferences
Section B to D	Culvert WP04A	As a result of independent internal review.

2.15 Items for Resolution

The following items are to be resolved in the next stage of this design package:

Table 2 – Items to be resolved in the next submission of this design package

Location	Description	Method of Resolution
Nil		

2.16 Verification, Reviews and Certification

2.16.1 Internal Design Verification

Internal Verification has been undertaken and all comments closed out.

2.16.2 Other Party Review (Construction)

Third party comments from the construction team have been received and addressed comments are attached in Appendix F.

2.16.3 Other Party Review (Clients Representative)

Third party comments from the client's representative have been received and are included in Appendix G.

2.16.4 Certification

Certification of the design has been included in Appendix N. A consequence assessment has also been undertaken and included in Appendix O.

2.17 Design Drawings

Refer to Appendix A for the list of design drawings applicable to this design lot.

2.18 Construction Methodology

The construction methodology of the levee has been to build the levee in stages with large scale earth moving machinery. To ensure that the levee is constructed in accordance with the design intent SMEC has maintained an onsite presence during the construction of the works where required. The key in relation to the construction methodology is building the levee up in linear layers and ensuring the levee is filled and cut back. SMEC and Ostwalds Brothers have undertaken multiple workshops in relation to suitable construction methods and staging.

2.19 Construction Specifications

Refer to Appendix B for the construction specifications.

3 SAFETY IN DESIGN AND RISK ASSESSMENT

3.1 Safety in Design

SMEC and Ostwald Brothers acknowledge the importance of Safety in Design and the following measures are used during the design phase:

Identify the hazards presented by potential design solutions and consider the risks these hazards will generate for construction works and others who may be affected by the construction work

Include health and safety considerations amongst the design options to avoid the hazards, reduce their impact or introduce control measures to protect those at risk where it is reasonably practicable

Forewarn the construction team of the residual hazards that have been identified within the design and will need to be managed during the construction work

As well as the above, the following hierarchy of risk control has adopted:

1. Eliminate the hazards. The job is redesigned so as to remove the hazard. However, the alternative method should not lead to a less acceptable product or less effective process
2. Substituting the system of work or plant with something safer. Replace the material or process with a less hazardous one.
3. Engineering controls – Install or by using additional machinery such as local exhaust ventilation to control a risk. Separating the hazard from operators by methods such as enclosing or guarding dangerous items of machinery. For example, use guards on compression testing machines.
4. Administrative controls – Reduce the time the worker is exposed to the hazard. Prohibit eating, drinking and smoking in laboratory areas. Provide training. Perform risk assessments. Increase safety awareness signage.
5. Personal Protective Equipment (PPE) – Only after all previous measures have been tried and found to be ineffective in controlling the risks should Personal Protective Equipment be considered. If chosen, PPE should be selected and fitted individually. Workers must be trained in the function and limitations of each item of PPE. For example, an operator should know how long the compressed supply in a self-contained breathing apparatus will last. PPE may be used as a temporary control measure until other alternatives are installed. In most cases a combination of engineering controls, administrative controls and PPE are chosen to effectively control the risks

3.2 Construction Hazard Assessment and Implication Review (CHAIR) Purpose

Construction hazard assessment and implication review (CHAIR) is a systematic method of analysing the importance of hazardous situation associated with a system or activity. It uses a simple technique to look for unexpected deviations from the way things are designed to happen, and decides whether these deviations could damage people, property or the environment. It does not review the design of the system or activity, but seeks to challenge the design intent looking for unexpected was the design can be defeated or modified. The aim is to facilitate safer construction or future operation

One of the main purpose of CHAIR is to bring together designers, constructors, asset owners and operates, and key stakeholders to eliminate (or minimise) the construction, operation, maintenance and demolition risk of project/asset during the design phase

The CHAIR provides a rigorous framework to facilitate discussion through the use of guidewords. The risks are formally identified, along with the likely consequences for action by the appropriate stakeholders.

The CHAIR is conducted in three parts, **CHAIR 1** (global project risks) during the concept/ tender design providing the best opportunity to make fundamental change even though much of the detail is yet too determined.

CHAIR 2 (construction and demolition risks) and **CHAIR 3** (operation and maintenance risks) assess the specific risks of those items during the detail design (85% Design) and reduce the CHAIR 2 risks while identifying the CHAIR 3 risks.

The CHAIR process and it's relation to the project and design phases has been shown below in Figure 2.

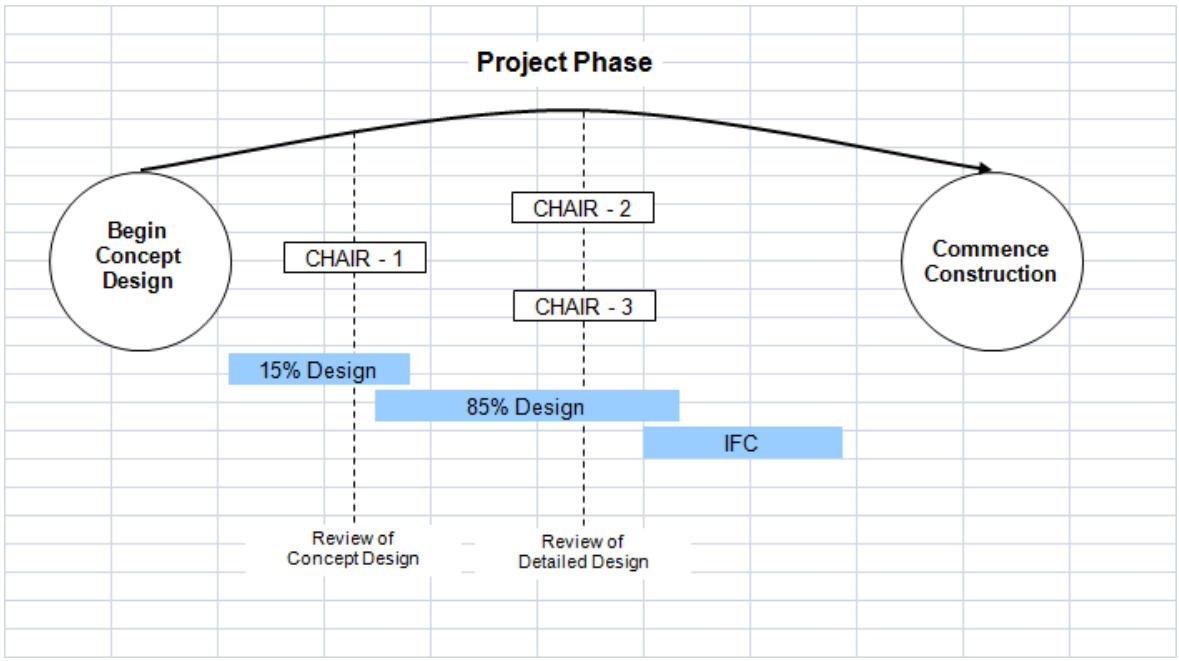

Figure 2 –The Chair Process

A safety in design workshop was undertaken on 15th October 2013, the outcomes from this assessment are included in Appendix H.

4 OPERATION, SAFETY AND MAINTENANCE

The detailed design has considered the ongoing operation, safety and maintenance issues. For further details please refer to Appendix M – Operations and Maintenance Manual.

4.1 Operation Considerations

The design of the proposed levee embankment including addressing potential seepage and dam safety issues will be designed to consider current standards for a “Referable Dam”. It is noted that over time standards change and there is no guarantee that the proposed levee will meet future changes to design standards and government requirements.

Council is to also note that a Regulated Dam is required to have in place a raft of documentation and maintenance practices. These include regular dam safety inspections (periodic, annual and comprehensive) together with their associated reporting requirements, Operations and Maintenance Manual, Standing Operation Procedures (SOPs), an established maintenance regime and an emergency action plan that includes levee failure scenarios. This documentation needs to be developed in close consultation with Council.

4.2 Safety Considerations

Safety has been considered during the design, construction and operation of the levee and key considerations to date are:

- Suitable signage;
- Inclusion of fencing and gates to restrict public access:
- Providing safe access for the operation of penstocks / gates
- Maintain 1 on 4 batters; and

  Proposing desirable road geometry solutions.

4.3 Maintenance Considerations

Maintenance has been considered during the design, and construction and operation of the levee and key considerations to date are:

- Inclusion of access;
- Providing safe access for the operation of penstocks / gates;
- Maintain 1 on 4 batters; and

  Temporary Alternative Access tracks.

APPENDIX A – RELEVANT DESIGN DRAWINGS

Drawing Transmittal Advice

Level 1, 154 Melbourne Street,
South Brisbane Q 4101

Project
ROMA FLOOD MITIGATION LEVEE

Project Number
30031182

Distribution	Method	Copies
Ostwalds	Email	1

Reason for issue	Document Type	Date
Construction	PDF	8/07/2014

Phase	Size	Issued By
Construction	A1	A.ZANETTI

Please sign and return as confirmation of receipt Signature…..	Comment

Drawing Title	Drawing No.	Revision
LOCALITY PLAN	DI-0001	C
DRAWING INDEX	DI-0002	G
GENERAL NOTES AND LEGEND	DI-0011	H
SCOPE OF WORKS AND KEY PLANS	SW-0001	C
TYPICAL CROSS SECTION AND DETAILS SHEET 1	TC-0101	E
TYPICAL CROSS SECTION AND DETAILS SHEET 2	TC-0102	E
TYPICAL CROSS SECTION AND DETAILS SHEET 3	TC-0103	E
CONTROL LINE AND FENCING SETOUT SHEET 1	CL-1001	C
CONTROL LINE AND FENCING SETOUT SHEET 2	CL-1002	D
CONTROL LINE AND FENCING SETOUT SHEET 3	CL-1003	E
CONTROL LINE AND FENCING SETOUT SHEET 4	CL-1004	B
CONTROL LINE AND FENCING SETOUT TABLES	CL-1005	F
WORKING PLAN AND LONG SECTION CONTROL LINE MC10 SHEET 1	WP-1001	E
WORKING PLAN AND LONG SECTION CONTROL LINE MC10 SHEET 2	WP-1002	D
WORKING PLAN AND LONG SECTION CONTROL LINE MC10 SHEET 3	WP-1003	E
WORKING PLAN AND LONG SECTION CONTROL LINE MC10 SHEET 4	WP-1004	E
WORKING PLAN AND LONG SECTION CONTROL LINE MC10 SHEET 5	WP-1005	D
WORKING PLAN AND LONG SECTION CONTROL LINE MC10 SHEET 6	WP-1006	E
WORKING PLAN AND LONG SECTION CONTROL LINE MC10 SHEET 7	WP-1007	E
WORKING PLAN AND LONG SECTION CONTROL LINE MC10 SHEET 8	WP-1008	F
GENERAL ARANGEMENT - LEVEE CROSSINGS McPHIE STREET - PLAN AND SECTIONS	GA-0001	C
GENERAL ARANGEMENT - LEVEE CROSSINGS MISCAMBLE STREET - PLAN AND SECTIONS	GA-0002	C
GENERAL ARANGEMENT - LEVEE CROSSINGS PRIVATE ACCESSES	GA-0003	D
PROPERTY ACCESS - LEVEE CROSSINGS PROPERTY ACCESS SHEET 1	PA-0001	D
PROPERTY ACCESS - LEVEE CROSSINGS PROPERTY ACCESS SHEET 2	PA-0002	C
PROPERTY ACCESS - LEVEE CROSSINGS PROPERTY ACCESS SHEET 3	PA-0003	C
PROPERTY ACCESS - LEVEE CROSSINGS PROPERTY ACCESS SHEET 4	PA-0004	B
PROPERTY ACCESS - LEVEE CROSSINGS PROPERTY ACCESS SHEET 5	PA-0005	A
PROPERTY ACCESS - LEVEE CROSSINGS PROPERTY ACCESS DETAILS	PA-0101	C
PAVEMENT GENERAL NOTES	PD-0011	E
PAVEMENT DETAILS	PD-1001	D
DRAINAGE CULVERT SECTIONS SHEET 1	DD-0001	E
DRAINAGE CULVERT SECTIONS SHEET 2	DD-0002	C
PENSTOCK DETAILS SHEET 1	DD-0111	E
PENSTOCK DETAILS SHEET 2	DD-0112	C
ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 1	XS-1001	C
ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 2	XS-1002	C
ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 3	XS-1003	D
ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 4	XS-1004	D
ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 5	XS-1005	D
ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 6	XS-1006	C
ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 7	XS-1007	C
ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 8	XS-1008	C
ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 9	XS-1009	D
ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 10	XS-1010	D
ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 11	XS-1011	C
ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 12	XS-1012	D
ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 13	XS-1013	C

ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 14	XS-1014	**C**
ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 15	XS-1015	**C**
ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 16	XS-1016	**C**
GEOTECHNICAL INVESTIGATION AND BORROW PIT LOCATIONS OVERALL PLAN	GE-0101	**C**
GEOTECHNICAL INVESTIGATION AND BORROW PIT LOCATIONS SHEET 1	GE-1001	**D**
GEOTECHNICAL INVESTIGATION AND BORROW PIT LOCATIONS SHEET 2	GE-1002	**D**
GEOTECHNICAL INVESTIGATION AND BORROW PIT LOCATIONS SHEET 3	GE-1003	**D**
GEOTECHNICAL INVESTIGATION AND BORROW PIT LOCATIONS SHEET 4	GE-1004	**B**
GEOTECHNICAL INVESTIGATION AND BORROW PIT LOCATIONS SHEET 5	GE-1005	**C**
PUBLIC UTILITIES PLAN SHEET 1	PU-1001	**C**
PUBLIC UTILITIES PLAN SHEET 2	PU-1002	**C**
PUBLIC UTILITIES PLAN SHEET 3	PU-1003	**D**
PUBLIC UTILITIES PLAN SHEET 4	PU-1004	**B**
PUBLIC UTILITIES PLAN McPHIE STREET	PU-1011	**C**
PUBLIC UTILITIES PLAN TREATMENT FOR SERVICES UNDER LEVEE	PU-1020	**B**
TYPICAL CROSS SECTION	TC-1101	**C**
CONTROL LINE SETOUT	CL-1101	**C**
WORKING PLAN AND LONGITUDINAL SECTION SHEET 1	WP-1101	**D**
WORKING PLAN AND LONGITUDINAL SECTION SHEET 2	WP-1102	**D**
ANNOTATED CROSS SECTIONS SHEET 1	XS-1101	**D**
ANNOTATED CROSS SECTIONS SHEET 2	XS-1102	**D**
ANNOTATED CROSS SECTIONS SHEET 3	XS-1103	**D**
DRAINAGE CROSS SECTION AND SCHEDULE	DD-1101	**C**
PROPERTY ACCESS PLAN SHEET 1	PA-1101	**C**
PROPERTY ACCESS PLAN SHEET 2	PA-1102	**C**
PUBLIC UTILITIES PLAN	PU-1101	**C**

MARANOA REGIONAL COUNCIL

ROMA FLOOD MITIGATION PROJECT

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LOCALITY PLAN

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
	B	30/01/2014	REISSUED FOR SECTIONS B&D	019	AZ
	C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING: NTS

DESIGNER: SMEC AUSTRALIA PTY LTD
© ABN 47 065 475 149
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SOUTH BRISBANE QLD. 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT: maranoa REGIONAL COUNCIL

PROJECT TITLE: MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
LOCALITY PLAN

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
NTS	CONSTRUCTION	30031182-DI-0001	C

150 mm ON ORIGINAL
A1

DRAWING INDEX			PACKAGE			
DRAWING NUMBER	DRAWING TITLE	REVISION	AC	BD	CH	ST
30031182-DI-0001	LOCALITY PLAN	C	X	X	X	X
30031182-DI-0002	DRAWING INDEX	G (G)	X	X	X	X
30031182-DI-0011	GENERAL NOTES AND LEGEND	H	X	X	X	X
30031182-SW-0001	SCOPE OF WORKS AND KEY PLANS	C	X	X	X	X
30031182-TC-0101	TYPICAL CROSS SECTION AND DETAILS SHEET 1	(G) E	X	X		
30031182-TC-0102	TYPICAL CROSS SECTION AND DETAILS SHEET 2	E	X	X		
30031182-TC-0103	TYPICAL CROSS SECTION AND DETAILS SHEET 3	E	X	X		
30031182-CL-1001	CONTROL LINE AND FENCING SETOUT SHEET 1	C		X		
30031182-CL-1002	CONTROL LINE AND FENCING SETOUT SHEET 2	D	X	X		
30031182-CL-1003	CONTROL LINE AND FENCING SETOUT SHEET 3	E	X	X		
30031182-CL-1004	CONTROL LINE AND FENCING SETOUT SHEET 4	B	X			
30031182-CL-1005	CONTROL LINE AND FENCING SETOUT TABLES	(G) F	X	X		
30031182-WP-1001	WORKING PLAN AND LONG SECTION CONTROL LINE MC10 SHEET 1	E		X		
30031182-WP-1002	WORKING PLAN AND LONG SECTION CONTROL LINE MC10 SHEET 2	D		X		
30031182-WP-1003	WORKING PLAN AND LONG SECTION CONTROL LINE MC10 SHEET 3	E	X			
30031182-WP-1004	WORKING PLAN AND LONG SECTION CONTROL LINE MC10 SHEET 4	E	X	X		
30031182-WP-1005	WORKING PLAN AND LONG SECTION CONTROL LINE MC10 SHEET 5	D		X		
30031182-WP-1006	WORKING PLAN AND LONG SECTION CONTROL LINE MC10 SHEET 6	E	X	X		
30031182-WP-1007	WORKING PLAN AND LONG SECTION CONTROL LINE MC10 SHEET 7	E	X			
30031182-WP-1008	WORKING PLAN AND LONG SECTION CONTROL LINE MC10 SHEET 8	(G) F	X			
30031182-GA-0001	GENERAL ARANGEMENT - LEVEE CROSSINGS McPHIE STREET - PLAN AND SECTIONS	C		X		
30031182-GA-0002	GENERAL ARANGEMENT - LEVEE CROSSINGS MISCAMBLE STREET - PLAN AND SECTIONS	B	X			
30031182-GA-0003	GENERAL ARANGEMENT - LEVEE CROSSINGS PRIVATE ACCESSES	D		X		
30031182-PA-0001	PROPERTY ACCESS - LEVEE CROSSINGS PROPERTY ACCESS SHEET 1	D		X		
30031182-PA-0002	PROPERTY ACCESS - LEVEE CROSSINGS PROPERTY ACCESS SHEET 2	C	X			
30031182-PA-0003	PROPERTY ACCESS - LEVEE CROSSINGS PROPERTY ACCESS SHEET 3	C		X		
30031182-PA-0004	PROPERTY ACCESS - LEVEE CROSSINGS PROPERTY ACCESS SHEET 4	B	X			
30031182-PA-0005	PROPERTY ACCESS - LEVEE CROSSINGS PROPERTY ACCESS SHEET 5	A	X			
30031182-PA-0101	PROPERTY ACCESS - LEVEE CROSSINGS PROPERTY ACCESS DETAILS	C	X	X		
30031182-PD-0011	PAVEMENT GENERAL NOTES	E	X	X		
30031182-PD-1001	PAVEMENT DETAILS	C	X	X		
30031182-DD-0001	DRAINAGE CULVERT SECTIONS SHEET 1	E	X	X		
30031182-DD-0002	DRAINAGE CULVERT SECTIONS SHEET 2	C	X	X		
30031182-DD-0111	PENSTOCK DETAILS SHEET 1	E	X	X		
30031182-DD-0112	PENSTOCK DETAILS SHEET 2	C	X	X		
30031182-XS-1001	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 1	C		X		
30031182-XS-1002	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 2	C		X		
30031182-XS-1003	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 3	D		X		

DRAWING INDEX			PACKAGE			
DRAWING NUMBER	DRAWING TITLE	REVISION	AC	BD	CH	ST
30031182-XS-1004	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 4	D		X		
30031182-XS-1005	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 5	D	X	X		
30031182-XS-1006	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 6	C	X			
30031182-XS-1007	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 7	C	X			
30031182-XS-1008	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 8	C	X			
30031182-XS-1009	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 9	D		X		
30031182-XS-1010	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 10	D		X		
30031182-XS-1011	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 11	C		X		
30031182-XS-1012	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 12	D	X	X		
30031182-XS-1013	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 13	C	X			
30031182-XS-1014	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 14	(G) C	X			
30031182-XS-1015	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 15	C	X			
30031182-XS-1016	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 16	C	X			
30031182-GE-0101	GEOTECHNICAL INVESTIGATION AND BORROW PIT LOCATIONS OVERALL PLAN	C	X	X	X	
30031182-GE-1001	GEOTECHNICAL INVESTIGATION AND BORROW PIT LOCATIONS SHEET 1	D	X	X		
30031182-GE-1002	GEOTECHNICAL INVESTIGATION AND BORROW PIT LOCATIONS SHEET 2	D	X	X		
30031182-GE-1003	GEOTECHNICAL INVESTIGATION AND BORROW PIT LOCATIONS SHEET 3	C	X	X		
30031182-GE-1004	GEOTECHNICAL INVESTIGATION AND BORROW PIT LOCATIONS SHEET 4	B	X			
30031182-GE-1005	GEOTECHNICAL INVESTIGATION AND BORROW PIT LOCATIONS SHEET 5	C	X	X		
~~30031182-ST-1001~~	~~SHEET PILE LEVEE WALL PLAN AND ELEVATION SECTION D~~	~~A~~				~~X~~
~~30031182-ST-1002~~	~~SHEET PILE LEVEE WALL PLAN AND ELEVATION SECTION D~~	~~B~~				~~X~~
30031182-PU-1001	PUBLIC UTILITIES PLAN SHEET 1	C		X		
30031182-PU-1002	PUBLIC UTILITIES PLAN SHEET 2	C	X	X		
30031182-PU-1003	PUBLIC UTILITIES PLAN SHEET 3	D	X	X		
30031182-PU-1004	PUBLIC UTILITIES PLAN SHEET 4	B	X			
30031182-PU-1011	PUBLIC UTILITIES PLAN McPHIE STREET	C		X		
~~30031182-PU-1012~~	~~PUBLIC UTILITIES PLAN MISCAMBLE STREET~~	~~B~~	~~X~~			
30031182-PU-1020	PUBLIC UTILITIES PLAN TREATMENT FOR SERVICES UNDER LEVEE	B	X	X	X	X
30031182-TC-1101	CARNARVON HIGHWAY - TYPICAL CROSS SECTION	C			X	
					X	
30031182-CL-1101	CARNARVON HIGHWAY - CONTROL LINE SETOUT	C			X	
					X	
30031182-WP-1101	CARNARVON HIGHWAY - WORKING PLAN AND LONGITUDINAL SECTION SHEET 1	D			X	
30031182-WP-1102	CARNARVON HIGHWAY - WORKING PLAN AND LONGITUDINAL SECTION SHEET 2	D			X	
					X	
30031182-XS-1101	CARNARVON HIGHWAY - ANNOTATED CROSS SECTIONS SHEET 1	D			X	
30031182-XS-1102	CARNARVON HIGHWAY - ANNOTATED CROSS SECTIONS SHEET 2	D			X	
30031182-XS-1103	CARNARVON HIGHWAY - ANNOTATED CROSS SECTIONS SHEET 3	D			X	
					X	
30031182-DD-1101	CARNARVON HIGHWAY - DRAINAGE CROSS SECTION AND SCHEDULE	D			X	
					X	
30031182-PA-1101	CARNARVON HIGHWAY - PROPERTY ACCESS PLAN SHEET 1	C			X	
30031182-PA-1102	CARNARVON HIGHWAY - PROPERTY ACCESS PLAN SHEET 2	C			X	
					X	
30031182-PU-1101	CARNARVON HIGHWAY - PUBLIC UTILITIES PLAN	C			X	

PACKAGE KEY

AC = SECTIONS A AND C
BD = SECTIONS B AND D
CH = CARNARVON HIGHWAY PACKAGE
ST = STRUCTURAL WALL DRAWINGS

LEGEND

~~———~~ DRAWING DELETED/ REMOVED FROM SET

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	30/01/2014	REISSUED FOR SECTIONS B&D	019	AZ
C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
D	10/04/2014	REVISIONS AMENDED	-	AZ
E	16/05/2014	REVISIONS AMENDED	032	AZ
F	5/06/2014	REVISIONS AMENDED	033	AZ
G	7/07/2014	REVISIONS AMENDED	-	

TITLE	NAME
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DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING: NTS

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SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
DRAWING INDEX

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
NTS	CONSTRUCTION	30031182-DI-0002	G

150 mm ON ORIGINAL
A1

NOTES

GENERAL

1. THE FOLLOWING NOTES APPLY GENERALLY TO THE DRAWINGS AND SHALL BE READ IN CONJUNCTION WITH THE NOTES ON THOSE DRAWINGS AND THE SPECIFICATIONS.
2. UNLESS OTHERWISE SHOWN ALL DIMENSIONS ARE IN METRES AND ALL LEVELS ARE TO AUSTRALIAN HEIGHT DATUM.
3. DO NOT OBTAIN DIMENSIONS BY SCALING FROM DRAWINGS.
4. DESIGNERS SITE REPRESENTATIVE IS ABBREVIATED AS (DSR).
5. ALL LOCATIONS, ORIENTATION AND LEVELS SHALL BE VERIFIED ON SITE PRIOR TO COMMENCING ANY WORK. ANY DISCREPANCIES ARE TO BE REFERRED TO THE DSR.
6. THE CONTRACTOR SHALL CONSTRUCT THE LEVEES, DRAINS AND ASSOCIATED STRUCTURES IN STRICT CONFORMITY WITH THE LOCATIONS AS SHOWN ON THE DRAWINGS EXCEPT WHERE OTHERWISE ADVISED IN WRITING BY THE DSR.
7. MATERIALS AND WORKMANSHIP SHALL COMPLY WITH THE SPECIFICATIONS, RELEVANT AUSTRALIAN AND INTERNATIONAL STANDARDS AND STATUARY REGULATIONS.
8. PROVISION FOR TRAFFIC SHOULD BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE AUSTRALIAN STANDARD FOR MANUAL TRAFFIC CONTROL DEVICES, PART 3 (AS1742.3-1996).
9. (01 / 1001) DENOTES REFERENCE TO DETAIL NUMBER ON REFERENCE DRAWING.
10. PRIOR TO COMMENCEMENT OF CLEARING OR EXCAVATION, THE CONTRACTOR SHALL:
    - MAKE COMPLETE ENQUIRIES AND INVESTIGATIONS FOR THE ASSESSMENT AND PROTECTION OF PUBLIC AND PRIVATE SERVICES UTILITIES AND PROPERTY FROM DAMAGE AND CONSTRUCT RELEVANT PROTECTION WORKS AS REQUIRED.
    - UNDERTAKE THE RELEVANT ENVIRONMENTAL, CULTURAL AND HISTORICAL ASSESSMENTS AND ENSURE THAT PLANS, PERMITS AND APPROVALS HAVE BEEN ASSESSED AND APPROVED BY THE RELEVANT AUTHORITIES.
11. DESIGNERS SITE GEOTECHNICAL REPRESENTATIVE IS ABBREVIATED AS (DSGR).
12. EXISTING SURFACE LEVELS ARE INDICATIVE ONLY.
13. ACCESS TO PROPERTIES TO BE MAINTAINED AT ALL TIMES.
14. CHAINAGES ARE EXPRESSED IN METRES.
15. TOPSOIL TO BE PLACED 150mm THICK.

FOUNDATION AND EARTHWORKS

1. THE LEVEE AND STRUCTURE FOUNDATION DESIGN IS BASED ON ASSUMPTION THAT THE FOUNDATION MATERIAL IS STIFF CLAY (OR BETTER). THE FOUNDATION MATERIAL SHALL BE INSPECTED BY THE DSGR TO CONFIRM THAT THE EXPOSED MATERIAL SATISFIES THE DESIGN ASSUMPTION INCLUDING CONFIRMING ABSENCE OF HIGH PERMEABILITY FOUNDATION MATERIAL. ANY MATERIAL ASSESSED TO BE UNSUITABLE SHALL BE REMOVED AND REPLACED WITH APPROVED LEVEE FILL.
2. REMOVAL OF UNSUITABLE MATERIAL SHALL BE BASED ON AN ASSESSMENT BY THE DSGR.
3. IF THE SITE CONDITIONS ENCOUNTERED ARE SUBSTANTIALLY DIFFERENT FROM THE CONDITIONS DEPICTED ON THIS PLAN, THE DSR IS TO BE NOTIFIED IMMEDIATELY FOR INSTRUCTION.
4. CLEARING AND DISTURBING OF VEGETATION SHALL BE KEPT TO A MINIMUM AND SHALL BE LIMITED TO AREAS CONTAINING THE EXCAVATIONS FOR THE CONSTRUCTION.
5. WHERE EXCAVATION IS REQUIRED ADJACENT TO EXISTING STRUCTURES, THE CONTRACTOR SHALL DESIGN AND INSTALL TEMPORARY SUPPORT AND SELECT APPROPRIATE EQUIPMENT TO ENSURE THAT NO DAMAGE OCCURS TO THE EXISTING STRUCTURE.
6. ALL EXCAVATIONS SHALL BE MADE SECURE AGAINST MOVEMENT BY MEANS OF STABLE BATTERS, TIMBERING, SHEET PILING OR PROTECTIVE SHIELDS.
7. ADEQUATE TEMPORARY PROTECTION AND MAN PROOF SITE FENCING SHALL BE PROVIDED FOR ALL PERSONS, PLANT AND ANIMALS DURING CONSTRUCTION AS PER MRC AGREEMENT.
8. LEVEE AND EMBANKMENT FILL MATERIALS AND PLACEMENT SHALL BE TESTED AND PLACED IN ACCORDANCE WITH THE EARTHWORKS SPECIFICATION FOR THIS PROJECT.
9. ALL DISTURBED AREAS SHALL BE HYDROMULCHED AT THE COMPLETION OF THE WORK. EQUIVALENT REVEGETATION METHODS PERMITTED SUBJECT TO APPROVAL BY THE DESIGNER.
10. TOPSOIL SHALL BE FERTILE, FRIABLE SOIL CONTAINING ORGANIC MATTER WHICH IS REASONABLY FREE SUBSOIL, REFUSE, TREE ROOTS LARGER THAN 20mm IN DIAMETER AND 300mm IN LENGTH, NOXIOUS WEEDS, CLAY LUMPS AND STONES LARGER THAN 50mm △H
11. ALL EXCAVATION, BACKFILLING, COMPACTION AND CONSTRUCTION WORKS SHALL BE CARRIED OUT STRICTLY IN ACCORDANCE WITH THE SPECIFICATION AND AS SHOWN ON THE DRAWINGS.
12. LEVEL 1 SUPERVISION AND TESTING OF THE WORKS SHALL BE UNDERTAKEN IN ACCORDANCE WITH AS3798-2007.
13. CLEARING TO BE COMPLETED AS PER SPECIFICATIONS.

DRAINAGE STRUCTURES

1. DESIGN LOADINGS FOR STRUCTURES ARE OPERATIONAL LOADS ACTING ON COMPLETED STRUCTURES. A SEPARATE ASSESSMENT SHALL BE UNDERTAKEN TO DETERMINE CONSTRUCTION LOADS AND REQUIRED TEMPORARY BRACING, PROPPING AND THE LIKE REQUIRED DURING CONSTRUCTION. STRUCTURES SHALL BE MAINTAINED IN A STABLE CONDITION AND NO PART SHALL BE OVERSTRESSED.
2. ANY CONSTRUCTION VEHICLE LOADING TO STRUCTURES SHALL BE SUBMITTED TO THE DSR FOR APPROVAL.
3. ALL WELDS TO COMPLY WITH AUSTRALIAN STANDARD AS 1554. FILLET WELDS TO BE NOT LESS THAN 6mm UNO.
4. ALL SETOUT POINTS TO CENTRE OF STRUCTURE UNLESS NOTED OTHERWISE.
5. FOUNDATIONS FOR ALL DRAINAGE STRUCTURES SHALL BE INSPECTED BY THE DSGR AND THE NEED FOR FOUNDATION IMPROVEMENT IN THESE AREAS ADVISED.
6. PIPE LENGTHS FOR DRAINAGE SHALL BE TO THE NEAREST MULTIPLE OF 1.22m FOR PIPES AND FOR BOXES.
7. HEADWALL APRONS TO BE TYPE 3 AS PER TMR STANDARD DRAWING 1318.

REINFORCEMENT

1. REINFORCEMENT STEEL TO BE AUSTRALIAN MADE GRADE 500N TO AS/NZS4671 UNO.
2. STEEL DOWELS SHALL BE GRADE R250N TO AS/NZS 4671.
3. BAR SHAPES ARE SHOWN ON TMR STANDARD DRAWING 1043 AND 1044 UNO.
4. LAPS AND SPLICES IN REINFORCEMENT SHALL ONLY BE MADE AT THE POSITIONS SHOWN ON THE DRAWINGS UNLESS APPROVED BY THE DSR.
5. SIDE AND END LAPS IN WELDED MESH FABRIC SHALL BE MADE SO THAT THE TWO OUTERMOST TRANSVERSE WIRES OF ONE SHEET OF MESH OVERLAP THE TWO OUTERMOST TRANSVERSE WIRES OF THE SHEET BEING LAPPED. REFER AS3600 FOR FURTHER DETAILS.
6. THE MINIMUM DEVELOPMENT LENGTHS AND LENGTHS OF LAPS FOR GRADE 500N BARS SHALL BE AS FOLLOWS, UNLESS NOTED OTHERWISE:

BAR SIZE	N12	N16	N20	N24	N28
MINIMUM LAP LENGTH	375	500	750	900	1200

COVER TO REINFORCEMENT

1. IF MINIMUM CLEAR COVER TO REINFORCEMENT IS NOT COVERED BY THE STANDARD DRAWINGS, SPECIFICATIONS OR PROJECT DETAILS, COVER TO BE AS FOLLOWS:

LOCATION	EXPOSURE CLASSIFICATION	COVER	CONCRETE
WHERE STANDARD FORMWORK AND COMPACTION IS USED	B2	45mm	40MPa/20mm
	C	70mm	50MPa/20mm
WHERE CAST AGAINST THE GROUND IF THE CONCRETE SURFACE IS PROTECTED BY A DAMP-PROOF MEMBRANE	B2	55mm	40MPa/20mm
	C	80mm	50MPa/20mm
WHERE CAST AGAINST THE GROUND	B2	65mm	40MPa/20mm
	C	100mm	50MPa/20mm

LINEMARKING

1. ALL LINEMARKING AND RAISED PAVEMENT MARKERS SHALL BE IN ACCORDANCE WITH THE 'MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES' (MUTCD).
2. WHERE LINEMARKING MATCHES ONTO EXISTING ROADS THE SETOUT IS TO BE CONFIRMED BY THE DSR PRIOR TO COMMENCING WORK.
3. ALL LINEMARKING PAINT TO BE TYPE 3 IN ACCORDANCE WITH MRTS 45 UNO.

SIGNS

1. THE LOCATION AND HEIGHT OF SIGNS SHALL BE IN ACCORDANCE WITH THE MUTCD.
2. DIMENSIONS OF SIGN FACES SHALL NOT BE SCALED OFF THE DRAWINGS.
3. SIGN POSTS TO BE 50NB CHS AND INSTALLED IN ACCORDANCE WITH TMR STANDARD DRAWING 1368.

BARRIERS

1. FOR DETAILS OF BARRIER SYSTEMS, INCLUDING STEEL BEAM GUARDRAILS, TERMINALS, TRANSITIONS, CONNECTIONS ETC. REFER TO THE TMR STANDARD DRAWINGS.

FENCING

1. FENCING AND GATES TO BE INSTALLED IN ACCORDANCE WITH MARANOA REGIONAL COUNCIL STANDARDS.
2. FENCES TO BE REINSTATED TO MATCH THE EXISTING FENCE LINES AS REQUIRED.
3. FENCE STRUTS AT GATE LOCATIONS TO BE ROTATED 90° TO RUN PARALLEL WITH LEVEE

ROAD EDGE GUIDE POSTS

1. ROAD EDGE GUIDE POSTS ARE TO BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF THE MUTCD.
2. REFER TO TMR STANDARD DRAWING 1356 FOR DETAILS.

RED DELINEATOR
ROAD EDGE GUIDE POSTS
WHITE DELINEATOR

RED DELINEATOR
DELINEATOR ON GUARDRAIL
WHITE DELINEATOR

LOCATION SHOWN ON THE DRAWINGS ARE A GUIDE ONLY. LOCATIONS AT TURNOUTS, PRIVATE ENTRANCES & CULVERT STRUCTURES SHALL BE AS SHOWN ON THE DRAWINGS. THE MAXIMUM DISTANCE BETWEEN GUARDRAIL DELINEATORS SHALL BE 40m. AT ALL OTHER LOCATIONS, THE ACTUAL LOCATIONS SHALL BE DETERMINED IN ACCORDANCE WITH STANDARD DRAWING 1356 & PART 2 CLAUSE 4.2.4.4 OF THE MUTCD.

PUBLIC UTILITIES

1. THE PRESENT AND/OR PROPOSED POSITIONS OF PUBLIC UTILITIES/SERVICES, FITTINGS, PIPES, POLES, MANHOLES, ETC. MAY BE INDICATED ON THE DRAWINGS, HOWEVER THE DRAWINGS ARE NOT AN ACCURATE REPRESENTATION OF THEIR PRESENCE OR OMISSION THEREOF.
2. THE LOCATION OF PUBLIC UTILITIES/SERVICES SHOWN ON THESE DRAWINGS HAVE BEEN APPROXIMATED FROM DIAL-BEFORE-YOU-DIG DATA. POTHOLING INFORMATION SUPPLIED BY SERVICE AUTHORITIES.
3. ALL NECESSARY AUTHORITIES SHALL BE CONTACTED TO VERIFY THE SIZE, TYPE, LOCATION AND LEVEL OF EXISTING PUBLIC UTLITIES/SERVICES PRIOR TO ANY EXCAVATION.
4. ALL NECESSARY MEASURES SHALL BE PROVIDED TO PROTECT PUBLIC UTILITIES/SERVICES DURING THE COURSE OF THE WORK.
5. NOT ALL PUBLIC UTILITY/SERVICE CONFLICTS HAVE NECESSARILY BEEN IDENTIFIED AND SHOWN ON THE DRAWINGS.
6. THE DSR IS TO BE ADVISED IMMEDIATELY OF ANY CONFLICT WITH PUBLIC UTILITY/SERVICE NOT IDENTIFIED ON THE DRAWINGS.
7. NO WORK IS TO BE CARRIED OUT OVER OR WITHIN 3.0m OF PUBLIC UTILITY/SERVICES WITHOUT THE PRIOR NOTIFICATION OF THE RELEVANT SERVICE AUTHORITY.
8. TELECOMMUNICATION CABLE IS TO BE MANUALLY EXPOSED AND PROTECTED WHEN EXCAVATING, OR WORKING, CLOSER TO THE TELECOMMUNICATION CABLE THAN 3.0m.

MATCH TO EXISTING

1. PRIOR TO COMMENCEMENT WORK AT AN AREA WHERE THE WORKS JOIN TO EXISTING CONSTRUCTION, THE CONTRACTOR SHALL:
    - UNDERTAKE SURVEY OF THE AREA.
    - SUBMIT FOR APPROVAL DETAILS OF THE TIE IN AND NEW SURVEY TO THE DSR.

LEGISLATION

1. ALL CONSTRUCTION SHALL COMPLY WITH REVENANT CURRENT WORK PLACE HEALTH AND SAFETY LEGISLATION.

SCOPE OF WORKS

CARNARVON HIGHWAY
LEVEE CROSSINGS
EROSION PROTECTION

LEGEND

GENERAL

EXTENT OF WORKS
EXISTING PROPERTY BOUNDARY
PROPOSED CLEARING BOUNDARY
EXISTING FEATURES
EXISTING TREE
EXISTING TREE TO BE REMOVED
EARTHWORKS
EROSION PROTECTION - PLACED ROCK d50 = 300mm
EROSION PROTECTION - PLACED ROCK d50 = 550mm
EROSION PROTECTION - TURF REINFORCEMENT MATTING
EROSION PROTECTION - RENO MATTRESS

LINEMARKING

BARRIER LINE - DOUBLE	BDL
BARRIER LINE - ONE DIRECTION	BL1
LANE LINE - SINGLE	LL
EDGE LINE - SINGLE	EL

SIGNAGE

SIGN LOCATION
EXISTING SIGN LOCATION
EXISTING SIGN TO BE RELOCATED
RELOCATED SIGN LOCATION
EXISTING SIGN TO BE REINSTATED

DRAINAGE

CULVERT WITH HEADWALL
OVERLAND FLOW PATH FREE DRAINING
DRAINAGE CHANNEL

FENCING

FENCE AND POST INACCORDANCE WITH DRG CMDG-G-010
GATE INACCORDANCE WITH DRG CMDG-G-017
EXISTING FENCE AND POST

ELECTRICAL

EXISTING OVERHEAD ELECTRICITY
EXISTING ELECTRICAL CONDUIT CONFLICT UNDER LEVEE TO BE TREATED. REFER DRG. TC-0103
EXISTING OVERHEAD ELECTRICITY TO BE REMOVED BY OTHERS
EXISTING POWERPOLE
DBYD ABOVE GROUND ELECTRICITY
DBYD UNDERGROUND ELECTRICITY

TELECOMMS

EXISTING TELSTRA
EXISTING TELSTRA CONDUIT CONFLICT UNDER LEVEE TO BE TREATED. REFER DRG. TC-0103
DBYD TELSTRA

UTILITIES

EXISTING WATER
EXISTING WATER MAIN CONFLICT UNDER LEVEE TO BE TREATED. REFER DRG. TC-0103

ISSUED FOR CONSTRUCTION

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	28/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	30/01/2014	REISSUED FOR SECTIONS B&D	019	AZ
C	28/02/2014	LEGEND AMENDED	025	RS
D	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
E	10/04/2014	NOTES AMENDED	033	AZ
F	16/05/2014	LEGEND UPDATED	032	AZ
G	2/06/2014	LEGEND UPDATED	033	AZ
H	7/07/2014	NOTE AMENDED	-	AZ

DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING: NTS

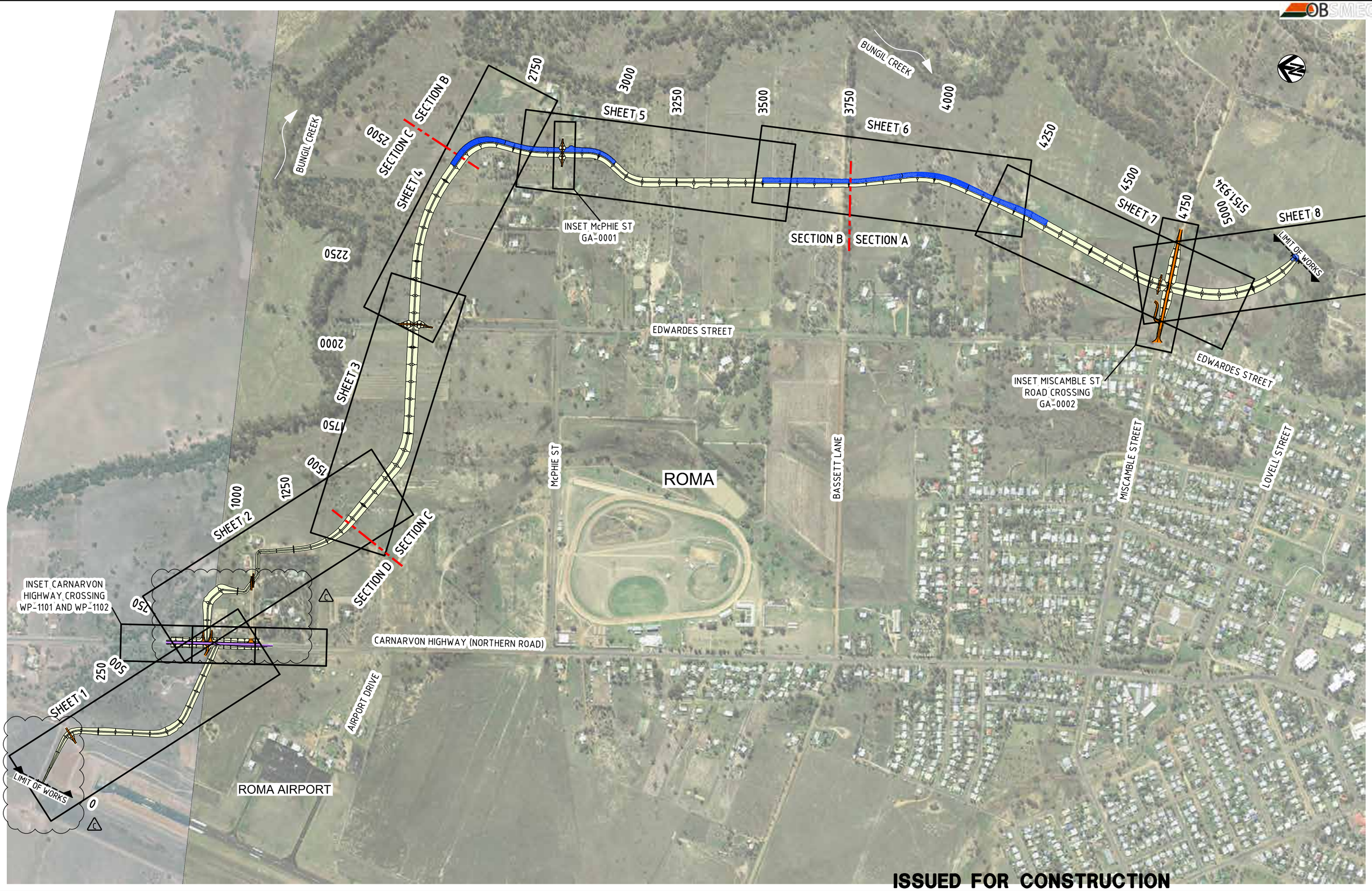
DESIGNER: SMEC
SMEC AUSTRALIA PTY LTD
© ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET SOUTH BRISBANE QLD 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT: maranoa REGIONAL COUNCIL

PROJECT TITLE: MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
GENERAL NOTES AND LEGEND

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
NTS	CONSTRUCTION	30031182-DI-0011	H

150 mm ON ORIGINAL
A1



ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	30/01/2014	REISSUED FOR SECTIONS B&D	019	AZ
C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

SCALE 1:5000 (50 0 100 200)

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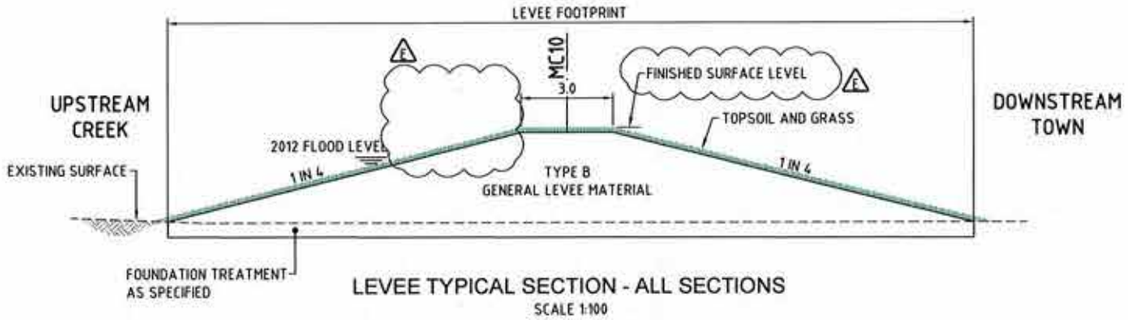
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

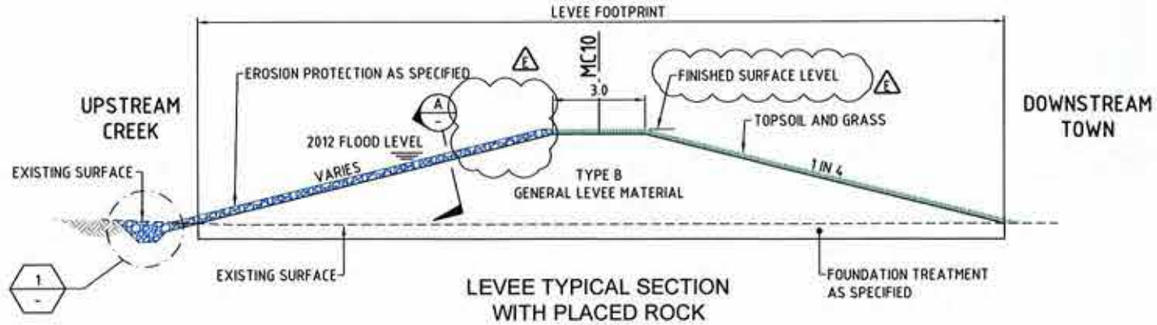
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
SCOPE OF WORKS AND KEY PLANS

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:5000	CONSTRUCTION	30031182-SW-0001	C

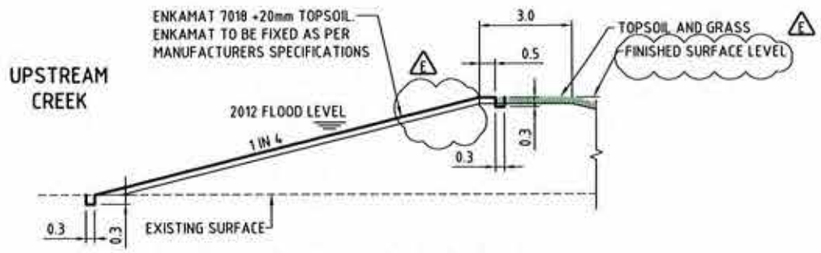
150 mm ON ORIGINAL
A1



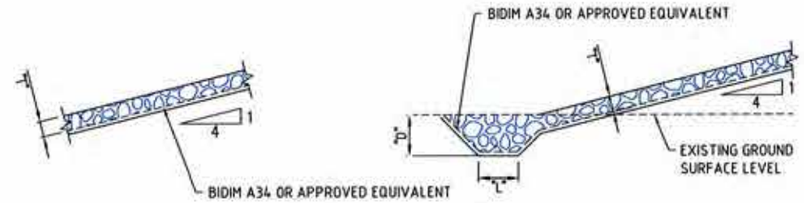
LEVEE TYPICAL SECTION - ALL SECTIONS
SCALE 1:100



LEVEE TYPICAL SECTION
WITH PLACED ROCK
SCALE 1:100

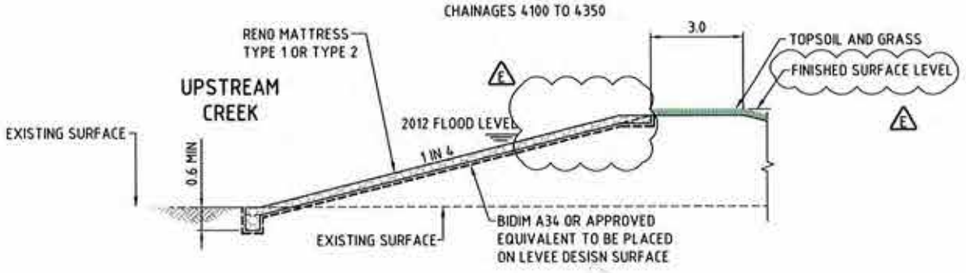


EROSION PROTECTION - ENKAMAT 7018
SCALE 1:100
CHAINAGES 2725 TO 2880
CHAINAGES 2900 TO 3050
CHAINAGES 3500 TO 3950
CHAINAGES 4100 TO 4350

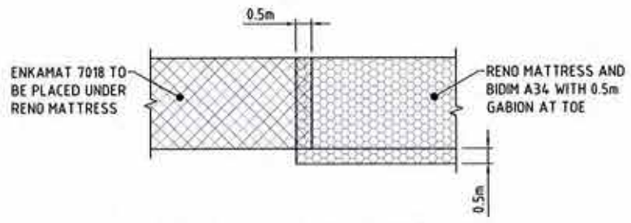


SECTION A N.T.S.

DETAIL 1 N.T.S.



EROSION PROTECTION - RENO MATTRESS
SCALE 1:100



ENKAMAT TO RENO MATTRESS OVERLAP
SCALE 1:100

TABLE A - PLACED ROCK GRADING				
LEVEE CHAINAGE	d50 (mm)	T (m)	D (m)	L (m)
2500 - 2725	300	0.6	0.6	1.2
3950 - 4100	300	0.6	0.6	1.2
5140 - END	550	1.1	1.0	2.0

NOTES
1. FOR GENERAL NOTES REFER TO DRAWING 30031182-DI-0011

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No	APPROVAL
	A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
	B	30/01/2014	DETAILS AMENDED	019	AZ
	C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
	D	16/05/2014	DETAILS AMENDED	032	AZ
	E	7/07/2014	NOTE AMENDED	-	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
SCALE 1:100 1 0 1 2 3 4 5

DESIGNER
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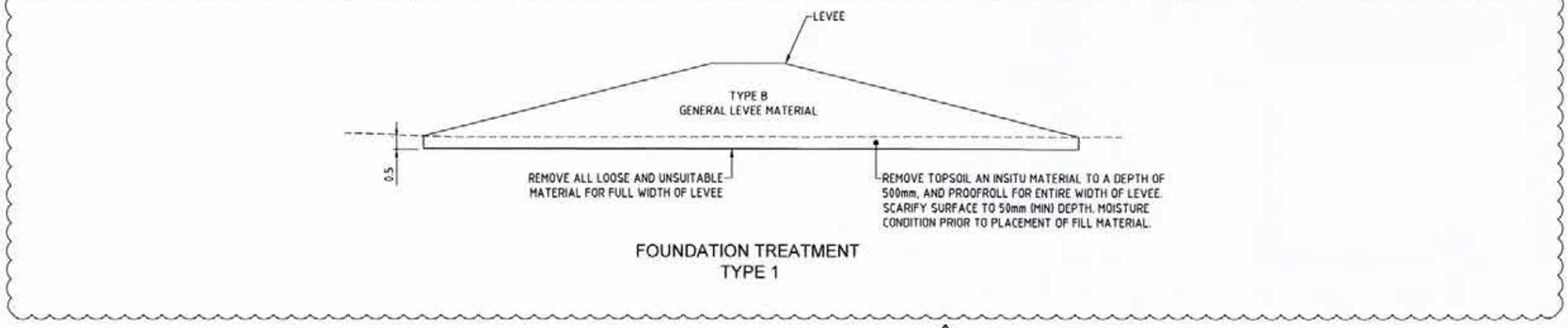
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

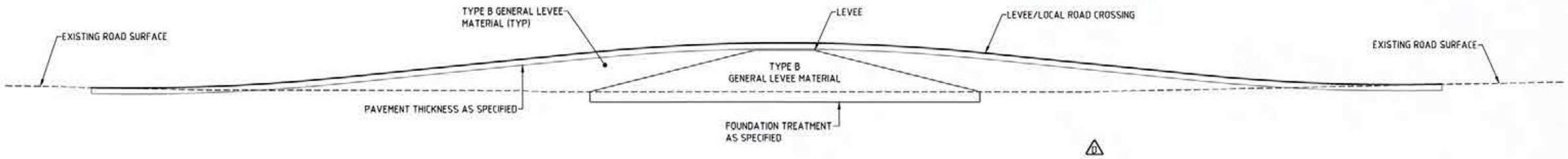
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
TYPICAL CROSS SECTION AND DETAILS
SHEET 1

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:100	CONSTRUCTION	30031182-TC-0101	E

150 mm ON ORIGINAL
A1



FOUNDATION TREATMENT
TYPE 1



TYPICAL LEVEE/LOCAL ROAD CROSSING TREATMENT SECTION

CHAINAGES 743.7 TO 803.7
CHAINAGES 1048 TO 1065
CHAINAGES 2064 TO 2070
CHAINAGES 2890 TO 2895
CHAINAGES 4720 TO 4765

NOTES
1. FOR GENERAL NOTES REFER TO DRAWING 30031182-DI-0011

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WWW No.	APPROVAL
A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	30/01/2014	DETAILS AMENDED	019	AZ
C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
D	16/05/2014	DETAILS AMENDED	032	

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
SCALE 1:100 1 0 1 2 3 4 5

DESIGNER
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CLIENT
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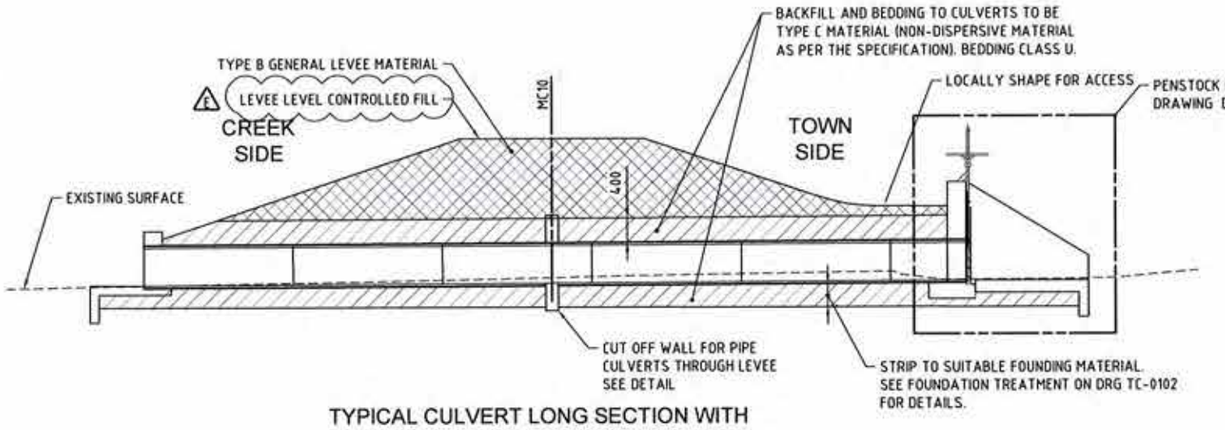
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
TYPICAL CROSS SECTION AND DETAILS
SHEET 2

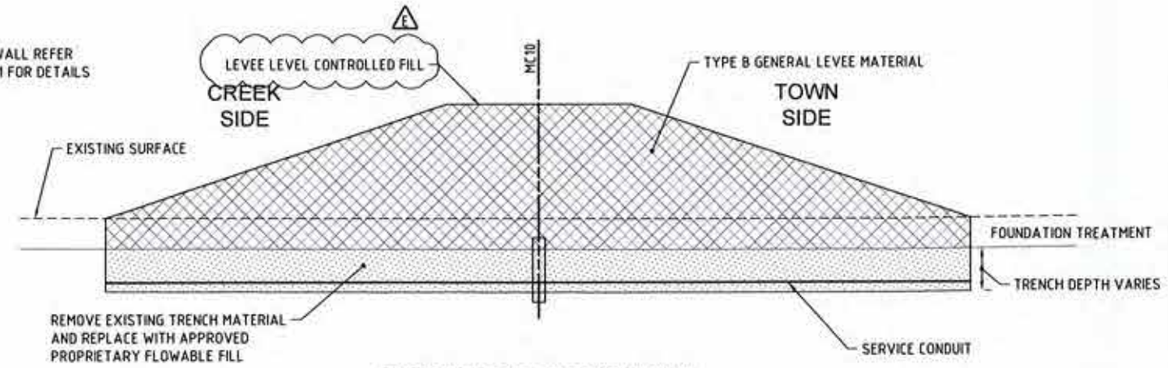
SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:100	CONSTRUCTION	30031182-TC-0102	D

A1 150 mm ON ORIGINAL



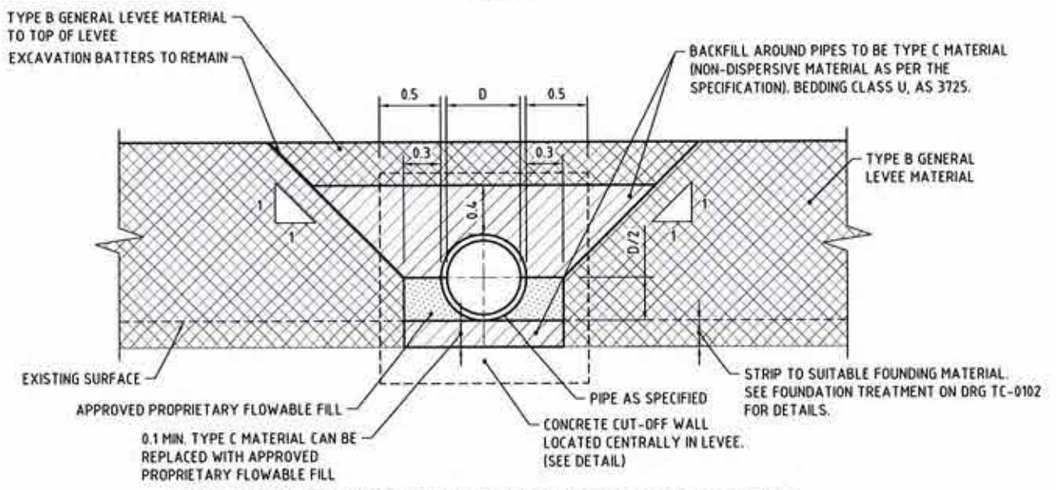
TYPICAL CULVERT LONG SECTION WITH PENSTOCK THROUGH LEVEE

SCALE 1:50



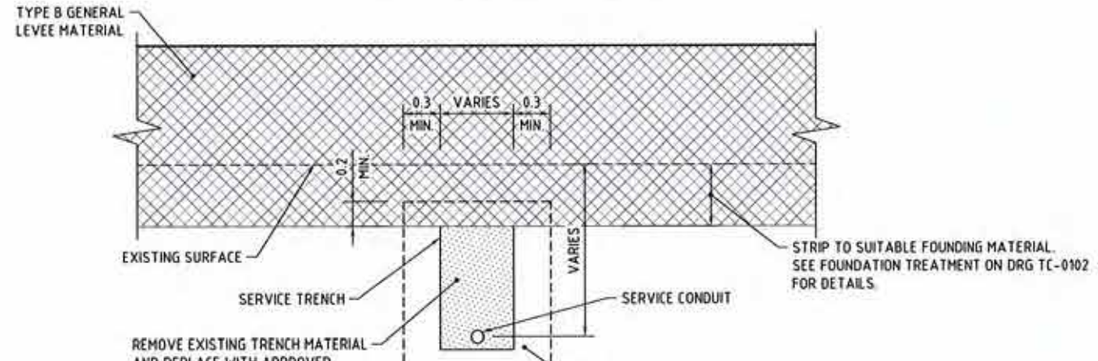
TYPICAL LONG SECTION WITH SERVICES THROUGH LEVEE

SCALE 1:50



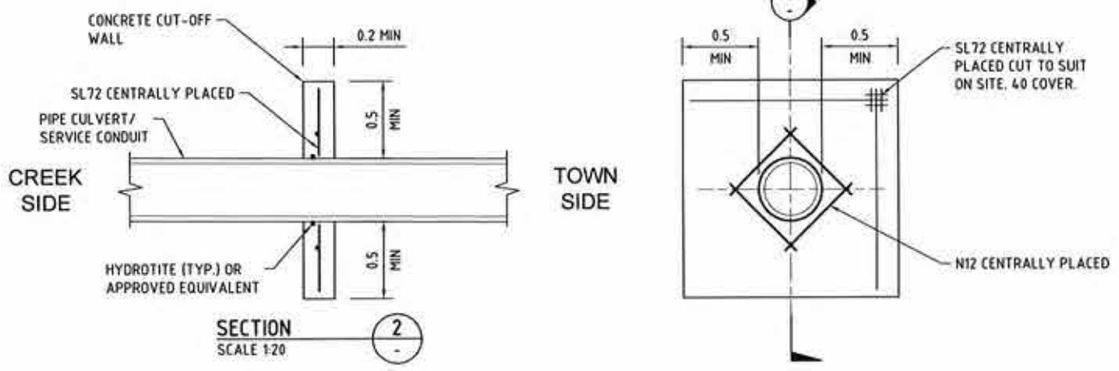
TYPICAL TREATMENT DETAIL FOR CULVERTS UNDER LEVEE

SCALE 1:25



TYPICAL TREATMENT DETAIL FOR SERVICES UNDER LEVEE

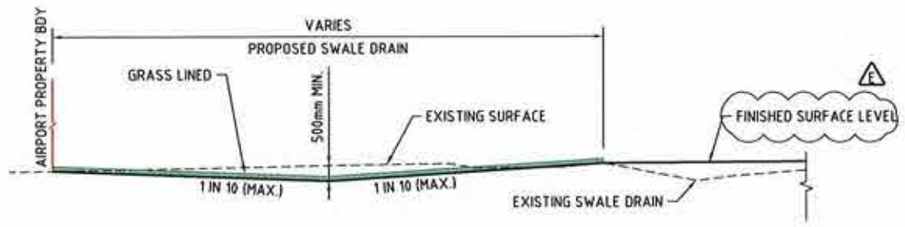
SCALE 1:25



CUT-OFF WALL DETAIL

SCALE 1:20

TO BE USED ON ALL PIPES, SERVICE CONDUITS AND CULVERTS FORMAL OR INFORMAL WITHIN LEVEES



TYPICAL V-DRAIN SECTION

SCALE 1:100

ISSUED FOR CONSTRUCTION

NOTES

1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
	B	30/01/2014	DETAILS AMENDED	019	AZ
	C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
	D	2/06/2014	DETAILS AMENDED	033	AZ
	E	7/07/2014	NOTE AMENDED	-	AZ AL

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

SCALE 1:20 — 0.2 0 0.2 0.4 0.6 0.8 1.0

SCALE 1:25 — 0.25 0 0.50 1.00

SCALE 1:50 — 0.5 0 1 2

DESIGNER

SMEC

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SMEC PROJECT No 30031182

CLIENT

maranoa REGIONAL COUNCIL

PROJECT TITLE

MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT

TYPICAL CROSS SECTION AND DETAILS SHEET 3

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
AS SHOWN	CONSTRUCTION	30031182-TC-0103	E

150 mm ON ORIGINAL

A1

REFER BELOW FOR CONTINUATION

OBSMEC

ROMA AIRPORT

CONTROL LINE MCP6
REFER TO DRG PA-0004
FOR DETAILS.

CONTROL LINE MC10

CONTROL LINE MCC1
REFER TO DRG CL-1101
FOR DETAILS.

CARNARVON HIGHWAY (NORTHERN ROAD)

CONTROL LINE MCC1
REFER TO DRG CL-1101
FOR DETAILS.

CONTROL LINE MCP9
CONTROL LINE MCP8
REFER TO DRG PA-0001
FOR DETAILS.

CONTROL LINE MC10

SECTION D
SECTION C

REFER ABOVE FOR CONTINUATION

REFER DRG CL-1002 FOR CONTINUATION

NOTES

1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.
2. FOR SETOUT DETAILS REFER TO DRAWING 30031182-CL-1005.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	A	30/01/2014	ISSUED FOR CONSTRUCTION	019	AZ
	B	31/03/2014	BIRKETT LEVEE REALIGNMENT	029	AZ
	C	16/05/2014	GOLDERS LEVEE REALIGNMENT	032	

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

SCALE 1:1000

DESIGNER
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SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
CONTROL LINE AND FENCING SETOUT
SHEET 1

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:1000	CONSTRUCTION	30031182-CL-1001	C

55 mm ON ORIGINAL
A1

REFER DRG CL-1001 FOR CONTINUATION

REFER BELOW FOR CONTINUATION

SECTION D

SECTION C

SECTION B

CT 1428.161

TC 1633.240

CT 1762.267

TC 2229.456

CT 2512.767

TC 2584.162

CT 2706.439

TC 2761.930

117°25'33"

80°28'46"

112°56'40"

183°0'14"

R -200

R 500

R 100

R -3

CONTROL LINE MC10

CONTROL LINE MCP7

REFER TO DRG PA-0005
FOR DETAILS.

FN 19

FN 20

FN 21

FN 22

FN 23

FN 24

FN 25

FN 26

FN 27

FN 28

FN 29

FN 30

FN 31

FN 32

FN 33

SINGLE GATE TO
BE INSTALLED

41
SP154293

40
SP154293

12
WV1037

11
R869

1
RP162007

2
RP162007

3
RP162007

9
R869

REFER ABOVE FOR CONTINUATION

REFER DRG CL-1003 FOR CONTINUATION

NOTES

1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.
2. FOR SETOUT DETAILS REFER TO DRAWING 30031182-CL-1005.

ISSUED FOR CONSTRUCTION

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	30/01/2014	REISSUED FOR SECTIONS B&D	019	AZ
C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
D	16/05/2014	ACCESS TRACK OVER LEVEE AMENDED	032	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

EXTERNAL REFERENCE FILES

SCALES AT A1 SIZE DRAWING

SCALE 1:1000

DESIGNER

SMEC

SMEC AUSTRALIA PTY LTD
ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD. 4101
PH 07 3029 6000 FAX 07 3029 6050
SMEC PROJECT No 30031182

CLIENT

maranoa REGIONAL COUNCIL

PROJECT TITLE

MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT

CONTROL LINE AND FENCING SETOUT SHEET 2

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:1000	CONSTRUCTION	30031182-CL-1002	D

150 mm ON ORIGINAL

A1

OBSMEC

CONTROL LINE MCP1
REFER TO DRG GA-0001 FOR DETAILS.

CONTROL LINE MC10

SECTION A

SECTION B

MCPHIE STREET

BASSETT LANE

R -300

R 100

210°48'56"

R -100

168°29'20"

168°2'48"

R 300

161°9'24"

191°40'34"

TC 2965.752

CT 2837.929

CT 3039.626

TC 3083.436

CT 3158.081

TC 3916.299

CT 3792.391

TC 3756.315

CT 4076.098

FN 34 FN 35 FN 36 FN 37 FN 38 FN 40 FN 40a FN 41 FN 42 FN 43 FN 44 FN 45 FN 46 FN 47 FN 48 FN 49 FN 50 FN 51 FN 52 FN 53

REFER DRG CL-1002 FOR CONTINUATION

REFER BELOW FOR CONTINUATION

REFER ABOVE FOR CONTINUATION

REFER DRG CL-1004 FOR CONTINUATION

NOTES
1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.
2. FOR SETOUT DETAILS REFER TO DRAWING 30031182-CL-1005.

ISSUED FOR CONSTRUCTION

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	28/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	30/01/2014	REISSUED FOR SECTIONS B&D	019	AZ
C	31/03/2014	BIRKETT LEVEL REALIGNMENT	030	AZ
D	10/04/2014	FENCE 40a ADDED	-	AZ
E	16/05/2014	MCPHIE ST REALIGNMENT	032	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

EXTERNAL REFERENCE FILES

SCALES AT A1 SIZE DRAWING

SCALE 1:1000 10 0 10 20 30 40 50

DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
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SMEC PROJECT No 30031182

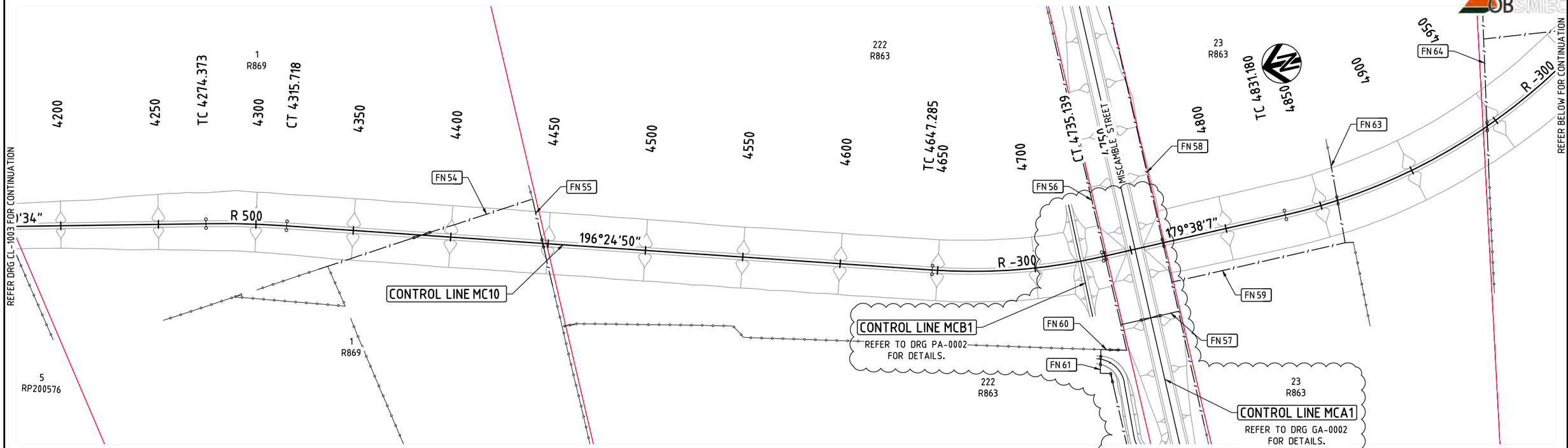
CLIENT
maranoa REGIONAL COUNCIL

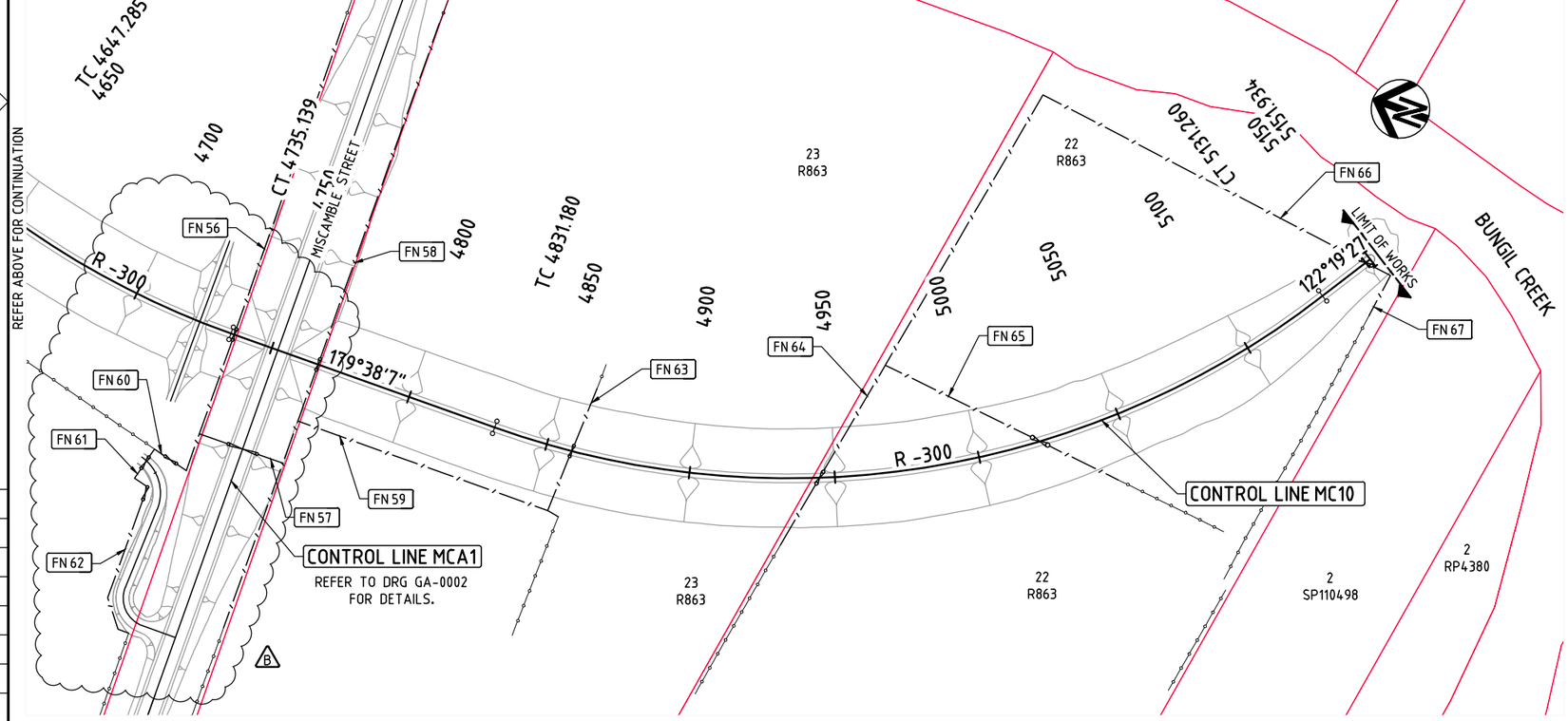
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
CONTROL LINE AND FENCING SETOUT SHEET 3

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:1000	CONSTRUCTION	30031182-CL-1003	E

150 mm ON ORIGINAL

A1





NOTES

1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.
2. FOR SETOUT DETAILS REFER TO DRAWING 30031182-CL-1005.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
	B	31/03/2014	BIRKETT LEVEE REALIGNMENT	029	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

SCALE 1:1000 (10 0 10 20 30 40 50)

DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
© ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD. 4101
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SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
CONTROL LINE AND FENCING SETOUT
SHEET 4

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:1000	CONSTRUCTION	30031182-CL-1004	B

150 mm ON ORIGINAL
A1

CONTROL LINE MC10

PT	CHAINAGE	EASTING	NORTHING	LEVEL	BEARING	RADIUS
IP1	0	677003.432	7063695.937	304.75	103°45'38.77"	
TC	138.308	677137.77	7063663.038	304.945	103°45'38.77"	
IP2	167.317	677169.6	7063655.242	304.787		50
CT	196.326	677175.154	7063622.946	304.957	170°14'37.03"	
TC	409.474	677211.274	7063412.88	304.971	170°14'37.03"	
IP3	469.135	677222.783	7063345.945	304.975		-100
CT	528.796	677289.246	7063331.967	304.979	101°52'37.98"	
IP4	751.495	677507.177	7063286.132	304.779		
IP5	782.58	677501.28	7063316.653	304.783		
TC	882.104	677599.029	7063335.369	304.99	79°09'38.53"	
IP6	903.227	677621.104	7063339.596	304.99		50
CT	924.349	677638.918	7063325.891	304.99	127°34'12.94"	
TC	950.155	677659.372	7063310.157	304.991	127°34'12.94"	
IP7	954.148	677662.716	7063307.584	304.991		10
CT	958.141	677663.207	7063303.393	304.991	173°19'41.86"	
TC	1016.64	677670.003	7063245.29	304.991	173°19'41.86"	
IP8	1021.906	677670.678	7063239.516	304.991		-10
CT	1027.172	677676.03	7063237.245	304.983	112°59'07.96"	
TC	1080.857	677725.453	7063216.282	304.922	112°59'07.96"	
IP9	1083.903	677728.347	7063215.054	304.955		-10
CT	1086.949	677731.423	7063215.703	304.987	78°04'51.29"	
TC	1140.095	677783.423	7063226.679	304.991	78°04'51.29"	
IP10	1148.065	677793.439	7063228.793	304.992		10
CT	1156.036	677795.318	7063218.732	304.992	169°25'02.98"	
TC	1167.935	677797.504	7063207.035	304.992	169°25'02.98"	
IP11	1173.978	677798.615	7063201.087	304.992		-100
CT	1180.021	677800.435	7063195.317	304.992	162°29'34.09"	
TC	1270.848	677827.758	7063108.698	304.99	162°29'34.09"	
IP12	1349.505	677852.72	7063029.561	304.987		-200
CT	1428.161	677926.374	7062991.341	304.985	117°25'32.95"	
TC	1633.24	678108.403	7062896.882	304.978	117°25'32.95"	
IP13	1697.724	678167.709	7062866.107	304.976		-200
CT	1762.207	678233.604	7062877.158	304.974	80°28'45.85"	

CONTROL LINE MC10

PT	CHAINAGE	EASTING	NORTHING	LEVEL	BEARING	RADIUS
TC	2229.456	678694.417	7062954.442	304.836	80°28'45.85"	
IP14	2371.111	678837.983	7062978.52	304.632		500
CT	2512.767	678972.037	7062921.771	304.401	112°56'39.77"	
TC	2584.162	679037.784	7062893.938	304.32	112°56'39.77"	
IP15	2645.301	679102.336	7062866.612	304.305		100
CT	2706.439	679098.663	7062796.61	304.254	183°00'13.66"	
TC	2761.93	679095.755	7062741.195	304.208	183°00'13.66"	
IP16	2799.93	679093.753	7062703.043	304.177		-300
CT	2837.929	679101.377	7062665.608	304.146	168°29'20.48"	
TC	2965.752	679126.884	7062540.356	303.946	168°29'20.48"	
IP17	3002.689	679134.61	7062502.421	303.822		100
CT	3039.626	679114.778	7062469.172	303.698	210°48'55.95"	
TC	3083.436	679092.335	7062431.548	303.55	210°48'55.95"	
IP18	3120.759	679072.275	7062397.918	303.425		-100
CT	3158.081	679080.386	7062359.609	303.356	168°02'47.82"	
TC	3756.315	679204.289	7061774.346	302.516	168°02'47.82"	
IP19	3774.353	679208.03	7061756.679	302.468		-300
CT	3792.391	679213.863	7061739.587	302.42	161°09'24.23"	
TC	3916.299	679253.882	7061622.32	302.167	161°09'24.23"	
IP20	3996.198	679280.316	7061544.862	302.071		300
CT	4076.098	679263.753	7061464.712	302.014	191°40'34.03"	
TC	4274.373	679223.626	7061270.54	301.632	191°40'34.03"	
IP21	4295.045	679219.44	7061250.283	301.613		500
CT	4315.718	679213.595	7061230.442	301.594	196°24'50.07"	
TC	4647.285	679119.903	7060912.388	301.365	196°24'50.07"	
IP22	4691.212	679107.401	7060869.947	301.359		-300
CT	4735.139	679107.682	7060825.705	301.105	179°38'06.71"	
TC	4831.18	679108.294	7060729.666	301.223	179°38'06.71"	
IP23	4981.22	679109.338	7060565.726	301.151		-300
CT	5131.26	679247.875	7060478.065	300.676	122°19'27.04"	
IP24	5151.934	679265.346	7060467.01	300.231	122°19'27.04"	

FENCE SETOUT

FENCE NUMBER	LENGTH (m)	TYPE	REFERENCE DRAWING
FN01	73	MATCH EXISTING	
FN02	4	4 STRAND BARBED WIRE	CMDG-G-010
FN03	191	4 STRAND BARBED WIRE	CMDG-G-010
FN04	4	4 STRAND BARBED WIRE	CMDG-G-010
FN05	4	4 STRAND BARBED WIRE	CMDG-G-010
FN06	85	4 STRAND BARBED WIRE, 1m FROM TOE OF BATTER TYPICALLY	CMDG-G-010
FN07	57	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN08	7	4 STRAND BARBED WIRE	CMDG-G-010
FN09	27	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN10	44	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN11	47	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
-	-	-	-
-	-	-	-
-	-	-	-
FN15	186	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN16	12	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN17	32	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN18	38	4 STRAND BARBED WIRE	CMDG-G-010
FN19	71	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN20	43	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN21	42	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN22	42	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN23	44	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN24	43	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN25	42	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN26	40	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN27	41	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN28	45	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN29	50	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN30	41	4 STRAND BARBED WIRE	CMDG-G-010
FN31	42	4 STRAND BARBED WIRE	CMDG-G-010
FN32	29	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN33	15	4 STRAND BARBED WIRE	CMDG-G-010
FN34	48	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010

FENCE SETOUT

FENCE NUMBER	LENGTH (m)	TYPE	REFERENCE DRAWING
FN35	21	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN36	49	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN37	85	4 STRAND BARBED WIRE	CMDG-G-010
FN38	31	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
-	-	-	-
FN40	45	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN40a	78	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN41	40	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN42	37	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN43	37	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN44	37	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN45	38	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN46	137	4 STRAND BARBED WIRE	CMDG-G-010
FN47	38	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN48	35	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN49	34	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN50	39	GALVANISED STEEL POST WITH CAP AND GATE, 1m DEEP CONCRETE FOOTING	
FN51	44	GALVANISED STEEL POST WITH CAP , 1m DEEP CONCRETE FOOTING	
FN52	5	GALVANISED STEEL POST WITH CAP , 1m DEEP CONCRETE FOOTING	
FN53	52	GALVANISED STEEL POST WITH CAP , 1m DEEP CONCRETE FOOTING	
FN54	115	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN55	46	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN56	163	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN57	30	REMOVE AND REPLACE EXISTING	
FN58	220	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN59	95	4 STRAND BARBED WIRE	CMDG-G-010
FN60	13	4 STRAND BARBED WIRE WITH GATE	CMDG-G-017
FN61	12	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN62	61	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN63	46	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN64	179	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN65	89	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN66	135	4 STRAND BARBED WIRE WITH GATE	CMDG-G-010
FN67	16	4 STRAND BARBED WIRE	CMDG-G-010

NOTES

1. FOR GENERAL NOTES REFER TO DRAWING 30031182-DI-0011

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WR No.	APPROVAL
A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	30/01/2014	REISSUED FOR SECTIONS B&D	019	AZ
C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
D	10/04/2014	FENCE 40a ADDED	-	AZ
E	16/05/2014	GOLDERS LEVEE REALIGNMENT	032	AZ
F	7/07/2014	MC10 LEVELS AMENDED	-	

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING: NTS

DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
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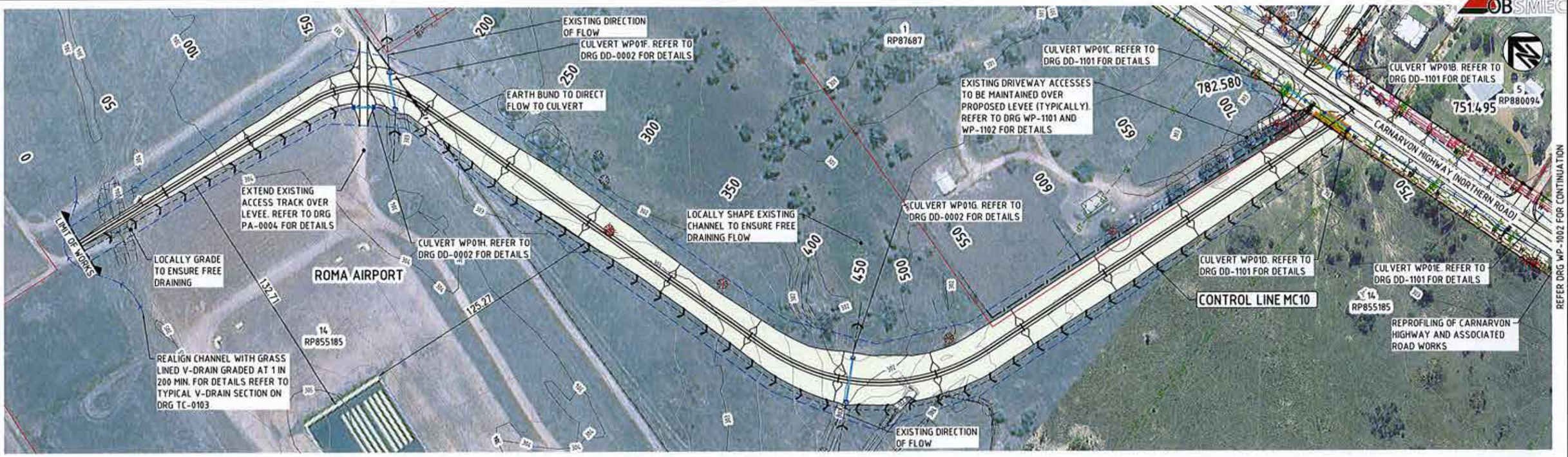
SMEC PROJECT No 30031182

CLIENT: maranoa REGIONAL COUNCIL

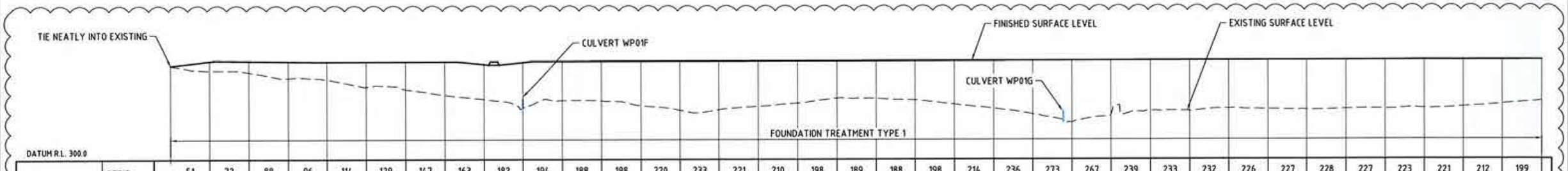
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
CONTROL LINE AND FENCING SETOUT TABLES

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
NTS	CONSTRUCTION	30031182-CL-1005	F

150 mm ON ORIGINAL
A1



PLAN
SCALE 1:1000



EARTHWORKS	STRIP	51	72	89	96	114	129	147	163	182	194	188	198	220	233	221	210	198	189	188	198	214	236	273	267	239	233	232	226	227	228	227	223	221	212	199
	FILL FROM STRIP	24	52	88	104	157	200	269	329	227	455	428	476	581	667	589	523	454	414	423	474	562	672	873	855	693	660	643	626	638	641	629	617	603	558	493
HORIZONTAL DATA									R50													R-100													
VERTICAL DATA		1.127%		-0.11%		0.01%			1.008%	1.01%		0.006%																							
FINISHED SURFACE LEVEL		304.750	304.975	304.980	304.958	304.939	304.941	304.943	304.945	304.813	304.910	304.957	304.959	304.960	304.961	304.963	304.964	304.965	304.966	304.968	304.969	304.970	304.972	304.973	304.974	304.975	304.977	304.978	304.979	304.981	304.982	304.983	304.984	304.986	304.987	304.988	304.990
EXISTING SURFACE LEVEL		304.750	304.500	304.410	304.124	304.049	303.677	303.540	303.251	303.042	302.603	302.986	302.966	302.717	302.484	302.508	302.677	302.840	303.083	303.071	302.993	302.781	302.561	302.279	301.865	302.223	302.444	302.427	302.559	302.517	302.490	302.525	302.533	302.568	302.641	302.780	302.932
DEPTH BETWEEN EXISTING & FINISHED SURFACE LEVEL		0	0.475	0.569	0.834	0.891	1.264	1.403	1.694	1.771	2.307	1.972	1.993	2.243	2.477	2.455	2.287	2.125	1.884	1.897	1.976	2.19	2.41	2.694	3.109	2.753	2.532	2.551	2.42	2.464	2.492	2.458	2.451	2.418	2.346	2.208	2.058
CHAINAGE		0	20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460	480	500	520	540	560	580	600	620	640	660	680	700

LONGITUDINAL SECTION MC10
SCALE HORIZ 1:1000
SCALE VERT 1:100

NOTES
1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	30/01/2014	ISSUED FOR CONSTRUCTION	019	AZ
B	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
C	10/04/2014	AIRPORT ACCESS AMENDED	-	AZ
D	16/05/2014	ACCESS NOTE AND CULVERT AMENDED	032	AZ
E	7/07/2014	LEVEE LEVELS AMENDED	-	AZ

DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
HORIZ. 1:1000
VERT. 1:100

DESIGNER
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© ABN 47 065 475 149
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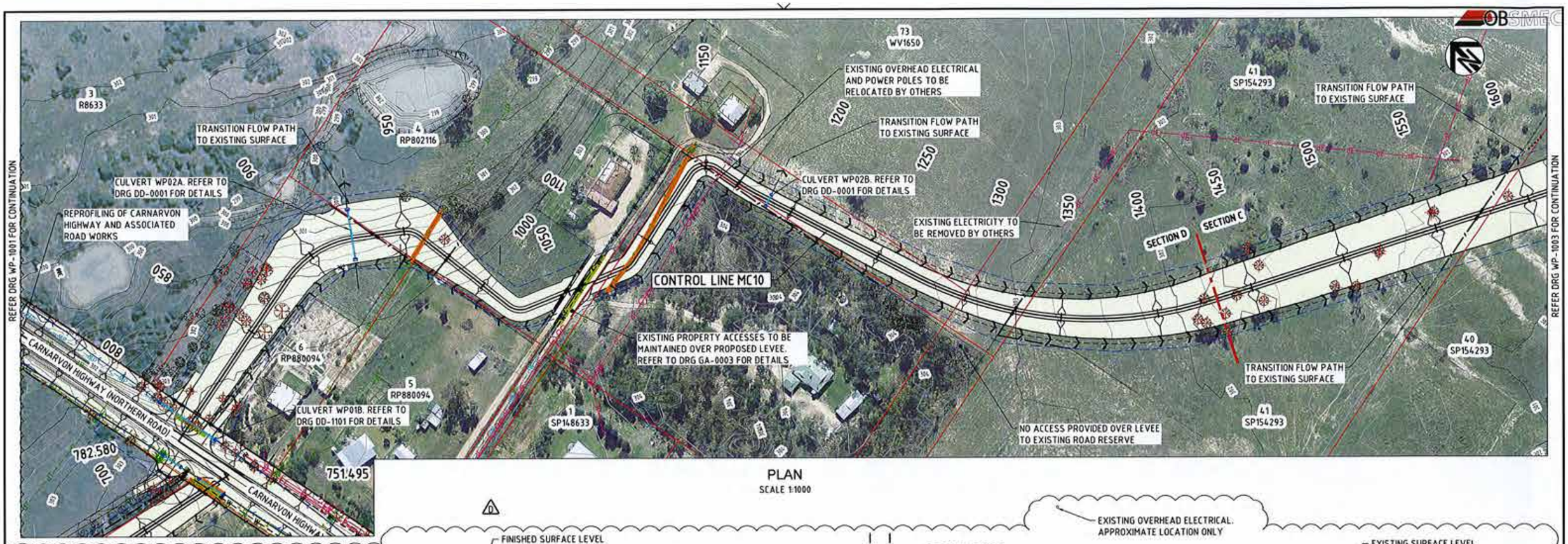
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

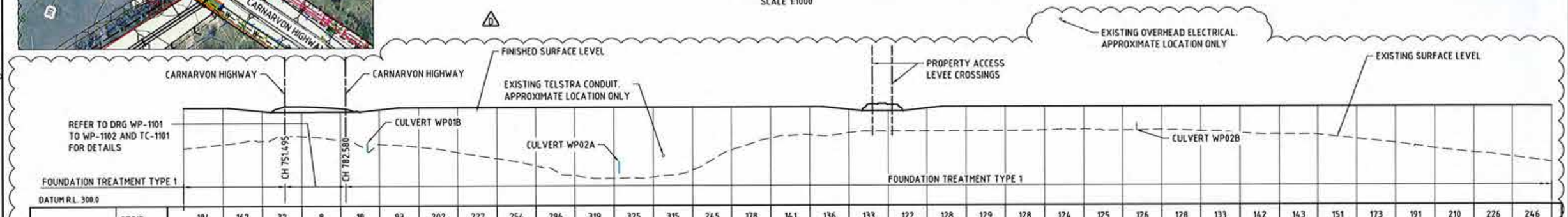
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
WORKING PLAN AND LONG SECTION
CONTROL LINE MC10
SHEET 1

SCALE	PHASE	PROJECT / DRAWING No	REVISION
AS SHOWN	CONSTRUCTION	30031182-WP-1001	E

150 mm ON ORIGINAL
A1



PLAN
SCALE 1:1000



EARTHWORKS	STRIP	184	162	32	8	19	93	202	227	254	296	319	325	315	245	178	141	136	133	122	128	129	128	124	125	126	128	133	142	143	151	173	191	210	226	246
	FILL FROM STRIP	421	323	41	0	54	252	494	621	781	1046	1261	1298	1187	752	390	249	230	72	80	194	198	195	182	188	188	192	210	242	247	280	359	444	541	629	747
HORIZONTAL DATA											R50			R10				R-10			R-10			R10	R-100								R-200			
VERTICAL DATA		0.006%		-0.99%			1.045%							0%							-1.032%		1.063%					0.001%							-0.003%	
FINISHED SURFACE LEVEL		304.990	304.991	304.821	304.780	304.783	304.888	304.990	304.990	304.990	304.990	304.990	304.990	304.991	304.991	304.991	304.991	304.991	304.991	304.851	304.782	304.913	304.991	304.991	304.991	304.992	304.992	304.992	304.991	304.991	304.990	304.990	304.989	304.988	304.988	304.987	304.986	304.986
EXISTING SURFACE LEVEL		302.932	303.133	303.294	303.534	303.357	303.126	302.988	302.707	302.398	302.025	301.545	301.370	301.449	301.796	302.816	303.402	303.575	303.670	303.750	303.750	303.750	303.750	303.785	303.839	303.771	303.809	303.736	303.631	303.573	303.538	303.324	303.114	302.843	302.623	302.409	302.148	302.148
DEPTH BETWEEN EXISTING & FINISHED SURFACE LEVEL		2.058	1.858	1.527	1.246	1.426	1.763	2.002	2.283	2.592	2.965	3.446	3.621	3.541	3.194	2.175	1.589	1.416	1.181	1.032	1.163	1.241	1.241	1.207	1.152	1.221	1.183	1.255	1.36	1.417	1.451	1.665	1.874	2.145	2.364	2.577	2.838	2.838
CHAINAGE		700	720	740	760	780	800	820	840	860	880	900	920	940	960	980	1000	1020	1040	1060	1080	1100	1120	1140	1160	1180	1200	1220	1240	1260	1280	1300	1320	1340	1360	1380	1400	1400

LONGITUDINAL SECTION MC10
SCALE HORIZ 1:1000
SCALE VERT 1:100

ISSUED FOR CONSTRUCTION

NOTES
1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	30/01/2014	ISSUED FOR CONSTRUCTION	019	AZ
B	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
C	16/05/2014	GOLDERS LEVEE REALIGNMENT	032	AZ
D	7/07/2014	LEVEE LEVELS AMENDED	-	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
HORIZ. 1:1000
VERT. 1:100

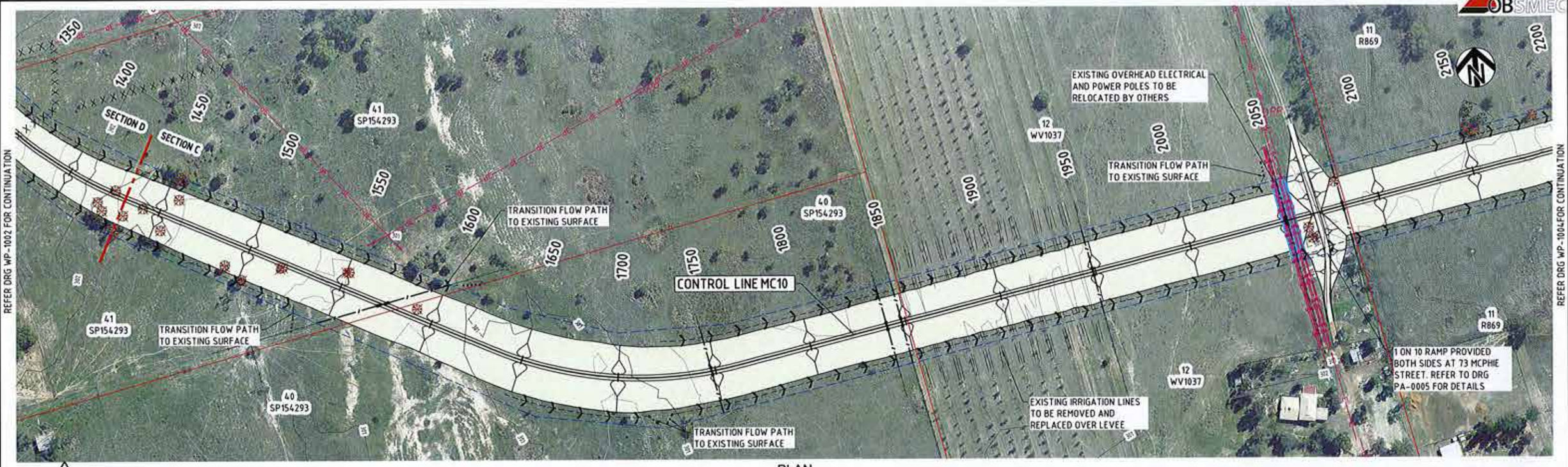
DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
© ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

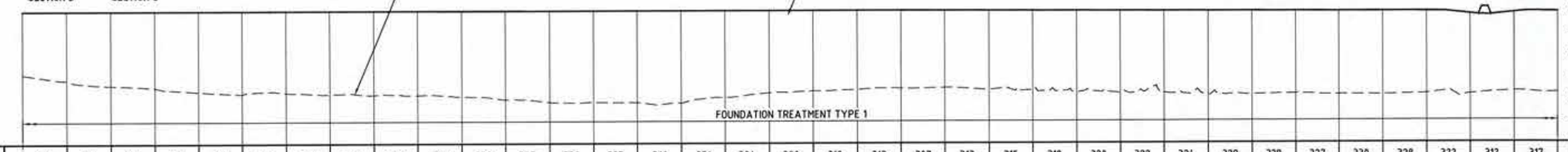
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
WORKING PLAN AND LONG SECTION
CONTROL LINE MC10
SHEET 2

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
AS SHOWN	CONSTRUCTION	30031182-WP-1002	D

150 mm ON ORIGINAL
A1



PLAN
SCALE 1:1000



DATUM R.L. 299.0

EARTHWORKS	STRIP	268	290	303	314	320	325	328	330	335	330	338	345	352	357	361	351	334	322	318	313	307	313	315	318	320	322	324	329	328	327	330	328	322	312	317
	FILL FROM STRIP	890	1047	1124	1221	1277	1293	1329	1344	1372	1377	1441	1521	1575	1598	1640	1525	1382	1290	1250	1212	1181	1205	1223	1249	1267	1262	1293	1341	1339	1332	1349	1335	1006	241	1246
HORIZONTAL DATA		R-200												R-200																						
VERTICAL DATA		-0.003%												-0.003%														-0.032%							-1.056% 1.026% -0.032%	
FINISHED SURFACE LEVEL		304.986	304.985	304.984	304.984	304.983	304.982	304.982	304.981	304.981	304.980	304.979	304.979	304.978	304.977	304.977	304.976	304.976	304.975	304.974	304.974	304.973	304.967	304.961	304.954	304.948	304.941	304.935	304.929	304.922	304.916	304.910	304.903	304.897	304.770	304.831	304.877
EXISTING SURFACE LEVEL		302.148	301.872	301.644	301.550	301.358	301.262	301.309	301.246	301.209	301.192	301.125	300.996	300.865	300.865	300.853	300.821	301.077	301.277	301.357	301.414	301.476	301.500	301.408	301.438	301.278	301.259	301.253	301.161	301.173	301.209	301.164	301.158	301.202	301.178	301.303	301.248
DEPTH BETWEEN EXISTING & FINISHED SURFACE LEVEL		2.838	3.113	3.34	3.434	3.625	3.72	3.672	3.735	3.772	3.787	3.855	3.983	4.113	4.113	4.124	4.155	3.899	3.698	3.618	3.56	3.497	3.466	3.553	3.516	3.67	3.683	3.682	3.767	3.75	3.707	3.745	3.746	3.695	3.592	3.528	3.629
CHAINAGE		1400	1420	1440	1460	1480	1500	1520	1540	1560	1580	1600	1620	1640	1660	1680	1700	1720	1740	1760	1780	1800	1820	1840	1860	1880	1900	1920	1940	1960	1980	2000	2020	2040	2060	2080	2100

LONGITUDINAL SECTION MC10
SCALE HORIZ 1:1000
SCALE VERT 1:100

NOTES
1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	28/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
C	10/04/2014	RAMP PROVIDED AT 73 MCPHIE STREET	-	AZ
D	16/05/2014	ACCESS NOTE AMENDED	032	AZ
E	7/07/2014	LEVEE LEVELS AMENDED	-	AZ

EXTERNAL REFERENCE FILES

DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
HORIZ. 1:1000
VERT. 1:100

DESIGNER
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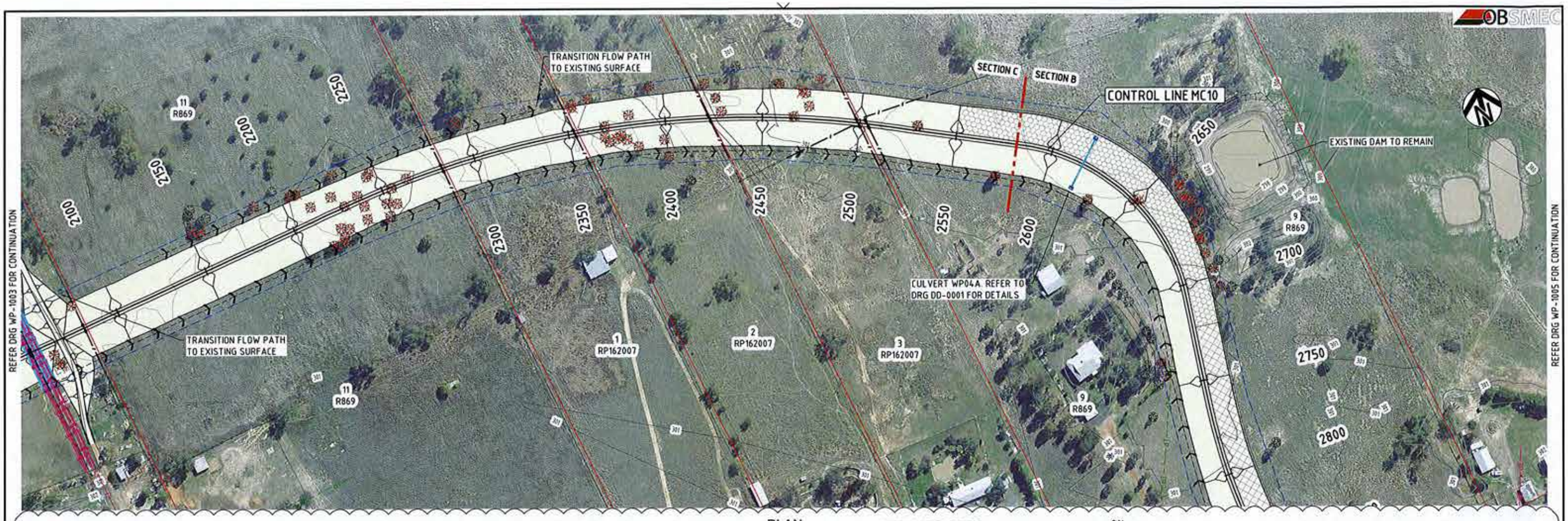
SOUTH BRISBANE QLD 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

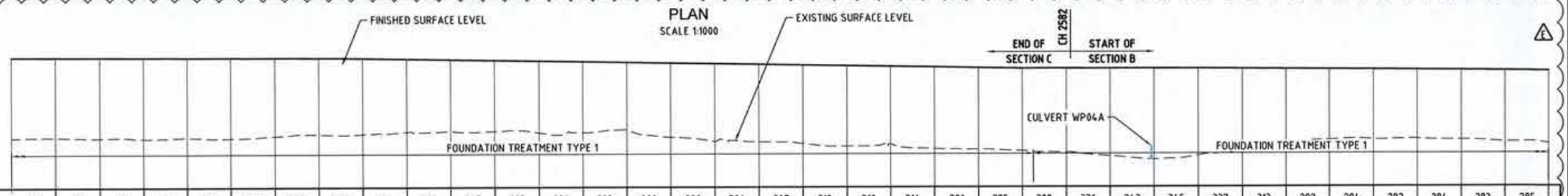
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
WORKING PLAN AND LONG SECTION
CONTROL LINE MC10
SHEET 3

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
AS SHOWN	CONSTRUCTION	30031182-WP-1003	E

150 mm ON ORIGINAL
A1



PLAN
SCALE 1:1000



DATUM R.L. 299.0

EARTHWORKS	STRIP	317	319	321	320	318	316	309	303	299	290	287	285	294	289	292	299	304	307	310	312	314	321	325	329	336	343	345	337	313	292	284	282	284	283	285
	FILL FROM STRIP	1244	1263	1281	1273	1271	1239	1167	1152	1109	1048	1026	994	1047	961	1038	1118	1129	1173	1220	1219	1238	1292	1307	1348	1414	1498	1514	1401	1184	1040	980	971	977	985	1004
HORIZONTAL DATA		R500																								R100									R-300	
VERTICAL DATA		-0.032%								-0.164%																-0.02%					-0.083%					
FINISHED SURFACE LEVEL		304.877	304.871	304.865	304.858	304.852	304.845	304.839	304.833	304.814	304.782	304.749	304.716	304.683	304.651	304.618	304.585	304.552	304.520	304.487	304.454	304.422	304.389	304.356	304.325	304.321	304.317	304.313	304.309	304.292	304.276	304.259	304.243	304.226	304.210	304.193	304.177
EXISTING SURFACE LEVEL		301.248	301.278	301.239	301.217	301.264	301.225	301.324	301.386	301.405	301.502	301.525	301.531	301.461	301.466	301.574	301.257	301.061	301.045	300.961	300.838	300.926	300.721	300.697	300.625	300.555	300.381	300.229	300.400	300.640	300.973	301.100	301.106	301.135	301.093	301.005	300.929
DEPTH BETWEEN EXISTING & FINISHED SURFACE LEVEL		3.629	3.593	3.625	3.642	3.588	3.62	3.515	3.446	3.409	3.28	3.223	3.186	3.223	3.185	3.043	3.328	3.492	3.475	3.526	3.617	3.496	3.668	3.659	3.7	3.766	3.936	4.084	3.909	3.653	3.303	3.159	3.137	3.092	3.117	3.189	3.248
CHAINAGE		2100	2120	2140	2160	2180	2200	2220	2240	2260	2280	2300	2320	2340	2360	2380	2400	2420	2440	2460	2480	2500	2520	2540	2560	2580	2600	2620	2640	2660	2680	2700	2720	2740	2760	2780	2800

LONGITUDINAL SECTION MC10
SCALE HORIZ 1:1000
SCALE VERT 1:100

NOTES
1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	28/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	30/01/2014	REISSUED FOR SECTIONS B&D	019	AZ
C	31/03/2014	BIRKETT LEVEE REALIGNMENT	038	AZ
D	16/05/2014	EROSION PROTECTION AMENDED	032	AZ
E	7/07/2014	LEVEE LEVELS AMENDED	-	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
HORIZ. 1:1000 10 0 10 20 30 40 50
VERT. 1:100 1 0 1 2 3 4 5

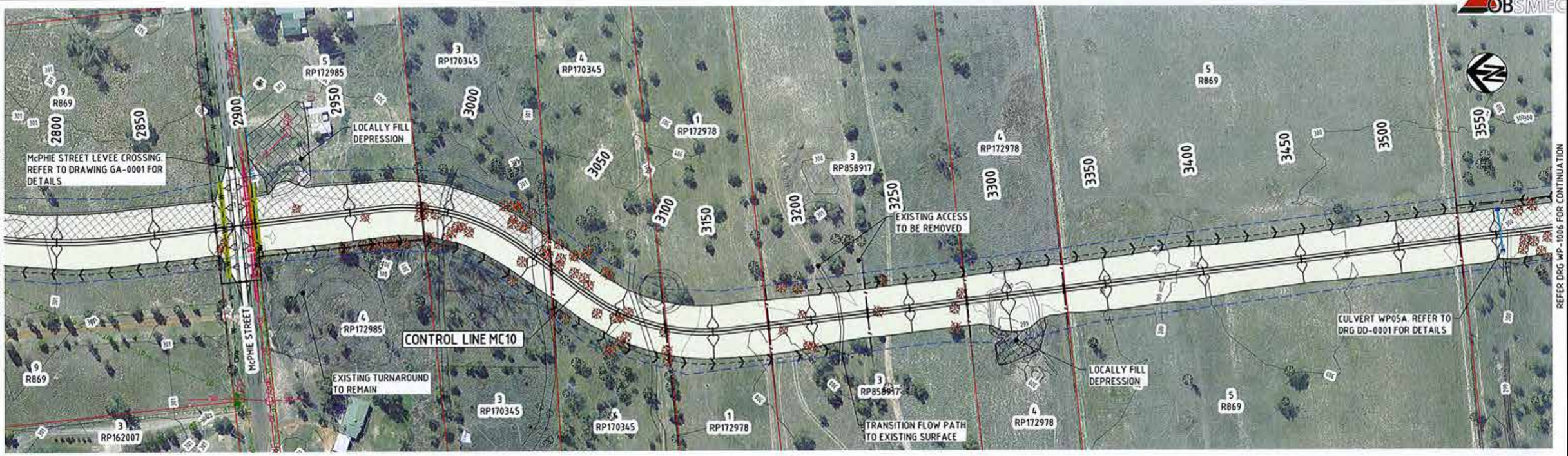
DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
© ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

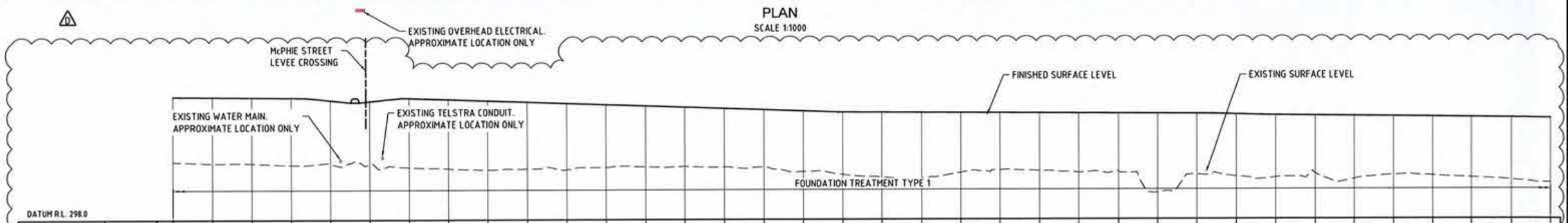
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
WORKING PLAN AND LONG SECTION
CONTROL LINE MC10
SHEET 4

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
AS SHOWN	CONSTRUCTION	30031182-WP-1004	E

150 mm ON ORIGINAL
A1



PLAN
SCALE 1:1000



DATUM R.L. 298.0

EARTHWORKS	STRIP	295	297	297	292	278	316	330	306	297	289	281	273	268	269	267	271	275	282	288	282	265	259	260	260	286	306	268	280	282	287	272	264	265	274	283
	FILL FROM STRIP	1069	1081	1087	1061	248	1049	1209	1168	1110	1057	995	933	902	884	865	900	927	1004	1047	989	860	826	847	849	1057	1175	908	976	951	1003	913	858	875	927	993
HORIZONTAL DATA		R-300								R100						R-100																			
VERTICAL DATA		-0.083%			-1.011%	1.022%				-0.336%													-0.053%						0.253%					-0.113%	
FINISHED SURFACE LEVEL		304.177	304.160	304.144	304.127	303.994	303.945	304.100	304.032	303.965	303.898	303.831	303.764	303.696	303.629	303.562	303.495	303.427	303.366	303.355	303.345	303.334	303.323	303.312	303.302	303.291	303.280	303.270	303.233	303.187	303.164	303.141	303.119	303.096	303.074	303.051	303.028
EXISTING SURFACE LEVEL		300.929	300.841	300.844	300.765	300.823	300.778	300.637	300.570	300.511	300.552	300.513	300.634	300.654	300.683	300.637	300.633	300.400	300.253	300.112	300.052	300.343	300.463	300.432	300.341	300.397	299.337	300.239	300.135	300.077	300.277	299.996	300.198	300.162	300.063	299.948	299.814
DEPTH BETWEEN EXISTING & FINISHED SURFACE LEVEL		3.248	3.32	3.299	3.363	3.171	3.167	3.463	3.462	3.454	3.347	3.318	3.129	3.043	2.946	2.925	2.862	3.027	3.113	3.243	3.293	2.991	2.86	2.88	2.96	2.894	3.943	3.031	3.099	3.109	2.887	3.145	2.921	2.934	3.011	3.103	3.214
CHAINAGE		2800	2820	2840	2860	2880	2900	2920	2940	2960	2980	3000	3020	3040	3060	3080	3100	3120	3140	3160	3180	3200	3220	3240	3260	3280	3300	3320	3340	3360	3380	3400	3420	3440	3460	3480	3500

LONGITUDINAL SECTION MC10
SCALE HORIZ 1:1000
SCALE VERT 1:100

NOTES
1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	30/01/2014	ISSUED FOR CONSTRUCTION	019	AZ
B	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
C	16/05/2014	EROSION PROTECTION AMENDED	032	AZ
D	7/07/2014	LEVEE LEVELS AMENDED	-	AZ

EXTERNAL REFERENCE FILES

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
HORIZ. 1:1000 10 0 10 20 30 40 50
VERT. 1:100 1 0 1 2 3 4 5

DESIGNER
SMEC
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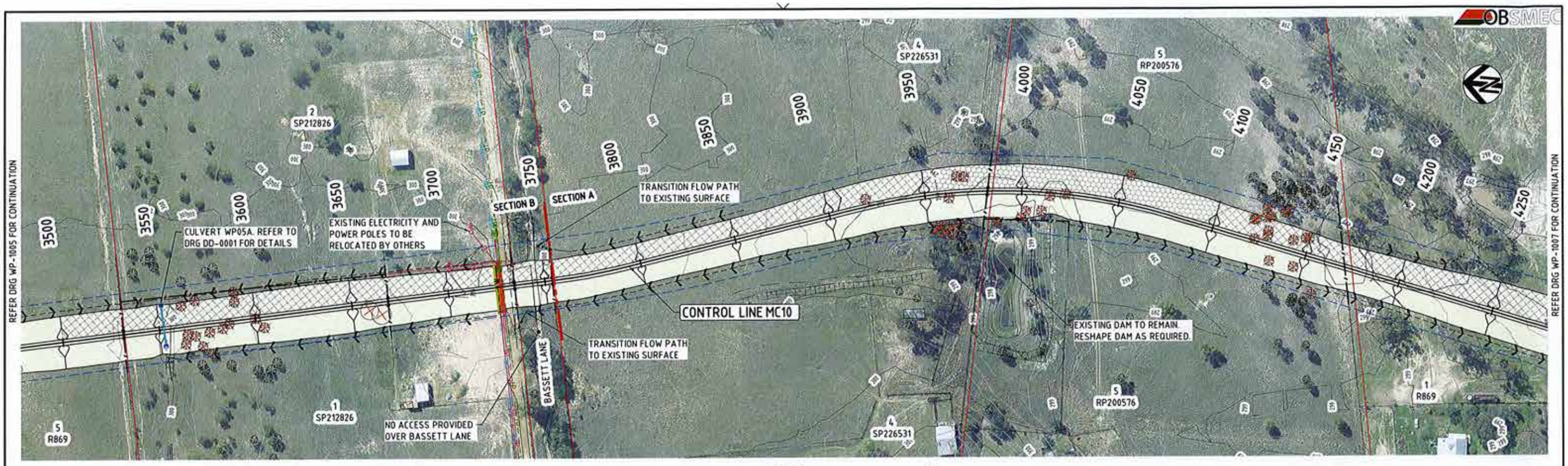
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

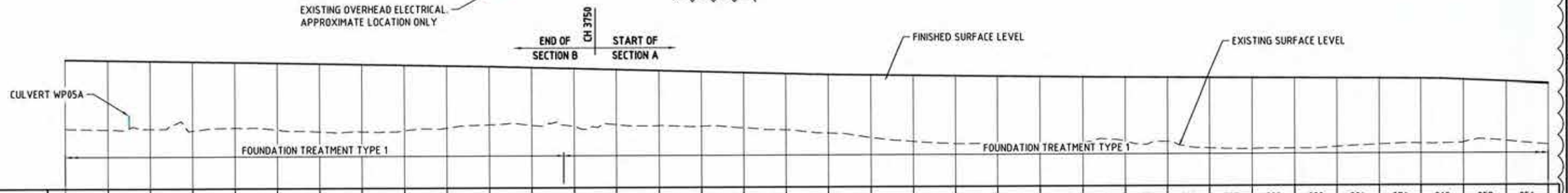
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
WORKING PLAN AND LONG SECTION
CONTROL LINE MC10
SHEET 5

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
AS SHOWN	CONSTRUCTION	30031182-WP-1005	D

150 mm ON ORIGINAL
A1



PLAN
SCALE 1:1000



EARTHWORKS	STRIP	287	283	276	272	274	282	285	280	266	256	245	241	242	238	234	234	241	244	251	270	281	284	285	284	293	278	282	289	289	288	284	276	269	257	256
	FILL FROM STRIP	1021	999	930	934	924	982	998	973	878	795	727	719	725	691	673	667	705	735	784	903	973	989	986	981	955	945	1003	1053	1047	1035	980	927	892	790	799
HORIZONTAL DATA															R-300								R300													
VERTICAL DATA		-0.113%		-0.174%				-0.19%							-0.267%							-0.128%						-0.072%							-0.428%	
FINISHED SURFACE LEVEL		303.028	302.995	302.961	302.926	302.891	302.856	302.818	302.780	302.742	302.704	302.666	302.613	302.560	302.506	302.453	302.399	302.346	302.292	302.239	302.213	302.188	302.162	302.136	302.111	302.085	302.069	302.054	302.040	302.025	302.011	301.996	301.982	301.968	301.914	301.828	301.743
EXISTING SURFACE LEVEL		299.814	299.771	299.799	299.711	299.863	299.745	299.648	299.653	299.698	299.811	299.957	299.930	299.875	299.948	299.892	299.863	299.785	299.674	299.515	299.293	299.112	298.998	298.995	298.982	299.046	299.083	299.071	298.757	298.721	298.735	298.800	298.906	298.957	299.002	299.065	298.895
DEPTH BETWEEN EXISTING & FINISHED SURFACE LEVEL		3.214	3.224	3.161	3.215	3.048	3.111	3.169	3.127	3.044	2.893	2.709	2.683	2.684	2.559	2.561	2.537	2.561	2.619	2.724	2.92	3.075	3.164	3.141	3.129	3.039	2.986	2.983	3.283	3.304	3.276	3.196	3.076	3.011	2.911	2.763	2.847
CHAINAGE		3500	3520	3540	3560	3580	3600	3620	3640	3660	3680	3700	3720	3740	3760	3780	3800	3820	3840	3860	3880	3900	3920	3940	3960	3980	4000	4020	4040	4060	4080	4100	4120	4140	4160	4180	4200

LONGITUDINAL SECTION MC10
SCALE HORIZ 1:1000
SCALE VERT 1:100

NOTES
1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	VVR No	APPROVAL
A	28/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	30/01/2014	REISSUED FOR SECTIONS B&D	019	AZ
C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
D	16/05/2014	EROSION PROTECTION AMENDED	032	AZ
E	7/07/2014	LEVEE LEVELS AMENDED	-	AZ

TITLE	NAME
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DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
HORIZ. 1:1000
VERT. 1:100

DESIGNER
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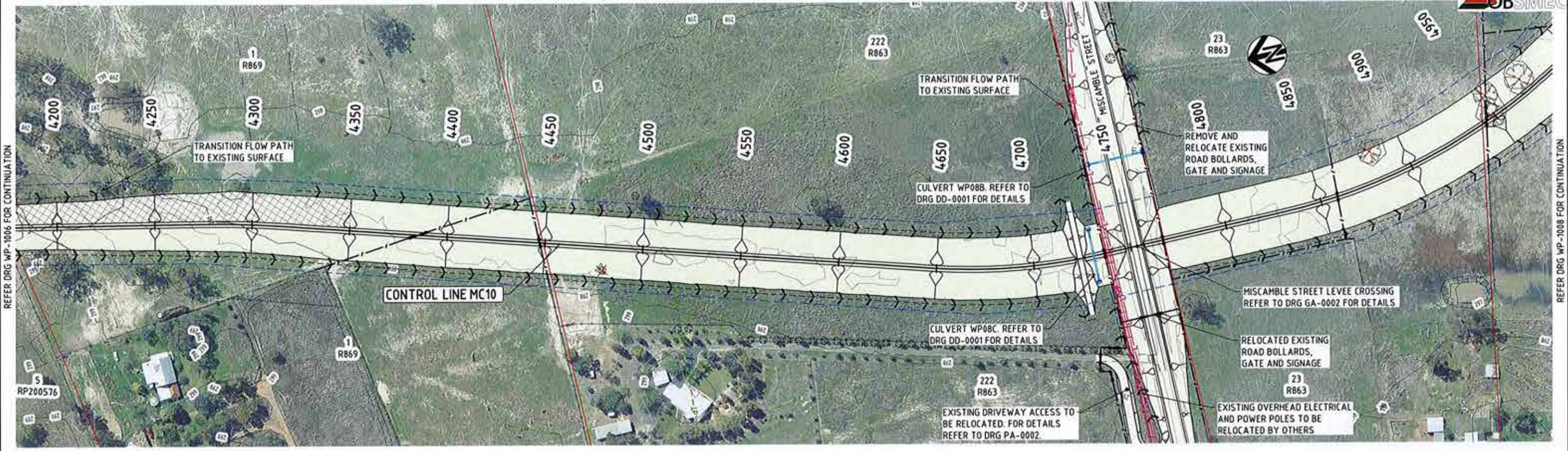
SOUTH BRISBANE QLD 4101
PH 07 3029 8600 FAX 07 3029 8650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
WORKING PLAN AND LONG SECTION
CONTROL LINE MC10
SHEET 6

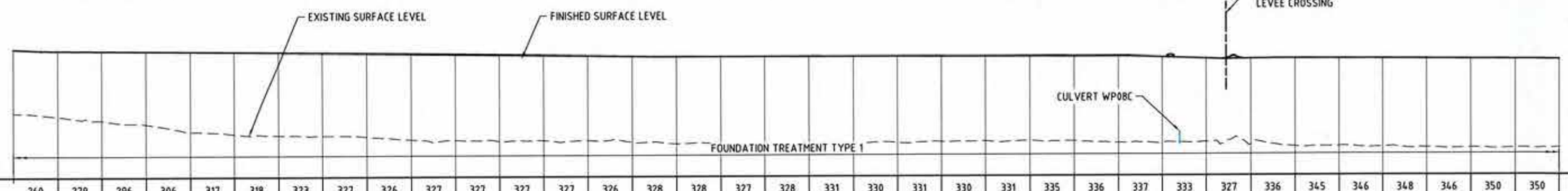
SCALE	PHASE	PROJECT / DRAWING No	REVISION
AS SHOWN	CONSTRUCTION	30031182-WP-1006	E

150 mm ON ORIGINAL
A1



PLAN
SCALE 1:1000

EXISTING OVERHEAD ELECTRICAL. APPROXIMATE LOCATION ONLY



DATUM R.L. 296.0

EARTHWORKS	STRIP	260	279	296	306	317	318	323	327	326	327	327	327	327	326	328	328	327	328	331	330	331	330	331	335	336	337	333	327	336	345	346	348	346	350	350
	FILL FROM STRIP	832	933	1039	1144	1270	1295	1322	1340	1364	1399	1401	1388	1381	1363	1402	1416	1413	1416	1411	1398	1393	1386	1382	1390	1403	1284	573	112	980	1481	1494	1508	1509	1525	1517
HORIZONTAL DATA					R500																					R-300								R-300	
VERTICAL DATA		-0.428%			-0.09%								-0.125%								-0.014%								-0.314%	0.122%					0.048%	
FINISHED SURFACE LEVEL		301.743	301.681	301.663	301.645	301.626	301.608	301.590	301.572	301.550	301.525	301.500	301.475	301.450	301.425	301.400	301.386	301.383	301.380	301.377	301.374	301.372	301.369	301.366	301.363	301.360	301.358	301.308	301.245	301.237	301.247	301.238	301.228	301.219	301.209	301.199	301.190
EXISTING SURFACE LEVEL		298.895	298.745	298.561	298.381	298.037	297.929	297.870	297.856	297.804	297.673	297.642	297.598	297.624	297.624	297.534	297.463	297.440	297.479	297.467	297.448	297.495	297.538	297.554	297.581	297.551	297.468	297.451	297.499	297.364	297.290	297.296	297.261	297.224	297.210	297.204	297.204
DEPTH BETWEEN EXISTING & FINISHED SURFACE LEVEL		2.847	2.936	3.102	3.263	3.589	3.68	3.72	3.716	3.746	3.852	3.857	3.877	3.826	3.8	3.865	3.923	3.943	3.901	3.91	3.927	3.876	3.831	3.812	3.782	3.81	3.889	3.856	3.745	3.872	3.958	3.941	3.967	3.995	3.999	3.996	3.986
CHAINAGE		4200	4220	4240	4260	4280	4300	4320	4340	4360	4380	4400	4420	4440	4460	4480	4500	4520	4540	4560	4580	4600	4620	4640	4660	4680	4700	4720	4740	4760	4780	4800	4820	4840	4860	4880	4900

LONGITUDINAL SECTION MC10
SCALE HORIZ 1:1000
SCALE VERT 1:100

NOTES
1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	28/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	30/01/2014	PRIVATE INTERNAL ACCESS ADDED	019	AZ
C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
D	16/05/2014	EROSION PROTECTION AMENDED	032	AZ
E	7/07/2014	LEVEE LEVELS AMENDED	-	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
HORIZ. 1:1000 10 0 10 20 30 40 50
VERT. 1:100 1 0 1 2 3 4 5

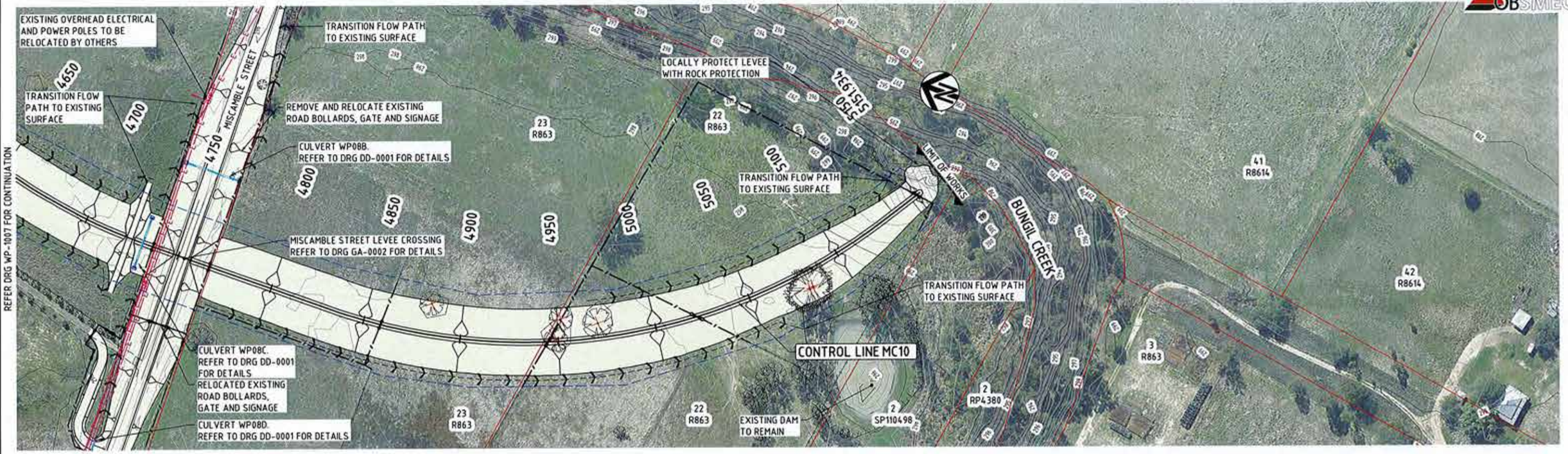
DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
© ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

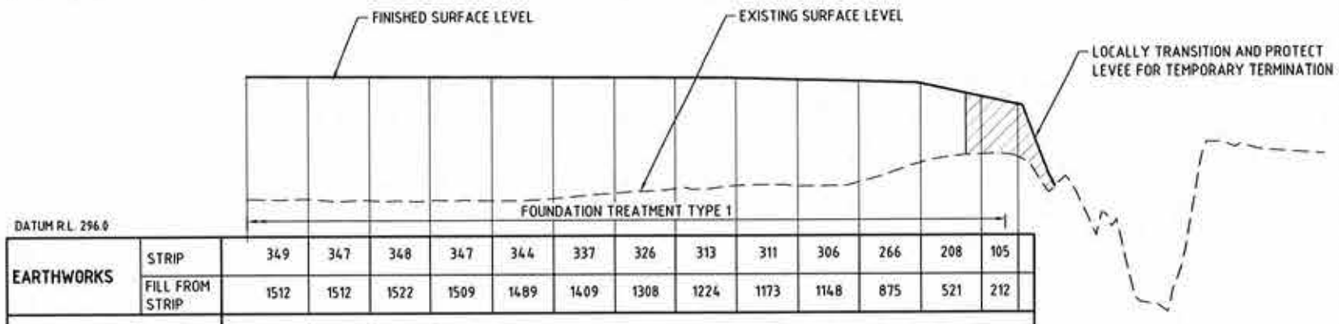
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
WORKING PLAN AND LONG SECTION
CONTROL LINE MC10
SHEET 7

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
AS SHOWN	CONSTRUCTION	30031182-WP-1007	E

150 mm ON ORIGINAL
A1



PLAN
SCALE 1:1000



DATUM R.L. 296.0

EARTHWORKS	STRIP	349	347	348	347	344	337	326	313	311	306	266	208	105
	FILL FROM STRIP	1512	1512	1522	1509	1489	1409	1308	1224	1173	1148	875	521	212
HORIZONTAL DATA		R-300												
VERTICAL DATA		-0.048%								-0.281%			-2.151%	
FINISHED SURFACE LEVEL		301.190	301.180	301.170	301.161	301.151	301.141	301.132	301.122	301.106	301.049	300.993	300.918	300.488	300.232
EXISTING SURFACE LEVEL		297.204	297.209	297.161	297.149	297.142	297.205	297.369	297.513	297.612	297.600	297.724	298.355	298.619	298.518
DEPTH BETWEEN EXISTING & FINISHED SURFACE LEVEL		3.986	3.972	4.01	4.012	4.009	3.936	3.763	3.609	3.494	3.45	3.27	2.563	1.87	1.714
CHAINAGE		4900	4920	4940	4960	4980	5000	5020	5040	5060	5080	5100	5120	5140	5151.934

LONGITUDINAL SECTION MC10
SCALE HORIZ 1:1000
SCALE VERT 1:100

NOTES
1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No	APPROVAL
A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	30/01/2014	PRIVATE INTERNAL ACCESS ADDED	019	AZ
C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
D	16/05/2014	EROSION PROTECTION AMENDED	032	AZ
E	5/06/2014	LAYOUT AMENDED	033	AZ
F	7/07/2014	LEVEE LEVELS AMENDED	-	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
HORIZ. 1:1000
VERT. 1:100

DESIGNER
SMEC
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LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD 4101
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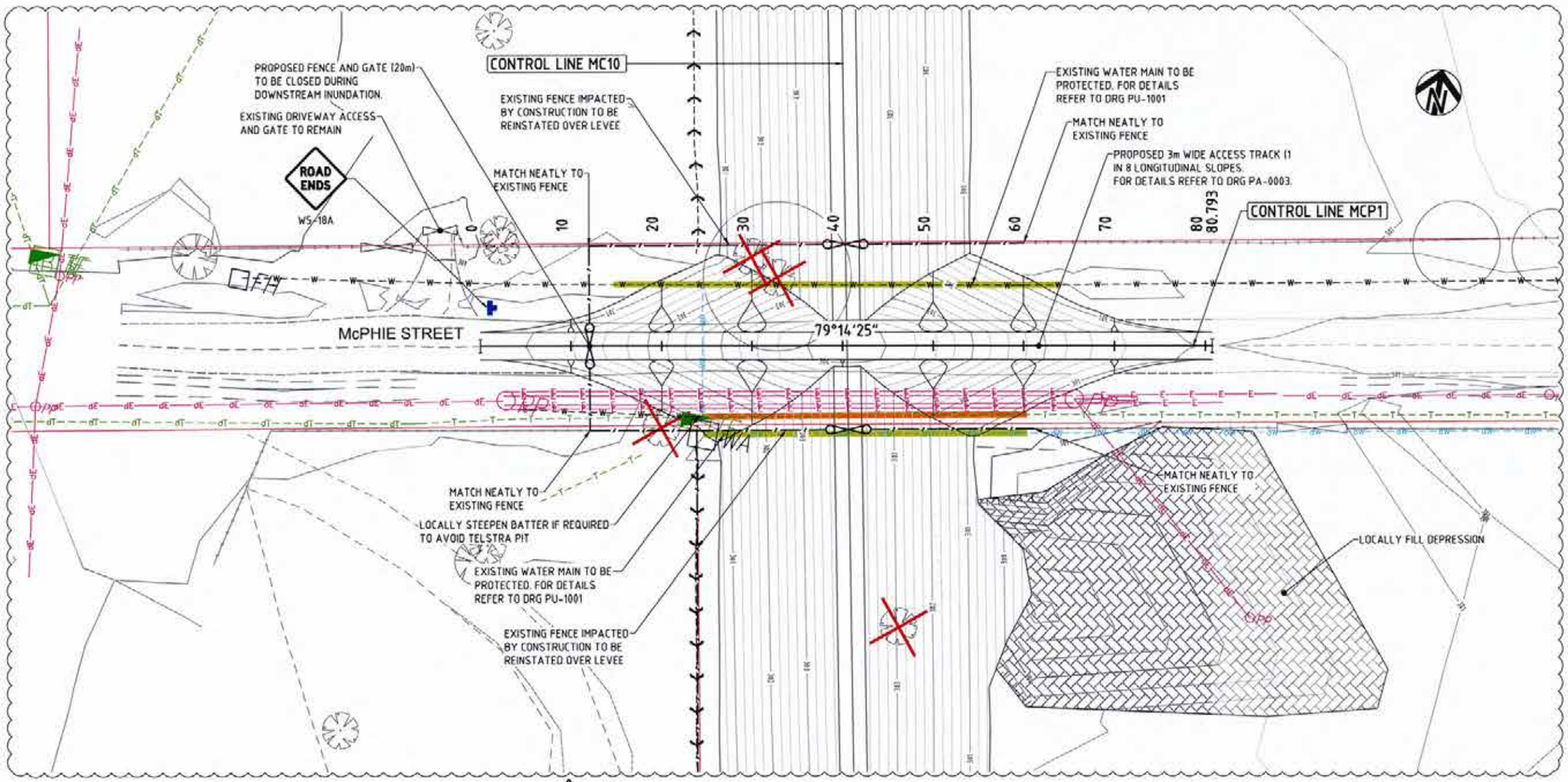
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
WORKING PLAN AND LONG SECTION
CONTROL LINE MC10
SHEET 8

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
AS SHOWN	CONSTRUCTION	30031182-WP-1008	F

150 mm ON ORIGINAL
A1



PLAN
SCALE 1:250

NOTES
1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	30/01/2014	ISSUED FOR CONSTRUCTION	019	AZ
B	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
C	16/05/2014	McPHIE ST REALIGNMENT	032	A2

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
SCALE 1:250 2.5 0 5 10

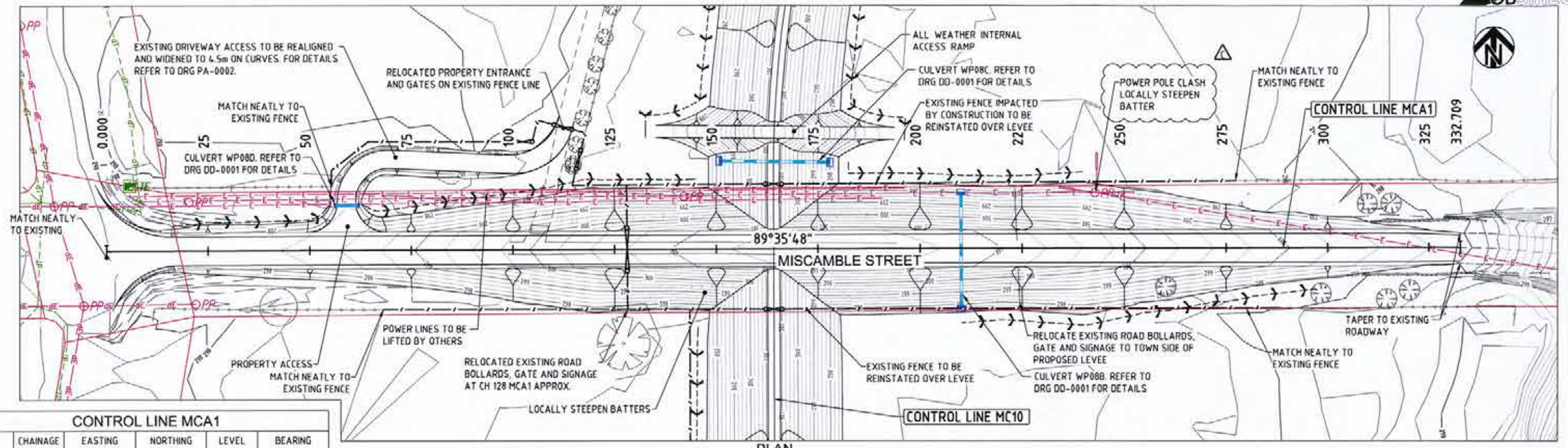
DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD. 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
GENERAL ARANGEMENT - LEVEE CROSSINGS
McPHIE STREET - PLAN AND SECTIONS

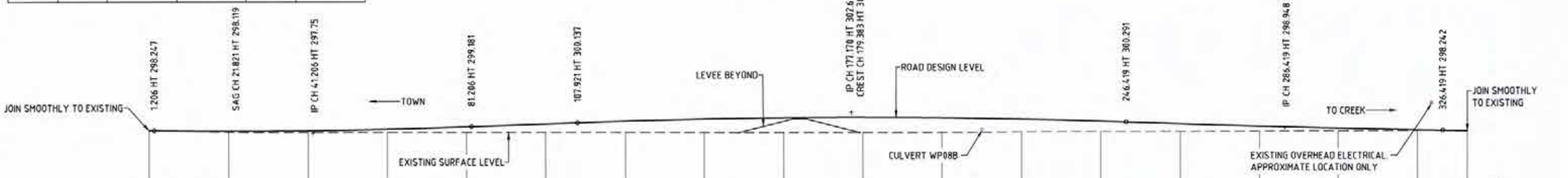
SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:250	CONSTRUCTION	30031182-GA-0001	C

15.5 mm ON ORIGINAL
A1



PLAN
SCALE 1:500

CONTROL LINE MCA1					
PT	CHAINAGE	EASTING	NORTHING	LEVEL	BEARING
START	0	678943.796	7060807.498	298.262	89°35'48.46"
END	332.709	679276.497	7060809.839	298.131	89°35'48.46"



DATUM R.L. 277.50

PAVEMENT MARKING	DBL									DBL								
HORIZONTAL DATA	L332.71																	
VERTICAL DATA	-1.242% L1.206	R1659.812			3.578% L26.715		R1997.377								R5031.596			-1.766% L6.29
ROAD DESIGN LEVEL	298.262	298.120	298.219	298.558	299.139	299.854	300.533	301.027	301.321	301.415	301.359	301.003	300.496	299.853	299.276	298.778	298.359	298.131
EXISTING SURFACE LEVEL	298.262	297.890	297.826	297.830	297.798	297.793	297.751	297.697	297.667	297.651	297.705	297.836	297.858	297.915	298.001	298.086	298.193	298.131
DEPTHS BETWEEN EXISTING & ROAD DESIGN LEVEL	0.000	-0.230	-0.392	-0.728	-1.340	-2.060	-2.782	-3.331	-3.654	-3.764	-3.685	-3.166	-2.638	-1.938	-1.275	-0.692	-0.166	-0.000
CHAINAGE	0.000	20.000	40.000	60.000	80.000	100.000	120.000	140.000	160.000	180.000	200.000	220.000	240.000	260.000	280.000	300.000	320.000	332.709

LONGITUDINAL SECTION MCA1
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:500

NOTES
1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	28/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
C	16/05/2014	GUIDE POSTS AMENDED	032	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
SCALE 1:500 5 0 10 20

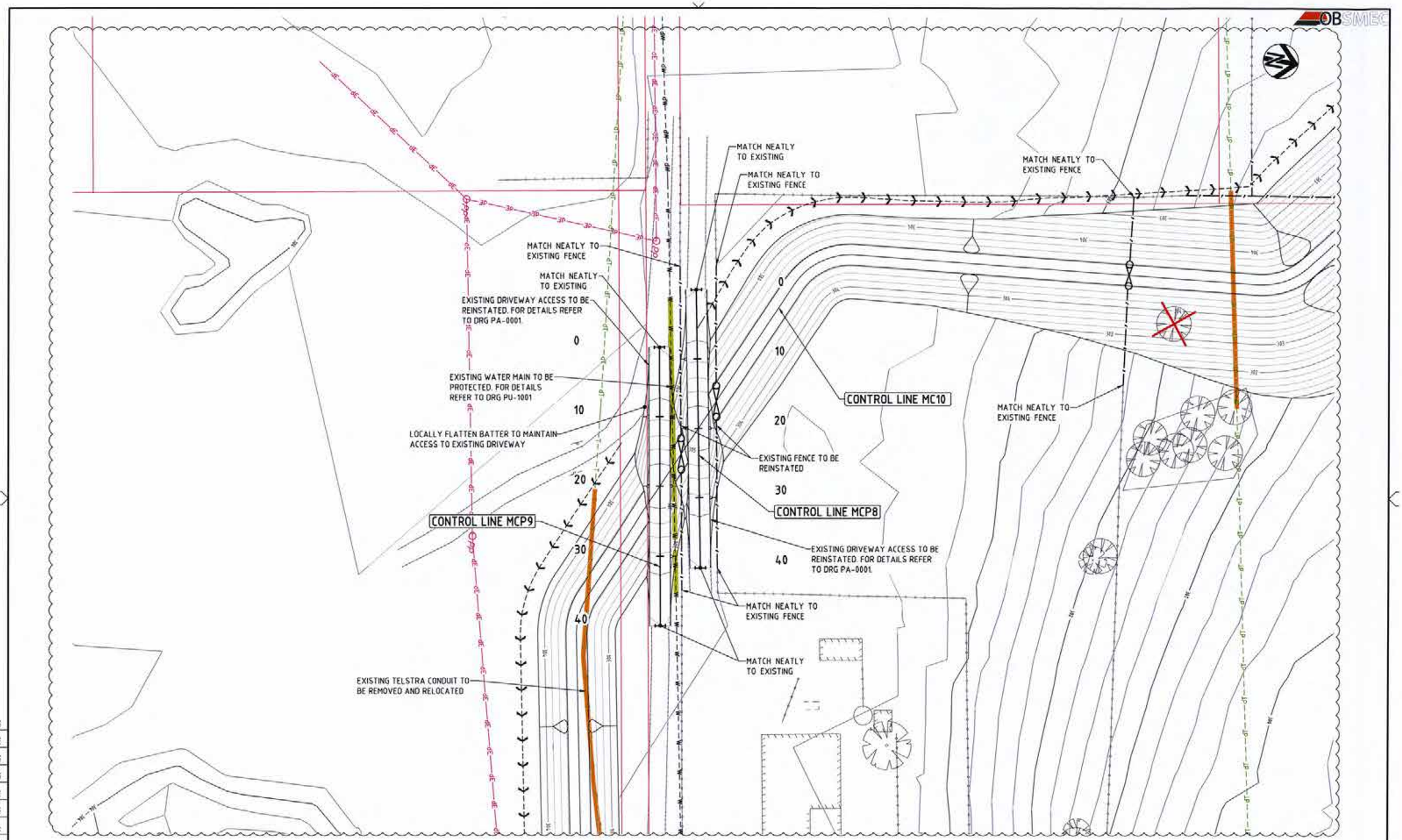
DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
© ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD. 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
GENERAL ARRANGEMENT - LEVEE CROSSINGS
MISCAMBLE STREET - PLAN AND SECTIONS

SCALE	PHASE	PROJECT / DRAWING No	REVISION
1:250	CONSTRUCTION	30031182-GA-0002	C

A1



PLAN
SCALE 1:250

NOTES
1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	A	30/01/2014	ISSUED FOR CONSTRUCTION	019	AZ
	B	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
	C	16/05/2014	GOLDERS LEVEE REALIGNMENT	032	

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
SCALE 1:250 2.5 0 5 10

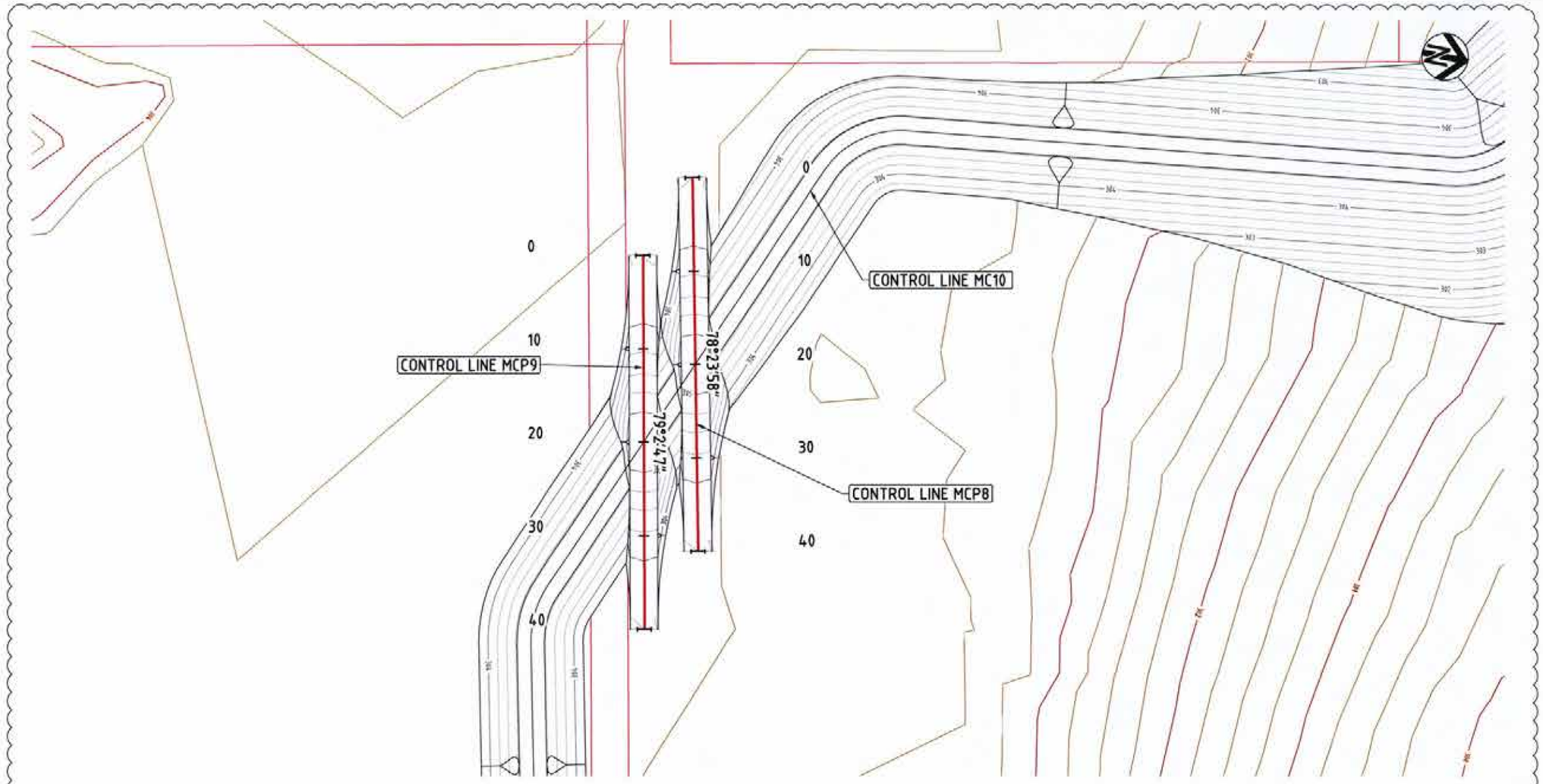
DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD. 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
GENERAL ARANGEMENT - LEVEE CROSSINGS PRIVATE ACCESSES

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:250	CONSTRUCTION	30031182-GA-0003	C

150 mm ON ORIGINAL
A3



PLAN
SCALE 1:250

CONTROL LINE MCP9					
PT	CHAINAGE	EASTING	NORTHING	LEVEL	BEARING
START	0	677688.477	7063219.837	303.75	79°02'46.52"
END	40	677727.748	7063227.437	303.75	79°02'46.52"

CONTROL LINE MCP8					
PT	CHAINAGE	EASTING	NORTHING	LEVEL	BEARING
START	0	677679.302	7063223.526	303.75	78°23'58.11"
END	40	677718.485	7063231.569	303.75	78°23'58.11"

NOTES
1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	A	30/01/2014	ISSUED FOR CONSTRUCTION	019	AZ
	B	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
	C	16/05/2014	GOLDERS LEVEE REALIGNMENT	032	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
SCALE 1:250 2.5 0 5 10

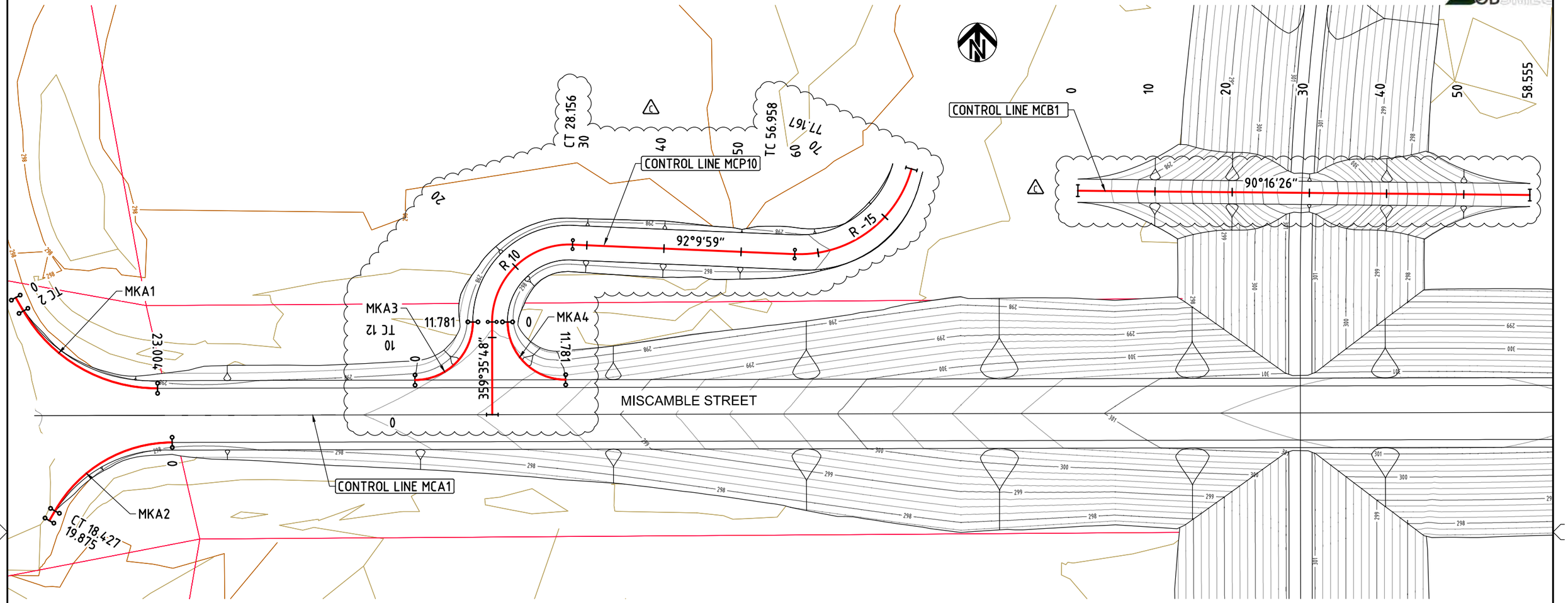
DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD. 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
PROPERTY ACCESS - LEVEE CROSSINGS
PROPERTY ACCESS
SHEET 1

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:250	CONSTRUCTION	30031182-PA-0001	C

150 mm ON ORIGINAL
A1



PLAN
SCALE 1:250

CONTROL LINE MCP10

PT	CHAINAGE	EASTING	NORTHING	LEVEL	BEARING	RADIUS
START	0	679003.109	7060807.915	298.543	359°35'48"	
TC	12	679003.024	7060819.915	298.231	359°35'48"	
IP	20.078	679002.951	7060830.374			10
CT	28.156	679013.402	7060829.978	298.173	92°09'59"	
TC	56.958	679042.183	7060828.89	298.087	92°09'59"	
IP	67.062	679054.147	7060828.437			-15
END	77.167	679057.241	7060840.003	297.839	14°58'32"	

CONTROL LINE MCB1

PT	CHAINAGE	EASTING	NORTHING	LEVEL	BEARING
START	0	679078.816	7060837.288	297.628	90°16'26.34"
END	58.555	679137.371	7060837.008	297.382	90°16'26.34"

SETOUT DETAILS MKA1

CHAINAGE	EASTING	NORTHING	LEVEL	RADIUS
0	678941.290	7060822.768	298.156	
2	678942.297	7060821.040	298.143	-20
4	678943.389	7060819.365	298.13	-20
6	678944.642	7060817.808	298.117	-20
8	678946.045	7060816.383	298.104	-20
10	678947.583	7060815.106	298.091	-20
12	678949.240	7060813.988	298.079	-20
14	678951.001	7060813.042	298.066	-20
16	678952.848	7060812.276	298.055	-20
18	678954.762	7060811.698	298.045	-20
20	678956.724	7060811.314	298.036	-20
22	678958.714	7060811.128	298.028	-20
23.004	678959.718	7060811.110	298.024	-20

SETOUT DETAILS MKA2

CHAINAGE	EASTING	NORTHING	LEVEL	RADIUS
0	678961.653	7060804.124	298.019	-17.5
2	678959.658	7060803.995	298.026	-17.5
4	678957.691	7060803.641	298.039	-17.5
6	678955.777	7060803.064	298.057	-17.5
8	678953.941	7060802.272	298.08	-17.5
10	678952.208	7060801.277	298.109	-17.5
12	678950.599	7060800.09	298.138	-17.5
14	678949.137	7060798.728	298.163	-17.5
16	678947.839	7060797.207	298.184	-17.5
18	678946.723	7060795.549	298.2	-17.5
18.427	678946.509	7060795.179	298.203	-17.5
19.875	678945.802	7060793.916	298.211	

SETOUT DETAILS MKA3

CHAINAGE	EASTING	NORTHING	LEVEL	RADIUS
0	678993.077	7060812.345	298.212	-7.5
2	678995.052	7060812.624	298.237	-7.5
4	678996.883	7060813.413	298.246	-7.5
6	678998.441	7060814.657	298.239	-7.5
8	678999.617	7060816.268	298.223	-7.5
10	679000.326	7060818.132	298.203	-7.5
11.781	679000.524	7060819.898	298.181	-7.5

SETOUT DETAILS MKA4

CHAINAGE	EASTING	NORTHING	LEVEL	RADIUS
0	679005.024	7060819.929	298.191	-7.5
2	679005.303	7060817.955	298.243	-7.5
4	679006.093	7060816.124	298.318	-7.5
6	679007.337	7060814.565	298.415	-7.5
8	679008.947	7060813.39	298.512	-7.5
10	679010.811	7060812.68	298.592	-7.5
11.781	679012.577	7060812.482	298.649	-7.5

NOTES
1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	30/01/2014	PRIVATE ACCESS ALIGNMENT REVISED	019	AZ
C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
SCALE 1:250 2.5 0 5 10

DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
© ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
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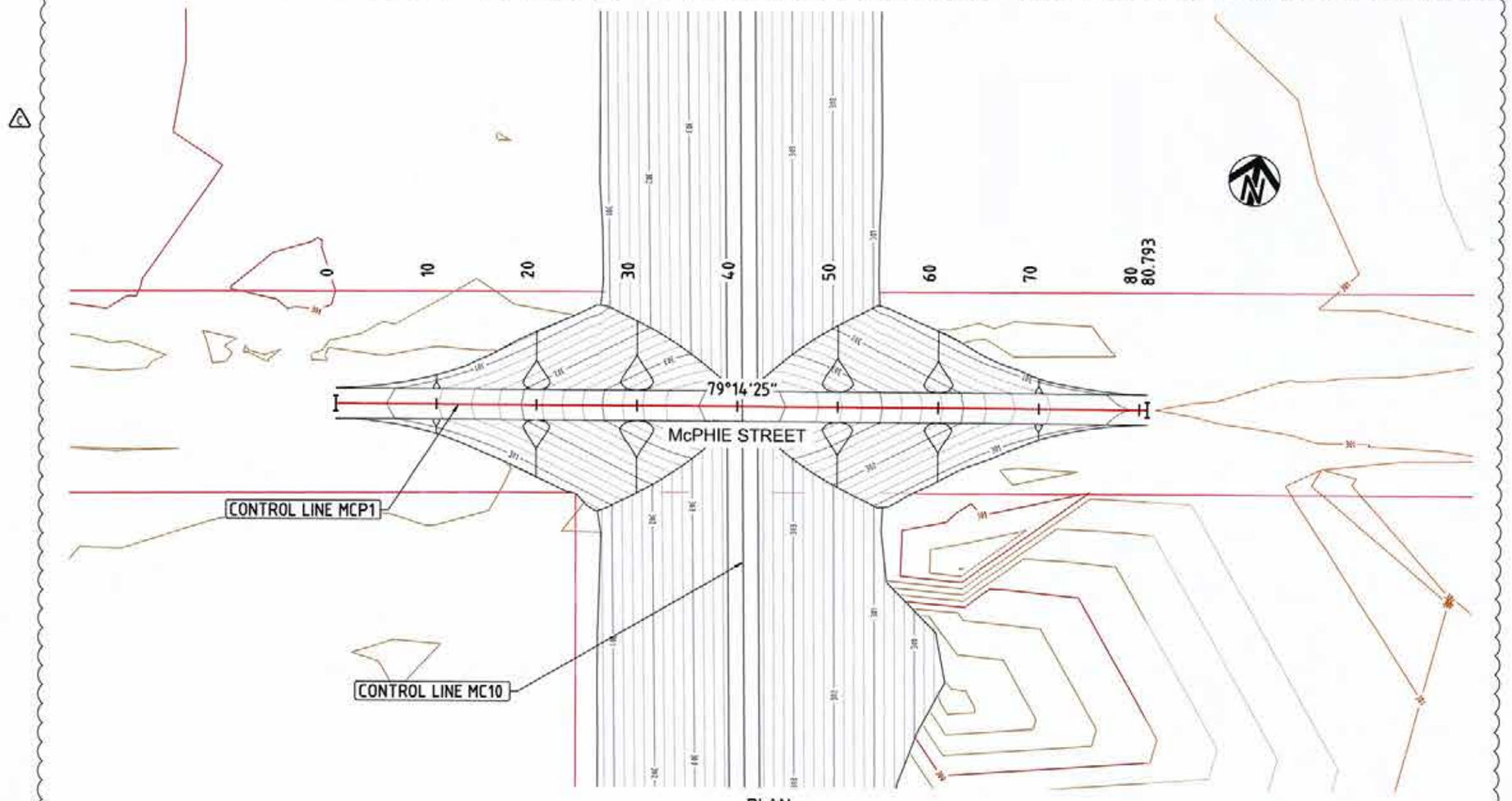
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
PROPERTY ACCESS - LEVEE CROSSINGS
PROPERTY ACCESS
SHEET 2

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:100	CONSTRUCTION	30031182-PA-0002	C

A1
150 mm ON ORIGINAL



PLAN
SCALE 1:250

CONTROL LINE MCP1					
PT	CHAINAGE	EASTING	NORTHING	LEVEL	BEARING
START	0	679072.491	7062604.564	300.914	79°14'24.60"
END	80.793	679151.864	7062619.647	300.997	79°14'24.60"

NOTES
1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	A	30/01/2014	ISSUED FOR CONSTRUCTION	019	A2
	B	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	A2
	C	16/05/2014	McPHIE ST REALIGNMENT	032	A1

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
SCALE 1:250 2.5 0 5 10

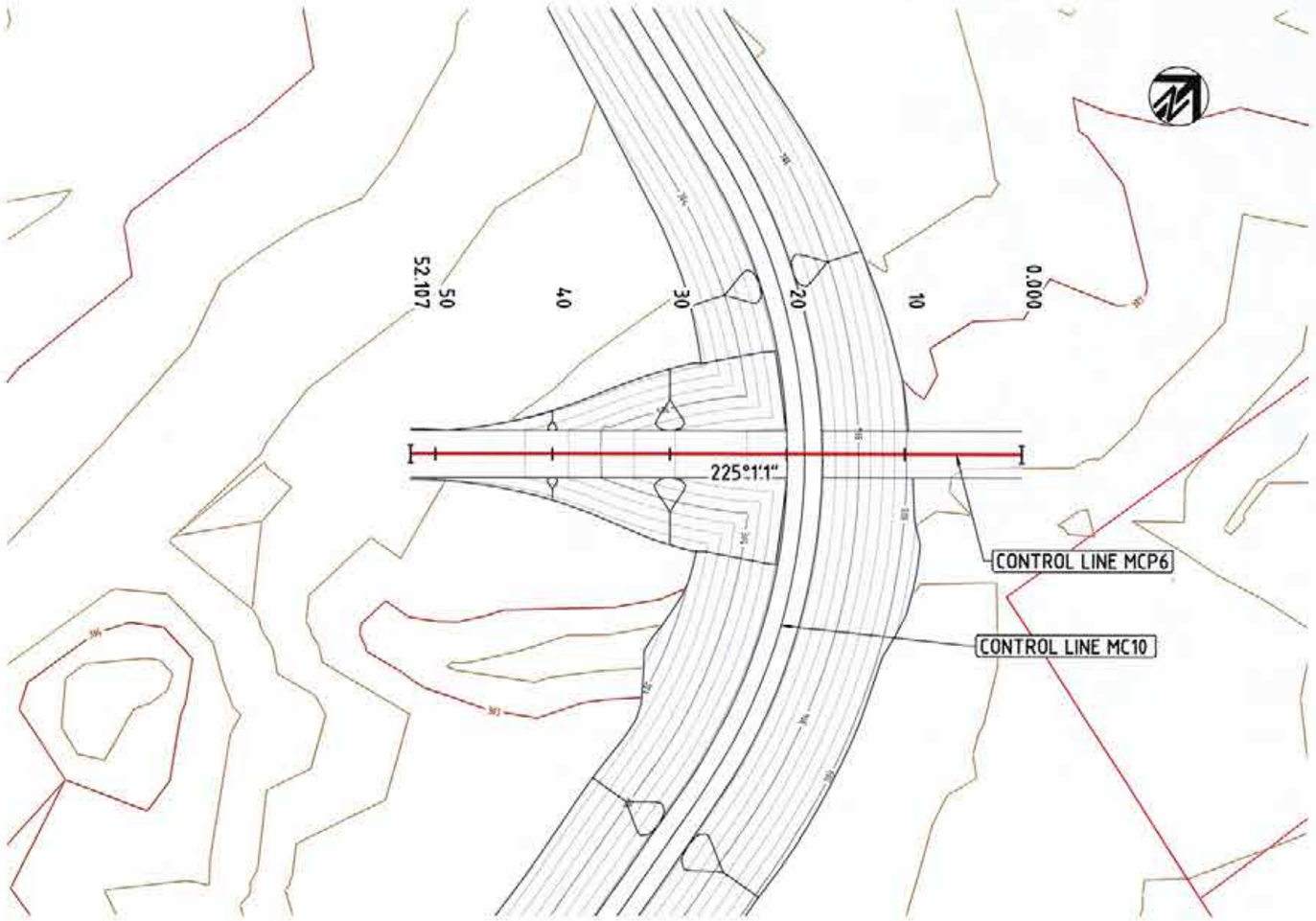
DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
PROPERTY ACCESS - LEVEE CROSSINGS
PROPERTY ACCESS
SHEET 3

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:100	CONSTRUCTION	30031182-PA-0003	C

150 mm ON ORIGINAL
A1



PLAN
SCALE 1:250

CONTROL LINE MCP6					
PT	CHAINAGE	EASTING	NORTHING	LEVEL	BEARING
START	0	677174.022	7063663.153	302.789	225°01'01.02"
END	52.107	677137.166	7063626.318	303.336	225°01'01.02"

NOTES
1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	A	16/05/2014	ISSUED FOR CONSTRUCTION	032	

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
SCALE 1:250 2.5 0 5 10

DESIGNER
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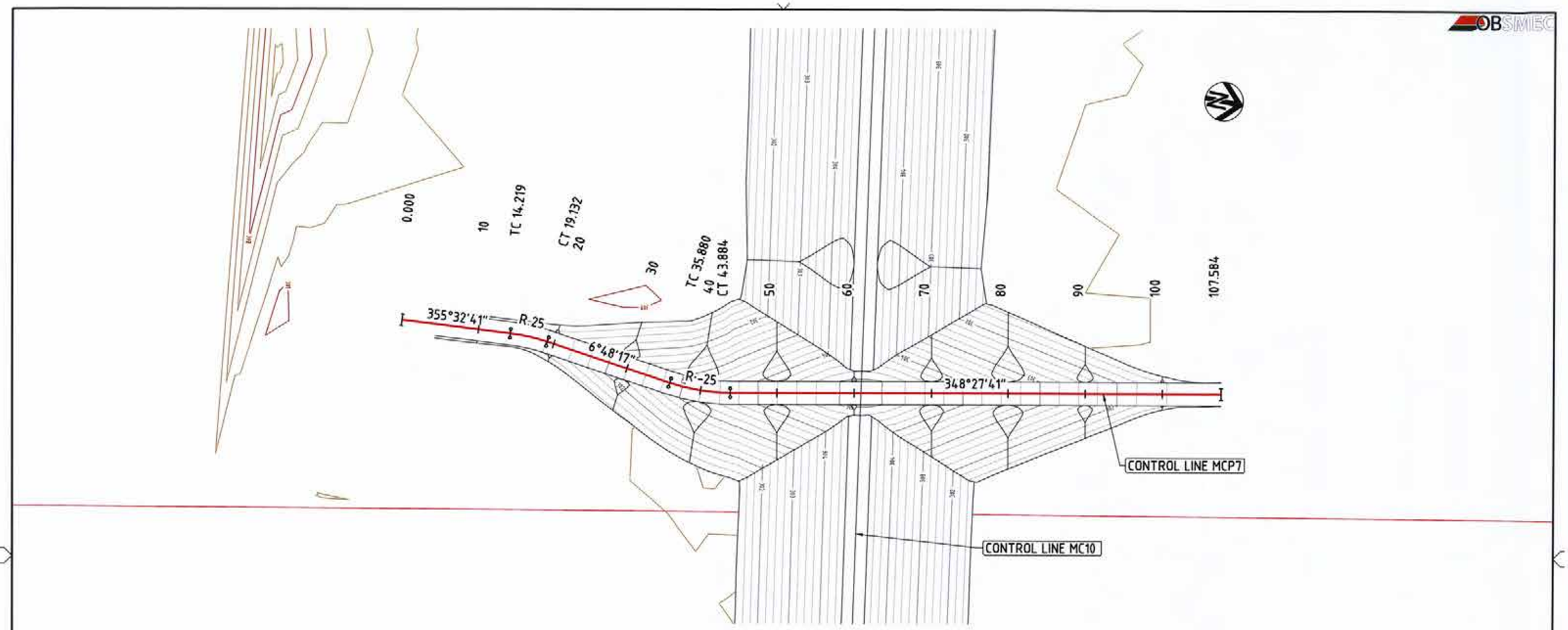
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
PROPERTY ACCESS - LEVEE CROSSINGS
PROPERTY ACCESS
SHEET 4

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:100	CONSTRUCTION	30031182-PA-0004	A

155 mm ON ORIGINAL
A1



PLAN
SCALE 1:250

CONTROL LINE MCP7						
PT	CHAINAGE	EASTING	NORTHING	LEVEL	BEARING	RADIUS
START	0	678536.646	7062867.206	301.113	355°32'41.09"	
TC	14.219	678535.541	7062881.382	301.113	355°32'41.09"	
IP	16.675	678535.35	7062883.839	301.155		25
CT	19.132	678535.642	7062886.286	301.258	6°48'17.49"	
TC	35.88	678537.626	7062902.916	302.829	6°48'17.49"	
IP	39.882	678538.105	7062906.924	303.229		-25
CT	43.884	678537.297	7062910.879	303.629	348°27'40.58"	
END	107.584	678524.555	7062973.292	301.427	348°27'40.58"	

NOTES
1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	A	16/05/2014	ISSUED FOR CONSTRUCTION	932	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
SCALE 1:250 2.5 0 5 10

DESIGNER
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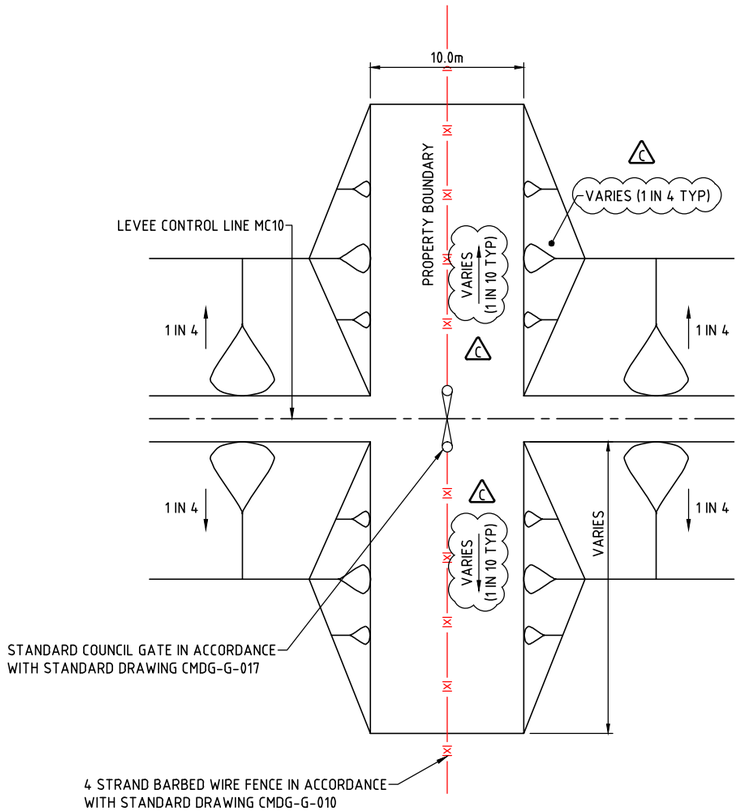
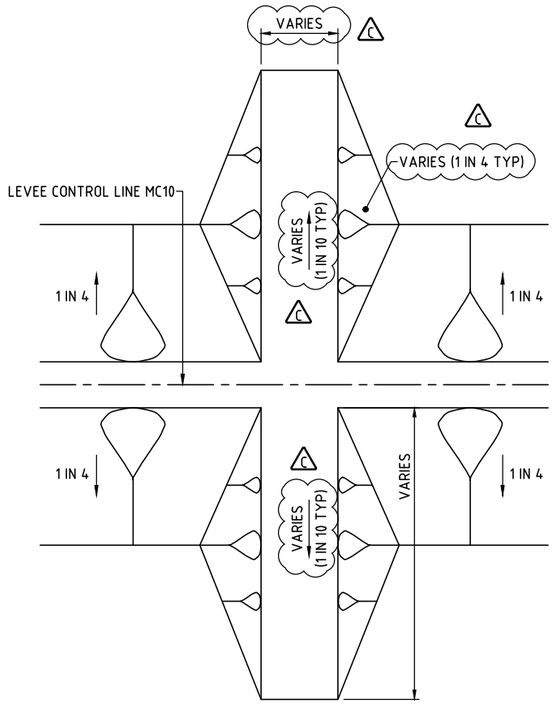
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
PROPERTY ACCESS - LEVEE CROSSINGS
PROPERTY ACCESS
SHEET 5

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:100	CONSTRUCTION	30031182-PA-0005	A

150 mm ON ORIGINAL
A1



TYPICAL DUAL PROPERTY ACCESS CROSSING
PLAN
SCALE 1:200



TYPICAL SINGLE PROPERTY ACCESS CROSSING
PLAN
SCALE 1:200

NOTES
1. FOR GENERAL NOTES REFER TO DRAWING 30031182-DI-0011

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
	B	30/01/2014	REISSUED FOR SECTIONS B&D	019	AZ
	C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
SCALE 1:200 2 0 2 4 6 8 10
SCALE 1:100 1 0 1 2 3 4 5

DESIGNER
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SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
PROPERTY ACCESS - LEVEE CROSSINGS
PROPERTY ACCESS DETAILS

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:200	CONSTRUCTION	30031182-PA-0101	C

150 mm ON ORIGINAL
A1

NOTES

GENERAL PAVEMENT NOTES

1. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE FOLLOWING DOCUMENTS:
   - DETAILED DESIGN REPORT
   - TMR STANDARD DRAWINGS
   - TECHNICAL SPECIFICATIONS
   - SUPPLEMENTARY SPECIFICATIONS
   - WRITTEN INSTRUCTIONS
2. ALL CONSTRUCTION MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE RELEVANT SPECIFICATION FOR THE WORKS TOGETHER WITH THE REQUIREMENTS OF ALL THE RELEVANT CODES OF PRACTICE REFERRED TO THEREIN AND THE REQUIREMENTS OF ALL THE STATUTORY AUTHORITIES WHERE APPLICABLE.
3. ALL LOCATIONS, ORIENTATION AND LEVELS SHALL BE VERIFIED ON SITE BEFORE COMMENCING ANY WORK. DISCREPANCIES SHALL BE REFERRED TO THE CONTRACT ADMINISTRATOR.
4. DO NOT OBTAIN DIMENSIONS FROM SCALING OFF DRAWINGS.
5. ANY PERMITS AND APPROVALS REQUIRED FOR CONSTRUCTION OF PERMANENT OR TEMPORARY WORKS SHALL BE OBTAINED BY THE CONTRACTOR.
6. TMR STANDARD DETAILS TO BE ADOPTED UNLESS OTHERWISE STATED.
7. DRAINAGE, EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IN ACCORDANCE WITH ENVIRONMENTAL MANAGEMENT PLAN (CONSTRUCTION).
8. THE WORKS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CONTRACTOR'S APPROVED CONSTRUCTION WORKS PROCEDURES/ WORK METHOD STATEMENT.
9. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING ANY INFRASTRUCTURE (E.G. CULVERTS OR STORMWATER DRAINAGE PIPES) WILL NOT INHIBIT CONSTRUCTION OF THE NOMINATED PAVEMENT THICKNESSES GIVEN.
10. ALL VARYING WIDTHS AND DEPTHS SPECIFIED ON THE DRAWINGS SHALL BE CONFIRMED ON SITE BY THE CONTRACT ADMINISTRATOR.
11. ALL WORKS ARE TO BE SUPERVISED BY A SUITABLY QUALIFIED RPEQ FAMILIAR WITH THE TYPE OF WORK BEING UNDERTAKEN IN ACCORDANCE WITH THE REQUIREMENTS OUTLINED IN THE ENGINEERING ACT 2002.
12. ALL MATERIALS ARE TO BE SUPPLIED AND PLACED IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:
    - PROVISION FOR TRAFFIC - MRTS 02
    - PRIME - MRTS20
    - POLYMER MODIFIED SEALS - MRTS 11, MRTS 18 & MRTS22
    - PLANT MIXED STABILISED PAVEMENT USING CEMENT OR CEMENTITIOUS BLENDS - MRTS08
    - PLANT MIXED STABILISED PAVEMENT USING CEMENT OR CEMENTITIOUS BLENDS - MRTS07B
    - EARTHWORKS - MRTS04
    - GEOFABRIC - MRTS27
    - UNBOUND PAVEMENT GRAVELS - MRTS 05
    - ENVIRONMENTAL MANAGEMENT - MTRS 51
13. ALL PROPRIETARY PRODUCTS ARE TO BE SUPPLIED AND INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
14. COLOUR PRINTS OF DRAWINGS ONLY SHOULD BE USED AS REFERENCE FOR CONSTRUCTION.
15. WORKS ARE TO BE UNDERTAKEN AT TIMES TO MINIMISE THE INFLUENCE OF RAIN AND/OR SEASONAL GROUND WATER.
16. LOCAL DRIVEWAYS AND ACCESS POINTS ARE TO BE 150mm TMR TYPE 2.3 BASE COURSE WITH A SPRAY SEAL OR AS OTHERWISE REQUESTED BY THE LAND OWNER

E

SUBGRADE

1. THE SUBGRADE IS TO BE INSPECTED PRIOR TO PLACEMENT OF ANY PAVEMENT LAYERS IN ACCORDANCE WITH MRTS04.
2. THE CONTRACT ADMINISTRATOR MAY DIRECT ADDITIONAL TESTING OF THE SUBGRADE FOLLOWING THE INSPECTION AND PRIOR TO PLACEMENT OF ANY PAVEMENT LAYERS.
3. ONCE THE SUBGRADE HAS BEEN INSPECTED AND SUBGRADE TEST RESULTS ARE RECEIVED BY THE CONTRACT ADMINISTRATOR THE NEED FOR ANY SUBGRADE IMPROVEMENT, SUBGRADE CUTTING TREATMENT OR ADJUSTMENT TO THE PAVEMENT THICKNESSES WILL BE ADVISED BY THE CONTRACT ADMINISTRATOR.
4. PAVEMENT TRANSITIONS SHALL BE CONFIRMED ON SITE BASED ON ACTUAL SUBGRADE CONDITIONS. THE CONTRACTOR SHALL OBTAIN CONFIRMATION OF ALL PAVEMENT TRANSITIONS FROM THE CONTRACT ADMINISTRATOR PRIOR TO THE PLACEMENT OF ANY PAVEMENT LAYERS.

EARTHWORKS

1. ANY FILL MATERIAL SHALL COMPLY WITH THE PROJECT SPECIFIC REQUIREMENTS.
2. MATERIAL PLACED SHALL BE PROTECTED FROM RAIN DAMAGE BY SEALING, ROLLING OR COVERING AT THE END OF EACH WORK DAY AND/OR PRIOR TO INCLEMENT WEATHER.
3. THE EXCAVATION WORK SHALL BE UNDERTAKEN IN SUCH A WAY TO PREVENT ANY PONDING OF STORMWATER ACROSS ALL AREAS OF THE WORK.

WORKING PLATFORMS

1. EXCESS EXISTING MATERIAL EXCAVATED FROM VARIOUS PAVEMENT BOXES MAY BE RE-USED FOR SUCH PURPOSES IF FOUND TO BE SUITABLE. VERIFICATION OF THE SUITABILITY OF ANY MATERIAL SHALL BE AT THE DISCRETION OF THE CONTRACT ADMINISTRATOR.

CMB

1. THE CMB MAY BE ACHIEVED USING PLANT MIXED OR INSITU STABILISATION PROCESSES IN ACCORDANCE WITH THE RESPECTIVE TMR SPECIFICATIONS.
2. THE THICKNESS OF CMB SHOWN IS THE MINIMUM THICKNESS REQUIRED, AND IF INSITU STABILISATION OPTION IS ADOPTED, THE CONTRACTOR SHALL PROVIDE A BUFFER OF 20MM OF ADDITIONAL GRAVEL TO BE STABILISED OVER THE CBR 35% SELECT FILL TO ENSURE THAT THE CBR35% MATERIAL IS NOT UNINTENTIONALLY INCORPORATED INTO STABILISATION BLEND.
3. THE BINDER CONTENT FOR THE CMB SHALL BE DETERMINED BY LABORATORY TESTING OF REPRESENTATIVE SAMPLES TO ACHIEVE 0.8MPA ≤ UCS ≤ 1.6 MPA AT 7 DAYS. UCS RESULTS ARE TO BE CONFIRMED DURING CONSTRUCTION - RESULTS OUTSIDE THIS RANGE ARE NOT ACCEPTABLE.
4. THE CEMENT USED IN THE UCS TESTING SHALL CONSIST OF A 65/35 CEMENT/SLAG BLEND. THE TESTING SHOULD BE IN ACCORDANCE WITH AS5101.4 2008 USING 115.5 X 105MM DIAMETER CYLINDER, COMPACTION AT 100% STANDARD OR 98% MODIFIED COMPACTION USING 7 DAY CURING AT 650C FOR 65/35 CEMENT/SLAG SLOW SETTING BINDER BLEND.

SPRAY SEALS

1. SPRAY / SPREAD RATES NOMINATED ARE INDICATIVE ONLY AND PROVIDED FOR ESTIMATION PURPOSES. SPRAY SEAL DESIGNS, APPROPRIATE FOR THE CONDITIONS AT THE TIME OF PLACEMENT, SHALL BE UNDERTAKEN BY THE CONTRACT ADMINISTRATOR. THE CONTRACTOR IS REQUIRED TO PROVIDE AT LEAST 48 STANDARD WORKING HOURS' NOTICE OF THEIR PROPOSED SEAL DATES TO HELP FACILITATE THIS PROCESS.
2. BITUMEN EMULSION SEALS ARE TO BE SUPPLIED AND APPLIED IN ACCORDANCE WITH MANUFACTURERS' RECOMMENDATIONS
3. THE PMB BINDER TYPE SHALL BE S0.75 UNLESS S0.38 IS OTHERWISE APPROVED BY TMR.

SIGNS AND LINEMARKING

1. ALL LINE MARKING, GUIDE POSTS AND RAISED PAVEMENT MARKERS SHALL BE IN ACCORDANCE WITH TMR MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES.
2. ALL SIGN SUPPORTS ARE TO BE INSTALLED AS PER TMR STANDARD DRAWING NO.'S 1363, 1365 AND 1368.

SERVICES

1. LOCATION AND LEVEL OF ALL SERVICES MUST BE OBTAINED PRIOR TO CONSTRUCTION. ALL LEVELS SHALL BE CHECKED FOR CONFLICT WITH ANY SERVICES AND ANY IDENTIFIED CONFLICTS RESOLVED WITH THE CONTRACT ADMINISTRATOR. ALL OVERHEAD CLEARANCES TO BE CONFIRMED PRIOR TO PAVEMENT WORKS TO ENSURE ENERGEX MINIMUM CLEARANCE REQUIREMENTS ARE MET. CLEARANCE REQUIREMENTS TO BE IN ACCORDANCE WITH ENERGEX 'OVERHEAD DESIGN MANUAL SECTION 4 - CLEARANCES'.
2. PROTECTION DETAILS TO BE PROVIDED BY RELEVANT SERVICE PROVIDERS IF REQUIRED.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	A	30/01/2014	ISSUED FOR CONSTRUCTION	019	AZ
	B	28/02/2014	NOTES AMENDED	25	RS
	C	31/03/2014	BIRKETT LEVEE REALIGNMENT	029	AZ
	D	10/04/2014	NOTE ADDED	-	AZ
	E	16/05/2014	NOTES AMENDED	032	

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	L. SWANN
DESIGN CHECK	S. RUNGE
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

DESIGNER
SMEC
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SMEC PROJECT No 30031182

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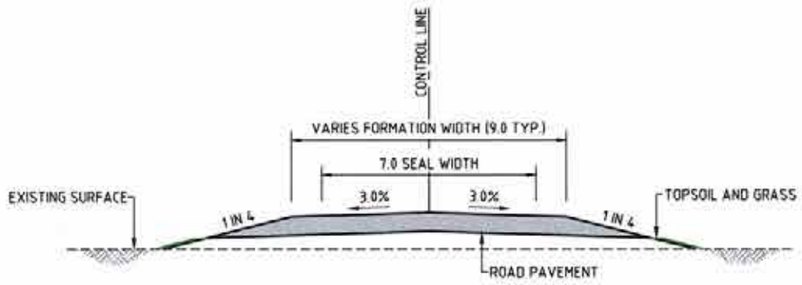
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
PAVEMENT GENERAL NOTES

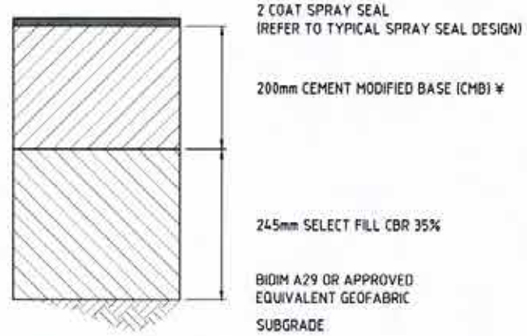
SCALE	PHASE	PROJECT / DRAWING No.	REVISION
NTS	CONSTRUCTION	30031182-PD-0011	E

150 mm ON ORIGINAL

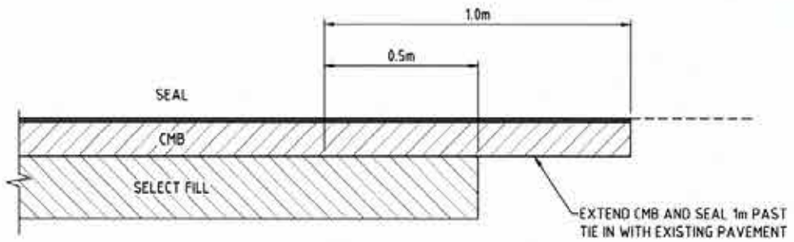


TYPICAL MISCAMBLE STREET
LEVEE CROSSING SECTION
SCALE 1:100

PAVEMENT DETAIL
MISCAMBLE STREET
TYPE 1 - WESTERN (DRY) SIDE
CH: START - 170
SCALE 1:5



PAVEMENT DETAIL
MISCAMBLE STREET
TYPE 1 - EASTERN (WET) SIDE
CH: 170 - END
SCALE 1:5



MISCAMBLE STREET PAVEMENT JOINT DETAIL
SCALE 1:10

TYPICAL SPRAY SEAL DESIGN - MISCAMBLE ST

- DOUBLE APPLICATION SEAL:
  - PRIME = SAMI K2 OR AMCO @ 1.1L/m²
    (COVER AGGREGATE AS NEEDED TO SUIT CONSTRUCTION LOGISTICS)
  - SURFACING:
    FIRST APPLICATION = PMB @ 0.9L/m² (14mm @ 80m²/m³)
    SECOND APPLICATION = PMB @ 1.3L/m² (7mm @ 180m²/m³)

PAVEMENT NOTES

¥ CEMENT DOSAGE FOR CMB TO BE DETERMINED USING LOCAL MATERIAL TO ACHIEVE 1-UCS-2MPa @ 28 DAYS.

NOTES

1. FOR GENERAL NOTES REFER TO DRAWING 30031182-DI-0011
2. FOR PAVEMENT GENERAL NOTES REFER TO DRAWING 30031182-PD-0011

ISSUED FOR CONSTRUCTION

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	30/01/2014	ISSUED FOR CONSTRUCTION	019	AZ
B	31/03/2014	BIRKETT LEVEE REALIGNMENT	029	AZ
C	10/04/2014	MISCAMBLE PAVEMENT THICKNESS AMENDED	-	AZ
D	16/05/2014	DETAILS AMENDED	032	AZ

DRAFTER	B. TAYLOR
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DESIGNER	L. SWANN
DESIGN CHECK	S. RUNGE
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
SCALE 1:100 1 0 1 2 3 4 5
SCALE 1:10 0.1 0 0.1 0.2 0.3 0.4 0.5
SCALE 1:5 0.05 0 0.10 0.20

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SMEC PROJECT No 30031182

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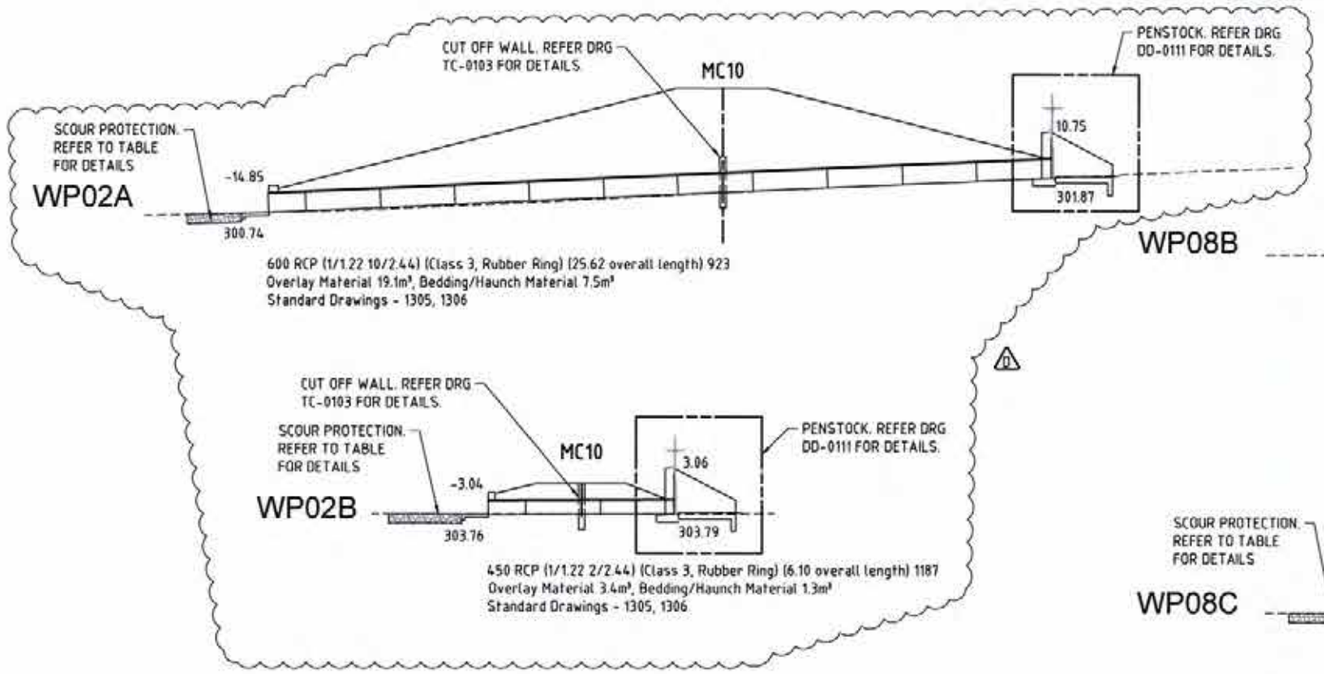
maranoa REGIONAL COUNCIL

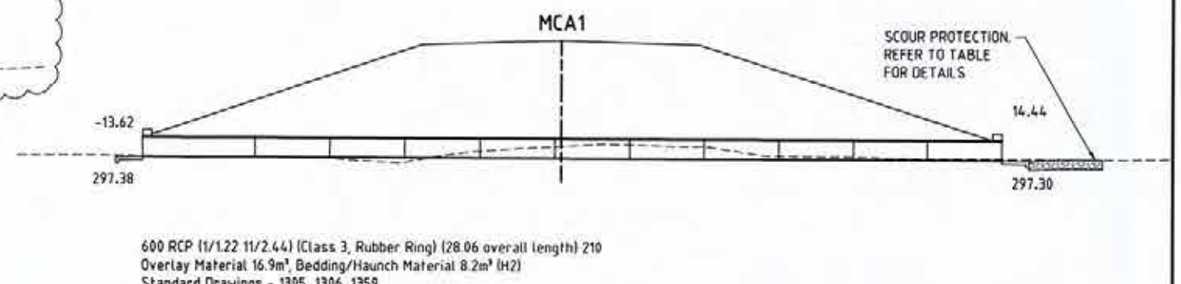
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
PAVEMENT DETAILS

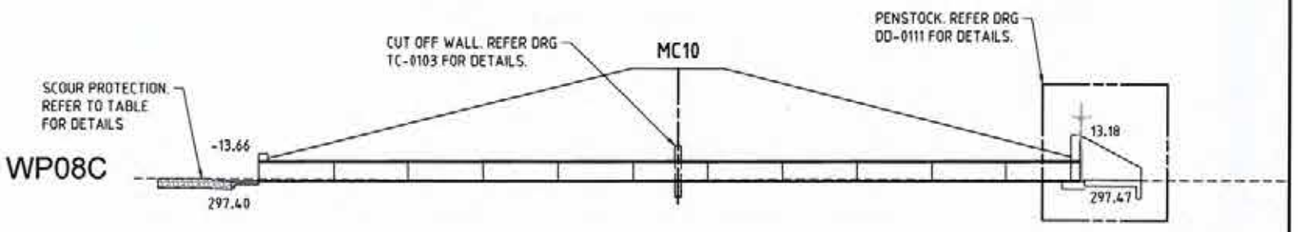
SCALE	PHASE	PROJECT / DRAWING No.	REVISION
AS SHOWN	CONSTRUCTION	30031182-PD-1001	D

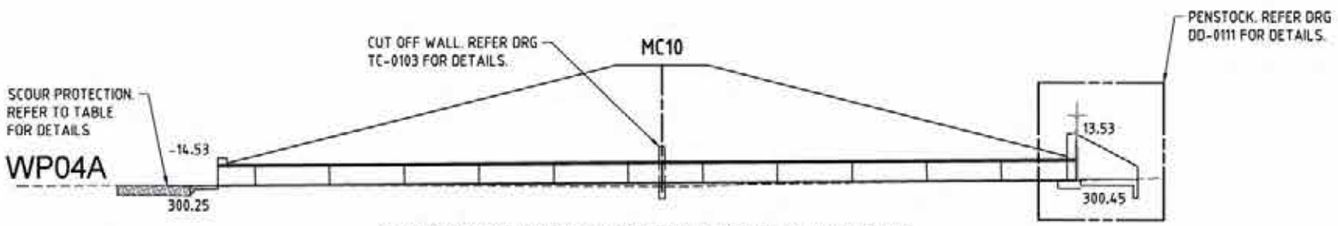
EXTERNAL REFERENCE FILES

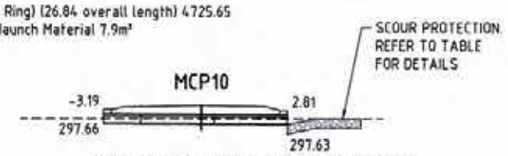
150 mm ON ORIGINAL
A1

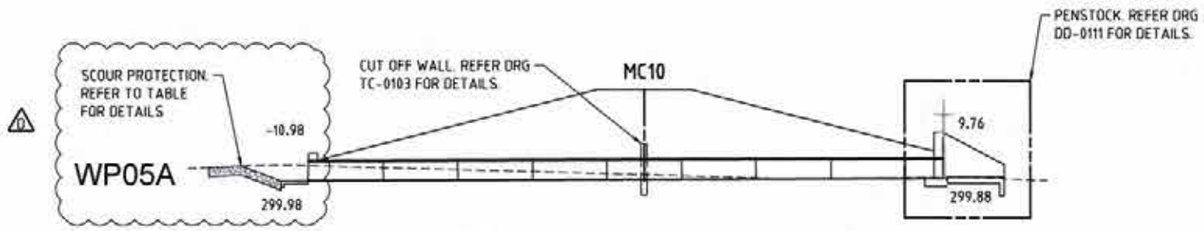


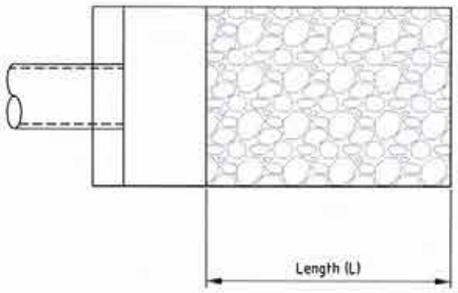












ROCK SCOUR PROTECTION DETAIL
N.T.S

TABLE A - ROCK SCOUR PROTECTION				
CULVERT	LENGTH (L)	MINIMUM ROCK SIZE (d_{50})	DEPTH	VOLUME (m^3)
WP02A	2.4 MIN.	200mm	300mm NOM.	0.7
WP02B	1.8 MIN.	200mm	300mm NOM.	0.5
WP04A	2.4 MIN.	200mm	300mm NOM.	0.7
WP05A	1.8 MIN.	200mm	300mm NOM.	0.5
WP08B	2.4 MIN.	200mm	300mm NOM.	0.7
WP08C	2.4 MIN.	200mm	300mm NOM.	0.7
WP08D	2.4 MIN.	200mm	300mm NOM.	0.7

NOTES
1. FOR CULVERT AND PENSTOCK DETAILS REFER DRAWING 30031182-DD-0111.
2. FOR TYPICAL PENSTOCK ARRANGEMENT DETAILS REFER TO DRAWING 30031182-TC-0103
3. FOR GENERAL NOTES REFER TO DRAWING 30031182-DI-0011

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
	B	30/01/2014	DRAINAGE DETAILS AMENDED	019	AZ
	C	31/03/2014	BIRKETT LEVEE REALIGNMENT	038	AZ
	D	16/05/2014	GOLDERS AND MCPHIE STREET LEVEE REALIGNMENT	052	

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	L. EVANS
DESIGN CHECK	A. ZANETTI
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
SCALE 1:100

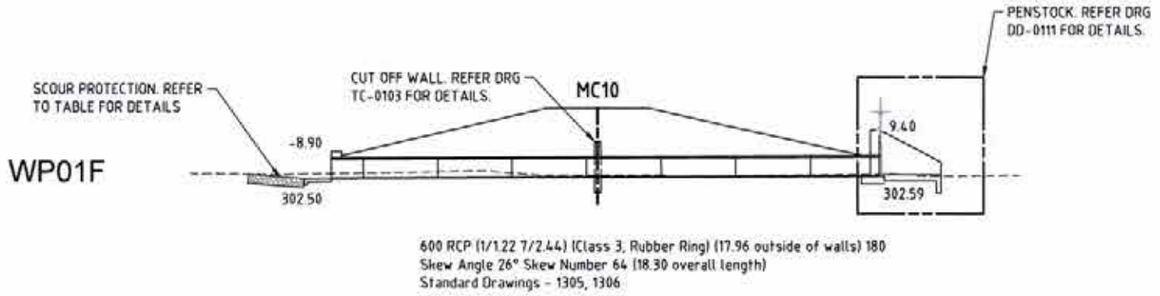
DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

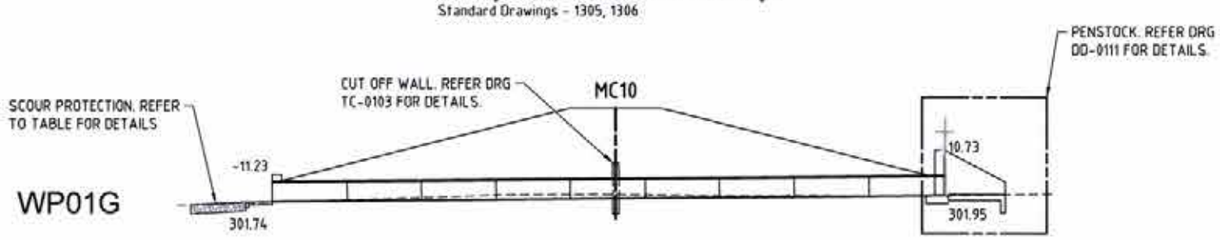
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
DRAINAGE
CULVERT SECTIONS
SHEET 1

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:100	CONSTRUCTION	30031182-DD-0001	D

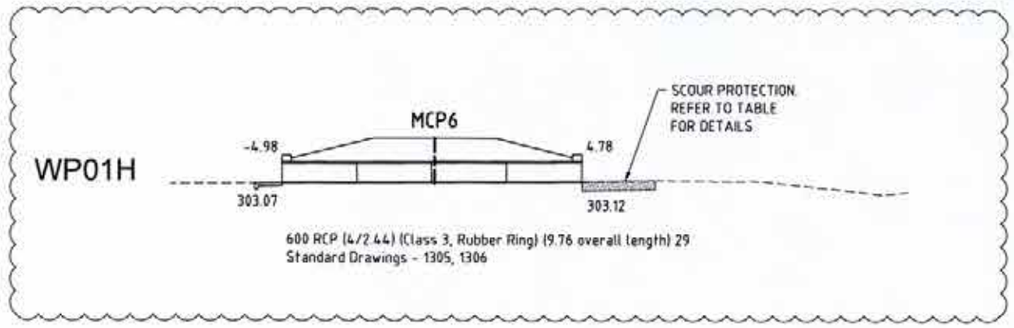
154 mm ON ORIGINAL
A1



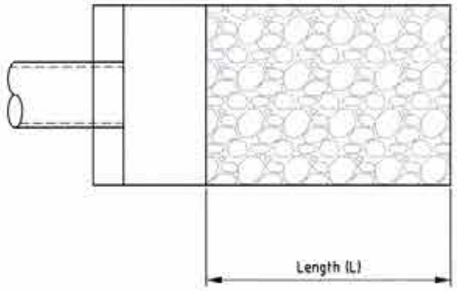
600 RCP (1/1.22 7/2.44) (Class 3, Rubber Ring) (17.96 outside of walls) 180
Skew Angle 26° Skew Number 64 (18.30 overall length)
Standard Drawings - 1305, 1306



600 RCP (9/2.44) (Class 3, Rubber Ring) (21.96 overall length) 455.5
Standard Drawings - 1305, 1306



600 RCP (4/2.44) (Class 3, Rubber Ring) (9.76 overall length) 29
Standard Drawings - 1305, 1306



ROCK SCOUR PROTECTION DETAIL
N.T.S

TABLE A - ROCK SCOUR PROTECTION				
CULVERT	LENGTH (L)	MINIMUM ROCK SIZE (d_{50})	DEPTH	VOLUME (m^3)
WP01F	2.4 MIN.	200mm	300mm NOM.	0.7
WP01G	2.4 MIN	200mm	300mm NOM.	0.7
WP01H	2.4 MIN.	200mm	300mm NOM.	0.7

NOTES
1. FOR CULVERT AND PENSTOCK DETAILS REFER DRAWING 30031182-DD-0111.
2. FOR TYPICAL PENSTOCK ARRANGEMENT DETAILS REFER TO DRAWING 30031182-TC-0103
3. FOR GENERAL NOTES REFER TO DRAWING 30031182-DI-0011

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	A	31/03/2014	ISSUED FOR CONSTRUCTION	029	AZ
	B	10/04/2014	CULVERT WP01H ADDED	-	AZ
	C	16/05/2014	CULVERT WP01H AMENDED	032	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	L. EVANS
DESIGN CHECK	A. ZANETTI
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
SCALE 1:100 1 0 1 2 3 4 5

DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD. 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

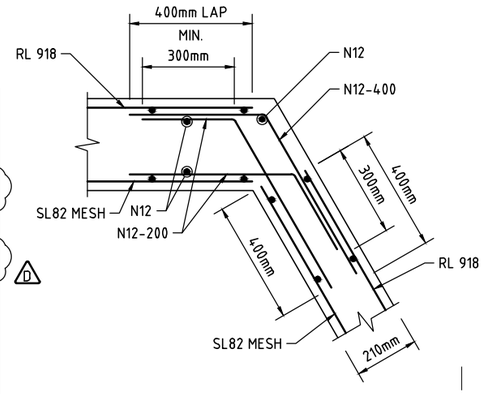
CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
DRAINAGE
CULVERT SECTIONS
SHEET 2

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:100	CONSTRUCTION	30031182-DD-0002	C

150 mm ON ORIGINAL
A1

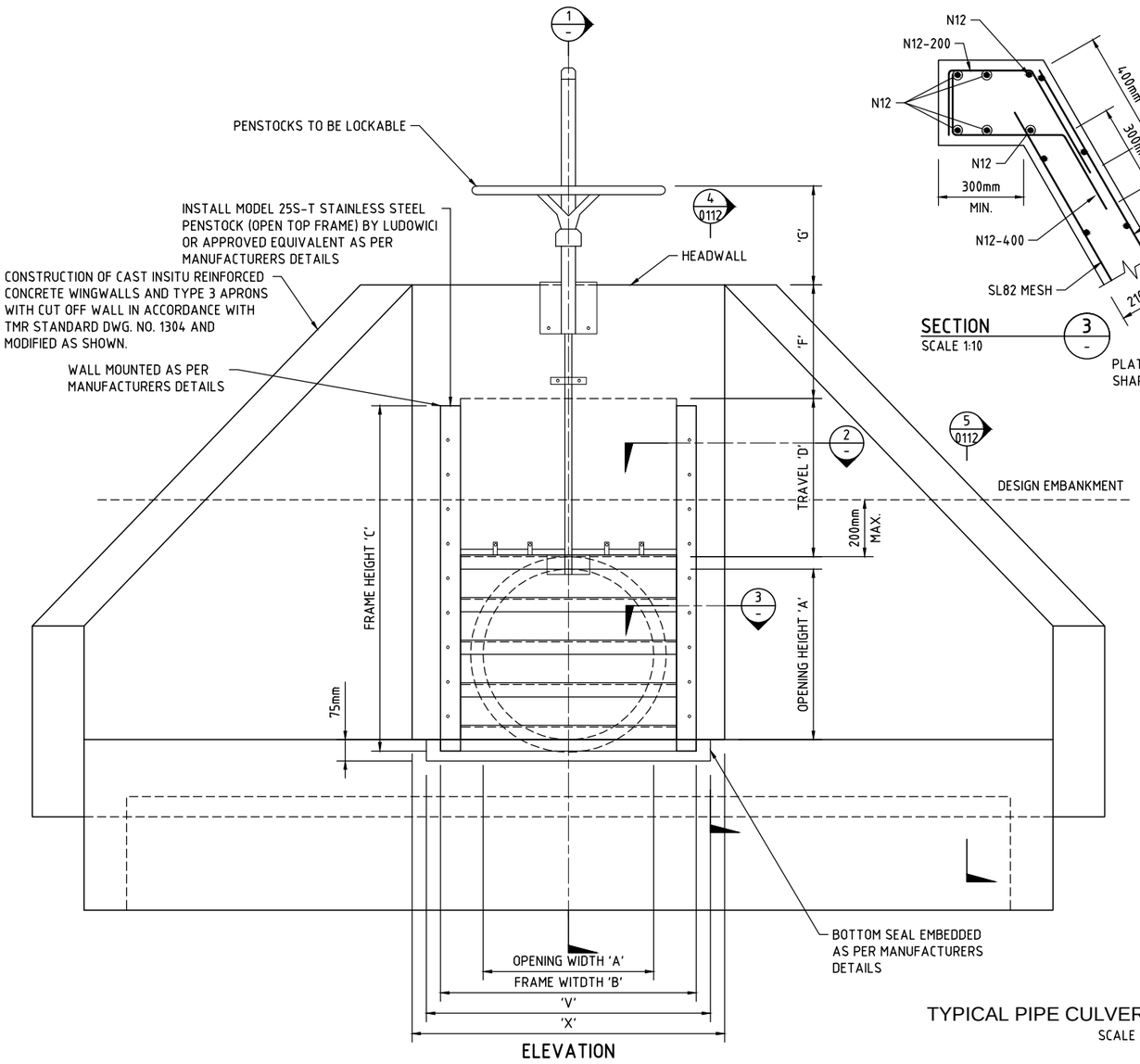
STRUCTURE NO.	PIPE SIZE (mm)	HEADWALL DIMENSIONS					PENSTOCK 25S - T DIMENSIONS						
		'Hw' (mm)	'W1' (mm)	'W2' (mm)	'X' (mm)	'V' (mm)	'A' (mm)	'B' (mm)	'C' (mm)	'D' (mm)	'E' (mm)	'F' (mm)	'G' (mm)
WP01A	450	1300	1475	1475	1140	850	450x450	750	1040	450	130	400	600
WP01B	450	1300	1475	1475	1140	850	450x450	750	1040	450	130	400	600
WP01C	450	1300	1475	1475	1140	850	450x450	750	1040	450	130	400	600
WP01D	450	1300	1475	1475	1140	850	450x450	750	1040	450	130	400	600
WP01F	600	1600	2020	2020	1300	1000	600x600	900	1215	600	134	400	450
WP01G	600	1600	2020	2020	1300	1000	600x600	900	1215	600	134	400	450
WP02A	600	1600	2020	2020	1300	1000	600x600	900	1215	600	134	400	450
WP02B	450	1300	1475	1475	1140	850	450x450	750	1040	450	130	400	600
WP04A	600	1600	2020	2020	1300	1000	600x600	900	1215	600	134	400	450
WP05A	600	1600	2020	2020	1300	1000	600x600	900	1215	600	134	400	450
WP08C	600	1600	2020	2020	1300	1000	600x600	900	1215	600	134	400	450

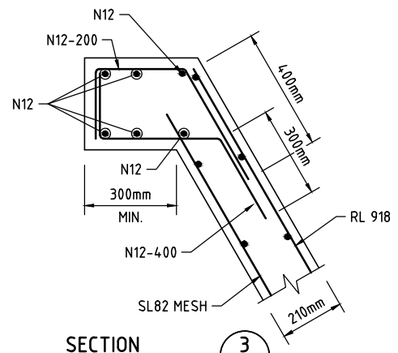


SECTION 2
SCALE 1:10

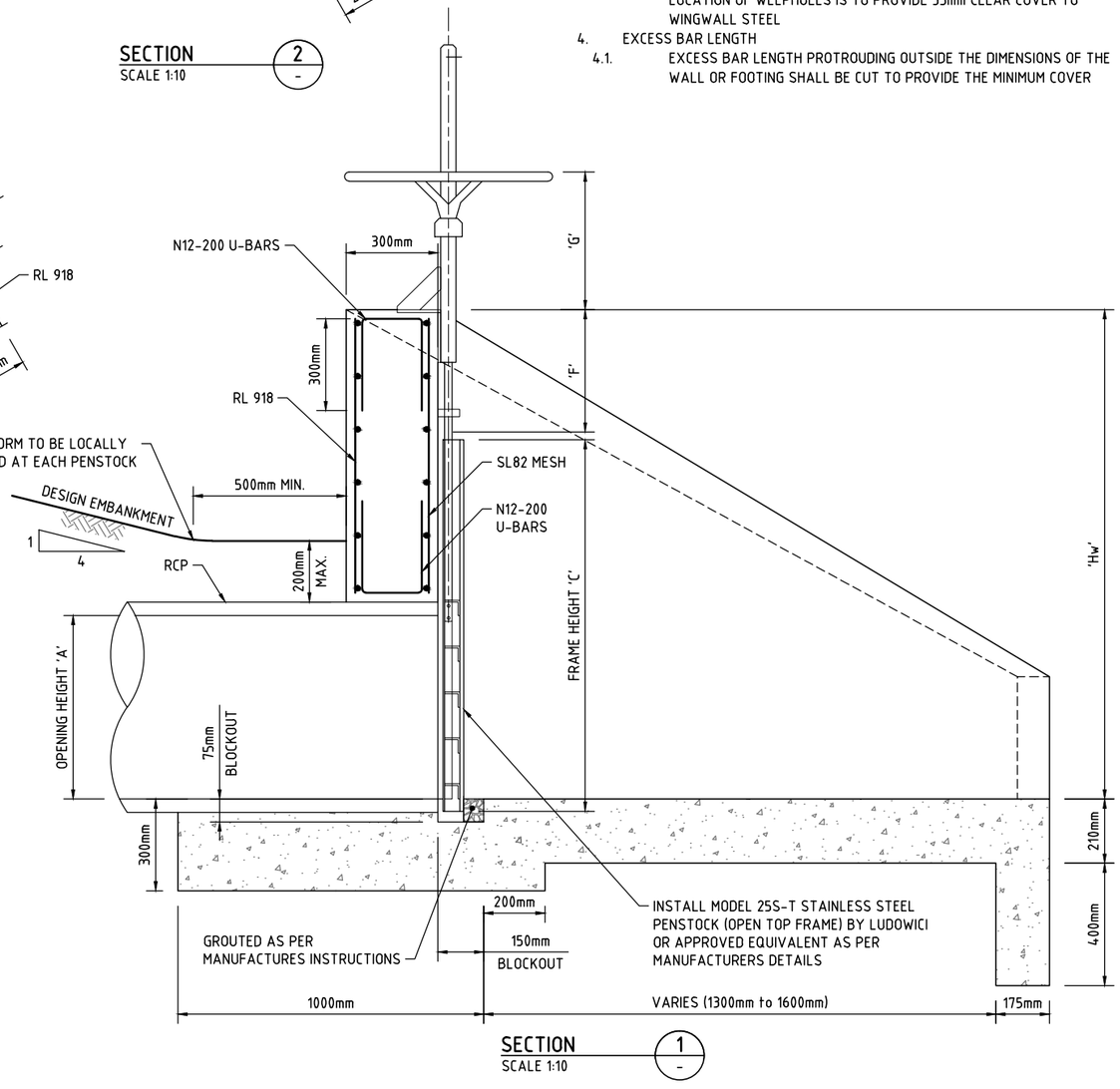
WINGWALL NOTES

1. CONCRETE
   - 1.1. REINFORCED CLASS S40/20
   - 1.2. CONCRETE COVER TO BE 55mm UNLESS NOTED OTHERWISE
   - 1.3. EXPOSURE CLASSIFICATION B2
2. STEEL
   - 2.1. REINFORCING STEEL TO BE IN ACCORDANCE WITH AS/NZS 4671
   - 2.2. DEFORMED BARS - GRADE D500N
   - 2.3. ROUNDED BARS - GRADE R250N
   - 2.4. DEFORMED WIRE - GRADE D500L
   - 2.5. ALL REINFORCING TO BE ARCS CERTIFIED
3. WEEPHOLES
   - 3.1. WEEPHOLES OF 90MM DIA. ARE TO BE PROVIDED AT MAXIMUM 1200 CRS. IN WINGWALLS. A 300 x 300 x 150 NO FINES CONCRETE BLOCK OR APPROVED EQUIVALENT IS TO BE PROVIDED AT EACH WEEPHOLE. LOCATION OF WEEPHOLES IS TO PROVIDE 55mm CLEAR COVER TO WINGWALL STEEL
4. EXCESS BAR LENGTH
   - 4.1. EXCESS BAR LENGTH PROTROUDING OUTSIDE THE DIMENSIONS OF THE WALL OR FOOTING SHALL BE CUT TO PROVIDE THE MINIMUM COVER





SECTION 3
SCALE 1:10



SECTION 1
SCALE 1:10

TYPICAL PIPE CULVERT WITH PENSTOCK
SCALE 1:10

NOTES

1. FOR GENERAL NOTES REFER TO DRAWING 30031182-DI-0011

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	30/01/2014	DRAWING TITLE AMENDED	019	AZ
C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
D	14/04/2014	DIMENSIONS ADDED	-	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	L. EVANS
DESIGN CHECK	A. ZANETTI
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
SCALE 1:10 0.1 0 0.1 0.2 0.3 0.4 0.5

DESIGNER
SMEC
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© ABN 47 065 475 149
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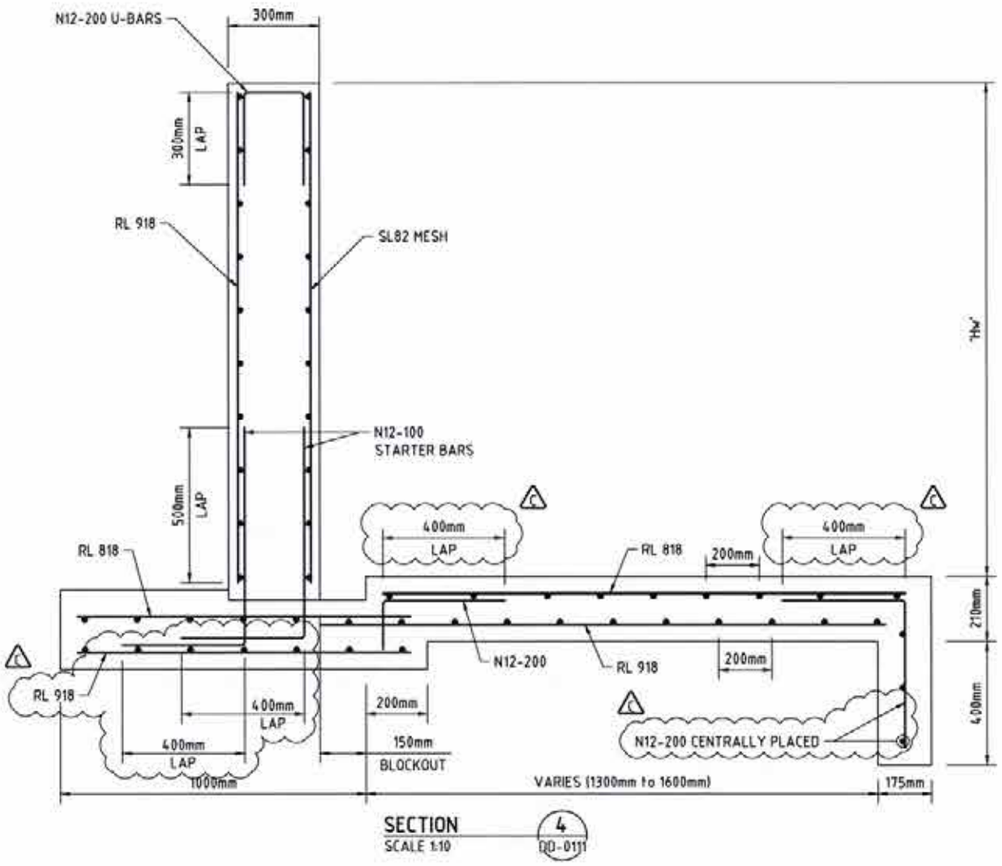
SOUTH BRISBANE QLD. 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
PENSTOCK DETAILS SHEET 1

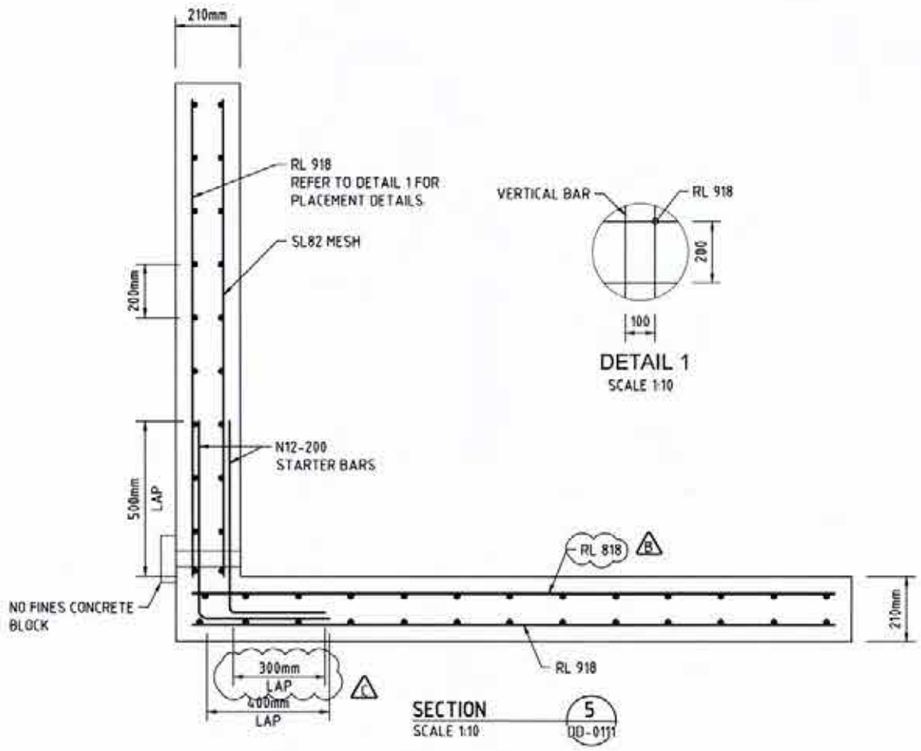
SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:10	CONSTRUCTION	30031182-DD-0111	D

150 mm ON ORIGINAL
A1



SECTION 4 DD-0111
SCALE 1:10

TYPICAL PIPE CULVERT WITH PENSTOCK REINFORCEMENT DETAIL
SCALE 1:10



DETAIL 1
SCALE 1:10

SECTION 5 DD-0111
SCALE 1:10

TYPICAL PIPE CULVERT WITH PENSTOCK REINFORCEMENT DETAIL
SCALE 1:10

NOTES
1. FOR NOTES AND DETAILS REFER TO DRAWING 30031182-DD-0111

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	A	31/03/2014	ISSUED FOR CONSTRUCTION	029	AZ
	B	16/04/2014	REINFORCING NOTE AMENDED	-	AZ
	C	16/05/2014	REINFORCING ARRANGEMENT REVISED	032	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	L. EVANS
DESIGN CHECK	A. ZANETTI
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
SCALE 1:10 0.1 0 0.1 0.2 0.3 0.4 0.5

DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD 4101
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SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
PENSTOCK DETAILS
SHEET 2

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:10	CONSTRUCTION	30031182-DD-0112	C

159 mm ON ORIGINAL
A1

CONTROL LINE MC10
X = 677148.700
Y = 7063658.960
Z = 304.914

Datum 302.00

DESIGN HEIGHT	303.273	304.914	304.914	303.226	
EXISTING SURFACE	303.273	303.127	303.161	303.226	
OFFSETS	-8.061	-1.500	1.500	8.249	

CHAINAGE 150.000

CONTROL LINE MC10
X = 677100.562
Y = 7063672.150
Z = 304.941

Datum 302.00

DESIGN HEIGHT	303.663	304.941	304.941	303.848	
EXISTING SURFACE	303.663	303.664	303.745	303.848	
OFFSETS	-6.613	-1.500	1.500	5.872	

CHAINAGE 100.000

CONTROL LINE MC10
X = 677051.997
Y = 7063684.043
Z = 304.969

Datum 302.00

DESIGN HEIGHT	304.235	304.969	304.969	304.278	
EXISTING SURFACE	304.235	304.222	304.269	304.278	
OFFSETS	-4.436	-1.500	1.500	4.261	

CHAINAGE 50.000

CONTROL LINE MC10
X = 677003.432
Y = 7063695.937
Z = 304.750

Datum 302.00

DESIGN HEIGHT	304.750	304.750	304.747		
EXISTING SURFACE	304.750	304.747	304.747		
OFFSETS	-1.500	1.500	1.512		

CHAINAGE 0.000

CONTROL LINE MC10
X = 677192.722
Y = 7063520.771
Z = 304.964

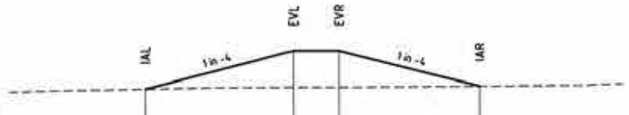
Datum 300.00

DESIGN HEIGHT	302.359	304.964	304.964	302.906	
EXISTING SURFACE	302.359	302.636	302.719	302.906	
OFFSETS	-11.921	-1.500	1.500	9.731	

CHAINAGE 300.000

CONTROL LINE MC10
X = 677184.249
Y = 7063570.047
Z = 304.961

Datum 300.00

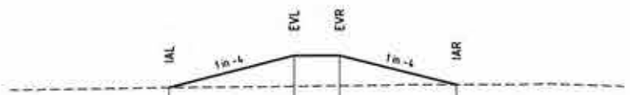


DESIGN HEIGHT	302.543	304.961	304.961	302.681	
EXISTING SURFACE	302.543	302.631	302.638	302.681	
OFFSETS	-11.172	-1.500	1.500	10.620	

CHAINAGE 250.000

CONTROL LINE MC10
X = 677175.776
Y = 7063619.324
Z = 304.957

Datum 300.00



DESIGN HEIGHT	302.912	304.957	304.957	303.067	
EXISTING SURFACE	302.912	302.962	302.993	303.067	
OFFSETS	-9.681	-1.500	1.500	9.062	

CHAINAGE 200.000

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	30/01/2014	ISSUED FOR CONSTRUCTION	819	AZ
B	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
C	7/07/2014	LEVEE LEVELS AMENDED	-	KL

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

SCALE 1:200 2 0 2 4 6 8 10

DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
© ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

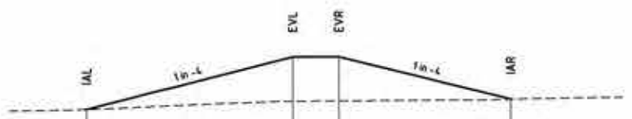
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
ANNOTATED CROSS SECTION
CONTROL LINE MC10
SHEET 1

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:200	CONSTRUCTION	30031182-XS-1001	C

150 mm ON ORIGINAL
A1

CONTROL LINE MC10
X = 677225.938
Y = 7063375.397
Z = 304.974

Datum 300.00

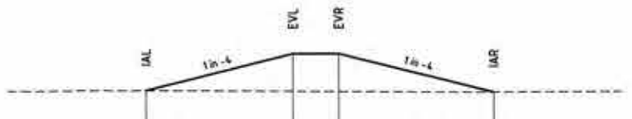


	IAL		EVL	EVR		IAR	
DESIGN HEIGHT	301.605		304.974	304.974		302.183	
EXISTING SURFACE	301.605		302.084	302.102		302.183	
OFFSETS	-14.973		-1.500	1.500		12.663	

CHAINAGE 450.000

CONTROL LINE MC10
X = 677358.926
Y = 7063317.312
Z = 304.983

Datum 300.00

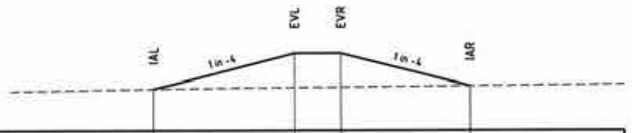


	IAL		EVL	EVR		IAR	
DESIGN HEIGHT	302.592		304.983	304.983		302.456	
EXISTING SURFACE	302.592		302.534	302.515		302.456	
OFFSETS	-11.065		-1.500	1.500		11.607	

CHAINAGE 600.000

CONTROL LINE MC10
X = 677209.668
Y = 7063422.217
Z = 304.970

Datum 300.00

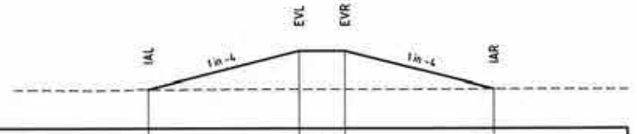


	IAL		EVL	EVR		IAR	
DESIGN HEIGHT	302.672		304.970	304.970		302.866	
EXISTING SURFACE	302.672		302.769	302.793		302.866	
OFFSETS	-10.692		-1.500	1.500		9.918	

CHAINAGE 400.000

CONTROL LINE MC10
X = 677309.996
Y = 7063327.602
Z = 304.980

Datum 300.00

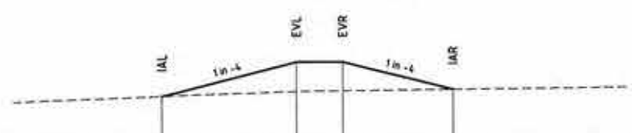


	IAL		EVL	EVR		IAR	
DESIGN HEIGHT	302.525		304.980	304.980		302.549	
EXISTING SURFACE	302.525		302.530	302.529		302.549	
OFFSETS	-11.321		-1.500	1.500		11.225	

CHAINAGE 550.000

CONTROL LINE MC10
X = 677201.195
Y = 7063471.494
Z = 304.967

Datum 300.00

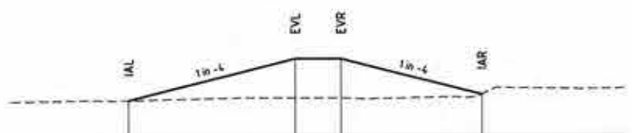


	IAL		EVL	EVR		IAR	
DESIGN HEIGHT	302.767		304.967	304.967		303.165	
EXISTING SURFACE	302.767		303.052	303.092		303.165	
OFFSETS	-10.299		-1.500	1.500		8.707	

CHAINAGE 350.000

CONTROL LINE MC10
X = 677262.302
Y = 7063341.841
Z = 304.977

Datum 300.00



	IAL		EVL	EVR		IAR	
DESIGN HEIGHT	302.264		304.977	304.977		302.674	
EXISTING SURFACE	302.264		302.442	302.440		302.674	
OFFSETS	-12.350		-1.500	1.500		10.711	

CHAINAGE 500.000

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	30/01/2014	ISSUED FOR CONSTRUCTION	019	AZ
B	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
C	7/07/2014	LEVEE LEVELS AMENDED	-	

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

SCALE 1:200 2 0 2 4 6 8 10

DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

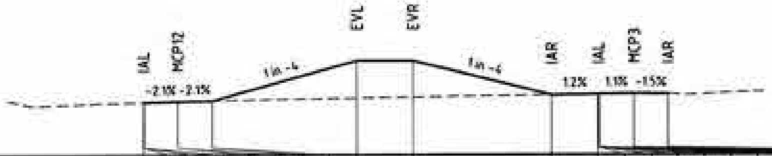
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
ANNOTATED CROSS SECTION
CONTROL LINE MC10
SHEET 2

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:200	CONSTRUCTION	30031182-XS-1002	C

150 mm ON ORIGINAL
A1

CONTROL LINE MC10
X = 677533.122
Y = 7063322.750
Z = 304.990

Datum 300.00



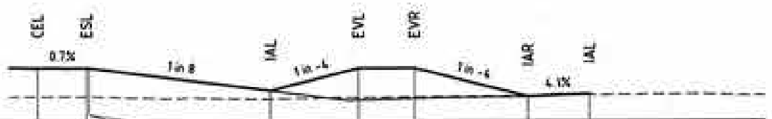
DESIGN HEIGHT	302.788	302.788	302.793	302.793	302.832	302.832	302.870	302.870	304.990	304.990	303.163	303.193
EXISTING SURFACE	302.788	302.788	302.788	302.788	302.832	302.832	302.872	302.872	303.014	303.064	303.163	303.193
OFFSETS	-12.780	-12.780	-12.757	-12.757	-10.957	-10.957	-9.157	-9.157	-1.500	1.500	8.807	11.270

DESIGN HEIGHT	303.193	303.193	303.193	303.193	303.193	303.208	303.208	303.208	303.208	303.208	303.208	303.228	303.228	303.202	303.202	303.203	303.203
EXISTING SURFACE	303.193	303.193	303.193	303.193	303.193	303.194	303.194	303.194	303.194	303.194	303.194	303.198	303.198	303.203	303.203	303.203	303.203
OFFSETS	11.270	11.272	11.272	11.273	11.273	11.332	11.332	11.332	11.332	11.332	11.332	13.139	13.139	14.946	14.946	14.962	14.962

CHAINAGE 815.000

CONTROL LINE MC10
X = 677495.928
Y = 7063288.498
Z = 304.821

Datum 302.00



DESIGN HEIGHT	304.901	304.884	304.882	304.882	303.658	304.821	304.821	303.322	303.455
EXISTING SURFACE	303.370	303.371	303.367	303.367	303.210	303.283	303.305	303.354	303.455
OFFSETS	-18.477	-15.897	-15.765	-15.765	-6.149	-1.500	1.500	7.495	10.733

CHAINAGE 740.000

CONTROL LINE MC10
X = 677659.249
Y = 7063310.251
Z = 304.991

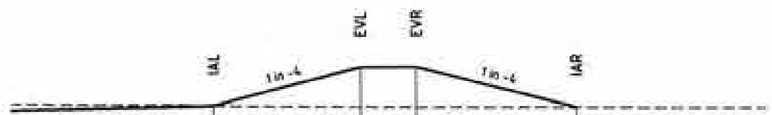
Datum 298.00

DESIGN HEIGHT	300.639	304.991	304.991	302.295
EXISTING SURFACE	300.639	301.467	301.622	302.297
OFFSETS	-18.908	-1.500	1.500	13.115

CHAINAGE 950.000

CONTROL LINE MC10
X = 677456.785
Y = 7063296.730
Z = 304.990

Datum 300.00



DESIGN HEIGHT	303.039	304.990	304.990	302.878
EXISTING SURFACE	303.039	302.944	302.922	302.878
OFFSETS	-9.302	-1.500	1.500	9.947

CHAINAGE 700.000

CONTROL LINE MC10
X = 677616.828
Y = 7063335.551
Z = 304.990

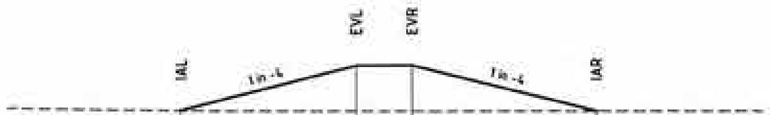
Datum 298.00

DESIGN HEIGHT	300.811	304.990	304.990	302.077
EXISTING SURFACE	300.811	301.475	301.614	302.077
OFFSETS	-18.219	-1.500	1.500	13.155

CHAINAGE 900.000

CONTROL LINE MC10
X = 677407.855
Y = 7063307.021
Z = 304.986

Datum 300.00

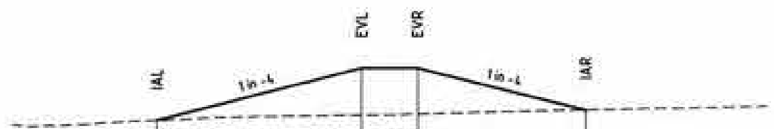


DESIGN HEIGHT	302.669	304.986	304.986	302.545
EXISTING SURFACE	302.669	302.585	302.569	302.545
OFFSETS	-10.769	-1.500	1.500	11.267

CHAINAGE 650.000

CONTROL LINE MC10
X = 677567.497
Y = 7063329.331
Z = 304.990

Datum 300.00



DESIGN HEIGHT	302.285	304.990	304.990	302.764
EXISTING SURFACE	302.285	302.532	302.575	302.764
OFFSETS	-12.320	-1.500	1.500	10.402

CHAINAGE 850.000

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	A	30/01/2014	ISSUED FOR CONSTRUCTION	019	AZ
	B	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
	C	16/05/2014	GOLDERS LEVEE REALIGNMENT	032	AZ
	D	7/07/2014	LEVEE LEVELS AMENDED	-	

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
SCALE 1:200 2 0 2 4 6 8 10

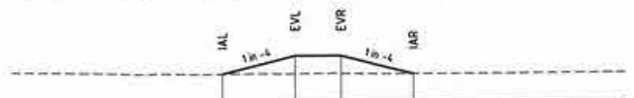
DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
© ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
ANNOTATED CROSS SECTION
CONTROL LINE MC10
SHEET 3

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:200	CONSTRUCTION	30031182-XS-1003	D

CONTROL LINE MC10
X = 677792.539
Y = 7063223.987
Z = 304.992

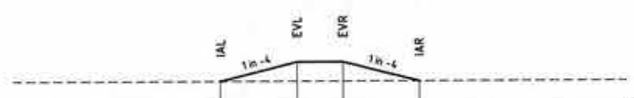


Datum 302.00

DESIGN HEIGHT	303.816	304.992	304.992	303.813	
EXISTING SURFACE	303.816	303.822	303.821	303.813	
OFFSETS	-6.203	-1.500	1.500	6.214	

CHAINAGE 1150.000

CONTROL LINE MC10
X = 677744.193
Y = 7063218.399
Z = 304.991

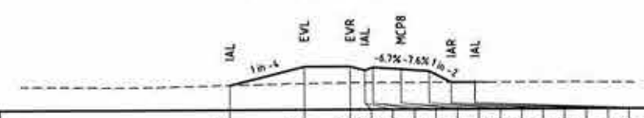


Datum 302.00

DESIGN HEIGHT	303.750	304.991	304.991	303.750	
EXISTING SURFACE	303.750	303.750	303.750	303.750	
OFFSETS	-6.464	-1.500	1.500	6.464	

CHAINAGE 1100.000

CONTROL LINE MC10
X = 677692.443
Y = 7063230.284
Z = 304.799



Datum 302.00

DESIGN HEIGHT	303.598	304.799	304.799	304.542	304.542	304.732	304.732	304.611	304.611	304.473	304.473	303.750	303.750	303.750	303.750	303.754	303.754
EXISTING SURFACE	303.598	303.700	303.749	303.750	303.750	303.750	303.750	303.750	303.750	303.750	303.750	303.750	303.750	303.750	303.750	303.750	
OFFSETS	-6.306	-1.500	1.500	2.464	2.464	3.009	3.009	4.831	4.831	6.653	6.653	8.120	8.120	9.637	9.637	9.647	9.647

CHAINAGE 1045.000

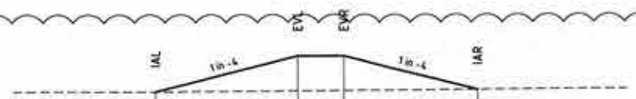
CONTROL LINE MC10
X = 677668.070
Y = 7063261.817
Z = 304.991

Datum 302.00

DESIGN HEIGHT	303.373	304.991	304.991	303.581	
EXISTING SURFACE	303.373	303.388	303.416	303.581	
OFFSETS	-7.970	-1.500	1.500	7.138	

CHAINAGE 1000.000

CONTROL LINE MC10
X = 677865.695
Y = 7063039.818
Z = 304.987



Datum 300.00

DESIGN HEIGHT	302.671	304.987	304.987	302.795	
EXISTING SURFACE	302.671	302.720	302.742	302.795	
OFFSETS	-10.765	-1.500	1.500	10.269	

CHAINAGE 1350.000

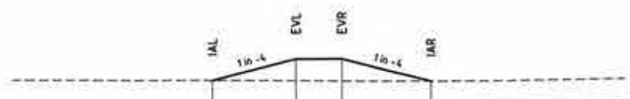
CONTROL LINE MC10
X = 677838.519
Y = 7063081.632
Z = 304.989

Datum 302.00

DESIGN HEIGHT	303.369	304.989	304.989	303.338	
EXISTING SURFACE	303.369	303.333	303.329	303.338	
OFFSETS	-7.981	-1.500	1.500	8.102	

CHAINAGE 1300.000

CONTROL LINE MC10
X = 677821.486
Y = 7063128.580
Z = 304.990

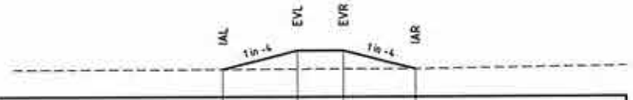


Datum 302.00

DESIGN HEIGHT	303.631	304.990	304.990	303.529	
EXISTING SURFACE	303.631	303.587	303.558	303.529	
OFFSETS	-6.938	-1.500	1.500	7.346	

CHAINAGE 1250.000

CONTROL LINE MC10
X = 677806.445
Y = 7063176.264
Z = 304.992



Datum 302.00

DESIGN HEIGHT	303.780	304.992	304.992	303.810	
EXISTING SURFACE	303.780	303.802	303.809	303.810	
OFFSETS	-6.346	-1.500	1.500	6.228	

CHAINAGE 1200.000

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES:	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	A	30/01/2014	ISSUED FOR CONSTRUCTION	019	AZ
	B	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
	C	16/05/2014	GOLDERS LEVEE REALIGNMENT	032	AZ
	D	7/07/2014	LEVEE LEVELS AMENDED	-	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
SCALE 1:200

DESIGNER
SMEC
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SMEC PROJECT No 30031182

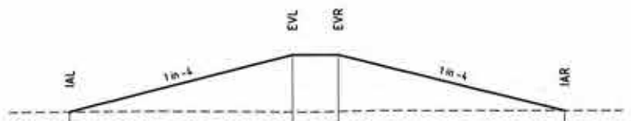
CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
ANNOTATED CROSS SECTION
CONTROL LINE MC10
SHEET 4

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:200	CONSTRUCTION	30031182-XS-1004	D

150 mm ON ORIGINAL
A1

CONTROL LINE MC10
X = 677990.138
Y = 7062958.252
Z = 304.982

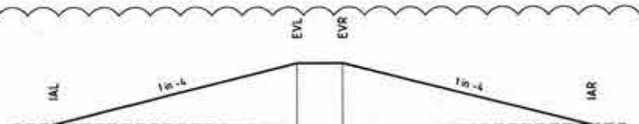


Datum 300.00

DESIGN HEIGHT	301.341	304.982	304.982	301.299
EXISTING SURFACE	301.341	301.271	301.292	301.299
OFFSETS	-16.067	-1.500	1.500	16.234

CHAINAGE 1500.000

CONTROL LINE MC10
X = 678123.585
Y = 7062889.794
Z = 304.978

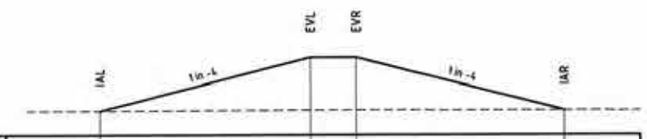


Datum 298.00

DESIGN HEIGHT	301.000	304.978	304.978	300.915
EXISTING SURFACE	301.000	300.859	300.830	300.915
OFFSETS	-17.410	-1.500	1.500	17.749

CHAINAGE 1650.000

CONTROL LINE MC10
X = 677945.758
Y = 7062981.282
Z = 304.984

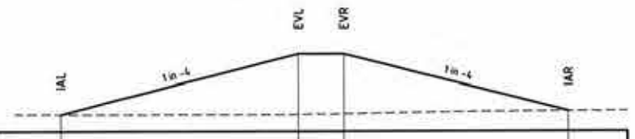


Datum 300.00

DESIGN HEIGHT	301.565	304.984	304.984	301.590
EXISTING SURFACE	301.565	301.611	301.609	301.590
OFFSETS	-15.178	-1.500	1.500	15.076

CHAINAGE 1450.000

CONTROL LINE MC10
X = 678078.899
Y = 7062912.192
Z = 304.979

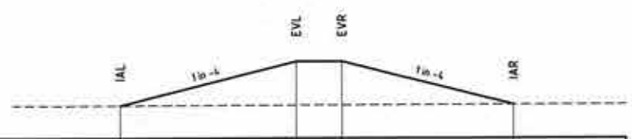


Datum 300.00

DESIGN HEIGHT	301.098	304.979	304.979	301.312
EXISTING SURFACE	301.098	301.104	301.145	301.312
OFFSETS	-17.026	-1.500	1.500	16.169

CHAINAGE 1600.000

CONTROL LINE MC10
X = 677902.372
Y = 7063006.026
Z = 304.986

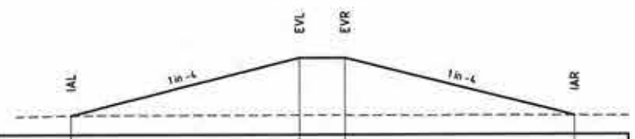


Datum 300.00

DESIGN HEIGHT	302.121	304.986	304.986	302.189
EXISTING SURFACE	302.121	302.144	302.151	302.189
OFFSETS	-12.959	-1.500	1.500	12.687

CHAINAGE 1400.000

CONTROL LINE MC10
X = 678034.519
Y = 7062935.222
Z = 304.981



Datum 300.00

DESIGN HEIGHT	301.245	304.981	304.981	301.233
EXISTING SURFACE	301.245	301.266	301.265	301.233
OFFSETS	-16.444	-1.500	1.500	16.493

CHAINAGE 1550.000

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	30/01/2014	REISSUED FOR SECTIONS B&D	019	AZ
C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
D	7/07/2014	LEVEE LEVELS AMENDED	-	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

SCALE 1:200 0 2 4 6 8 10

DESIGNER
SMEC
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SOUTH BRISBANE QLD 4101
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SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
ANNOTATED CROSS SECTION
CONTROL LINE MC10
SHEET 5

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:200	CONSTRUCTION	30031182-XS-1005	D

150 mm ON ORIGINAL
A1

CONTROL LINE MC10
X = 678270.876
Y = 7062883.409
Z = 304.973

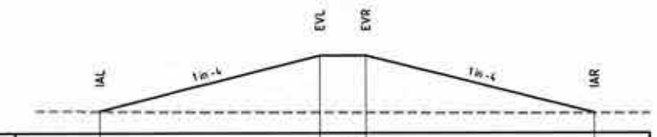
Datum 300.00

DESIGN HEIGHT	301.569		304.973	304.973	301.381	
EXISTING SURFACE	301.569		301.488	301.464	301.381	
OFFSETS	-15.116		-1.500	1.500	15.870	

CHAINAGE 1800.000

CONTROL LINE MC10
X = 678221.510
Y = 7062875.508
Z = 304.975

Datum 300.00

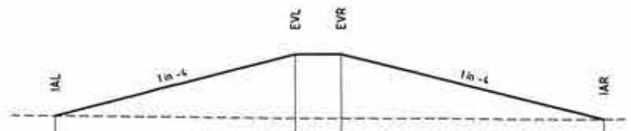


DESIGN HEIGHT	301.379		304.975	304.975	301.261	
EXISTING SURFACE	301.379		301.310	301.300	301.261	
OFFSETS	-15.883		-1.500	1.500	16.354	

CHAINAGE 1750.000

CONTROL LINE MC10
X = 678171.650
Y = 7062876.499
Z = 304.976

Datum 298.00

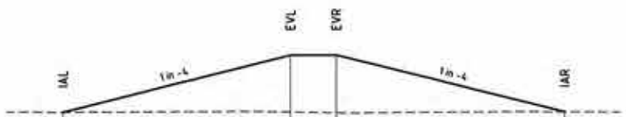


DESIGN HEIGHT	301.053		304.976	304.976	300.699	
EXISTING SURFACE	301.053		300.837	300.812	300.699	
OFFSETS	-17.191		-1.500	1.500	18.610	

CHAINAGE 1700.000

CONTROL LINE MC10
X = 678418.810
Y = 7062908.220
Z = 304.925

Datum 300.00

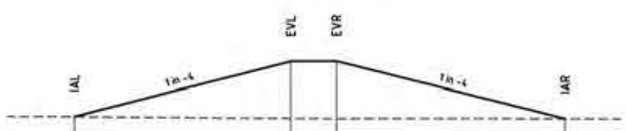


DESIGN HEIGHT	301.214		304.925	304.925	301.195	
EXISTING SURFACE	301.214		301.212	301.159	301.195	
OFFSETS	-16.346		-1.500	1.500	16.423	

CHAINAGE 1950.000

CONTROL LINE MC10
X = 678369.498
Y = 7062899.949
Z = 304.941

Datum 300.00

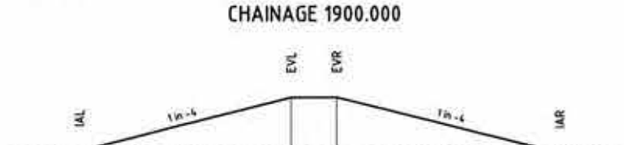


DESIGN HEIGHT	301.401		304.941	304.941	301.213	
EXISTING SURFACE	301.401		301.271	301.256	301.213	
OFFSETS	-15.660		-1.500	1.500	16.415	

CHAINAGE 1900.000

CONTROL LINE MC10
X = 678320.187
Y = 7062891.679
Z = 304.957

Datum 300.00



DESIGN HEIGHT	301.488		304.957	304.957	301.319	
EXISTING SURFACE	301.488		301.428	301.412	301.319	
OFFSETS	-15.379		-1.500	1.500	16.055	

CHAINAGE 1850.000

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	20/01/2016	ISSUED FOR CONSTRUCTION	006	AZ
B	31/03/2016	BIRKETT LEVEE REALIGNMENT	030	AZ
C	7/07/2016	LEVEE LEVELS AMENDED	-	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

SCALE 1:200 2 0 2 4 6 8 10

DESIGNER
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SMEC PROJECT No 30031182

CLIENT
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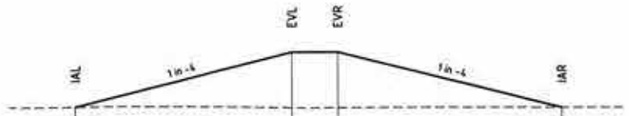
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
ANNOTATED CROSS SECTION
CONTROL LINE MC10
SHEET 6

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:200	CONSTRUCTION	30031182-XS-1006	C

150 mm ON ORIGINAL
A1

CONTROL LINE MC10
X = 678566.744
Y = 7062933.030
Z = 304.877

Datum 300.00

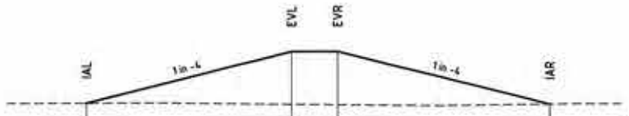


	IAL		EVL	EVR		IAR
DESIGN HEIGHT	301.341		304.877	304.877		301.239
EXISTING SURFACE	301.341		301.263	301.255		301.239
OFFSETS	-15.646		-1.500	1.500		16.053

CHAINAGE 2100.000

CONTROL LINE MC10
X = 678714.742
Y = 7062957.423
Z = 304.829

Datum 300.00

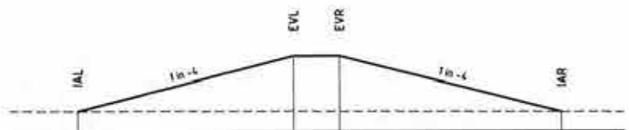


	IAL		EVL	EVR		IAR
DESIGN HEIGHT	301.485		304.829	304.829		301.359
EXISTING SURFACE	301.485		301.388	301.352		301.359
OFFSETS	-14.876		-1.500	1.500		15.382

CHAINAGE 2250.000

CONTROL LINE MC10
X = 678517.432
Y = 7062924.760
Z = 304.876

Datum 300.00

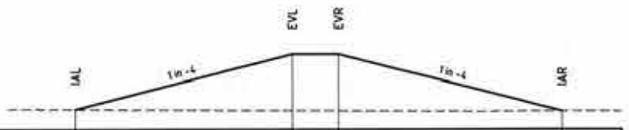


	IAL		EVL	EVR		IAR
DESIGN HEIGHT	301.352		304.876	304.876		301.266
EXISTING SURFACE	301.352		301.329	301.318		301.266
OFFSETS	-15.596		-1.500	1.500		15.939

CHAINAGE 2050.000

CONTROL LINE MC10
X = 678665.366
Y = 7062949.570
Z = 304.845

Datum 300.00

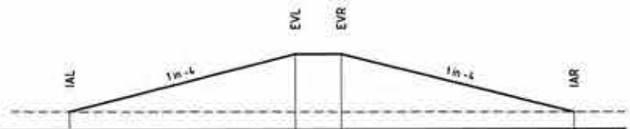


	IAL		EVL	EVR		IAR
DESIGN HEIGHT	301.304		304.845	304.845		301.193
EXISTING SURFACE	301.304		301.232	301.218		301.193
OFFSETS	-15.665		-1.500	1.500		16.110

CHAINAGE 2200.000

CONTROL LINE MC10
X = 678468.121
Y = 7062916.490
Z = 304.910

Datum 300.00

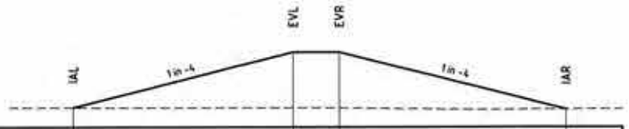


	IAL		EVL	EVR		IAR
DESIGN HEIGHT	301.230		304.910	304.910		301.120
EXISTING SURFACE	301.230		301.172	301.156		301.120
OFFSETS	-16.219		-1.500	1.500		16.658

CHAINAGE 2000.000

CONTROL LINE MC10
X = 678616.055
Y = 7062941.300
Z = 304.861

Datum 300.00



	IAL		EVL	EVR		IAR
DESIGN HEIGHT	301.266		304.861	304.861		301.159
EXISTING SURFACE	301.266		301.260	301.248		301.159
OFFSETS	-15.882		-1.500	1.500		16.311

CHAINAGE 2150.000

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
C	7/07/2014	LEVEE LEVELS AMENDED	-	

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

SCALE 1:200 2 4 6 8 10

DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
© ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD 4101
PH 07 3029 0500 FAX 07 3029 0650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
ANNOTATED CROSS SECTION
CONTROL LINE MC10
SHEET 7

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:200	CONSTRUCTION	30031182-XS-1007	C

150 mm ON ORIGINAL
A1

CONTROL LINE MC10
X = 678912.854
Y = 7062942.552
Z = 304.503

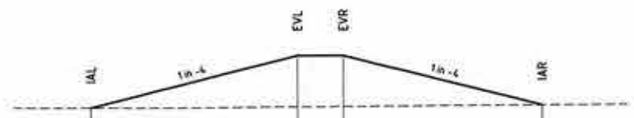
Datum 300.00

DESIGN HEIGHT	301.044	304.503	304.503	301.076
EXISTING SURFACE	301.044	301.039	301.025	301.076
OFFSETS	-15.038	-1.500	1.500	15.298

CHAINAGE 2450.000

CONTROL LINE MC10
X = 678864.133
Y = 7062953.699
Z = 304.585

Datum 300.00

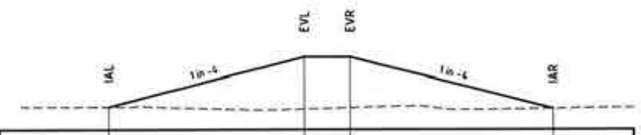


DESIGN HEIGHT	301.216	304.585	304.585	301.346
EXISTING SURFACE	301.216	301.251	301.267	301.346
OFFSETS	-14.978	-1.500	1.500	14.456

CHAINAGE 2400.000

CONTROL LINE MC10
X = 678814.544
Y = 7062959.926
Z = 304.667

Datum 300.00

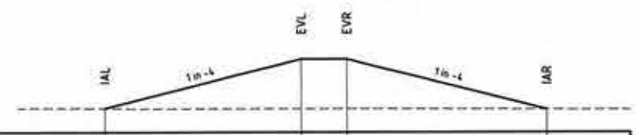


DESIGN HEIGHT	301.480	304.667	304.667	301.359
EXISTING SURFACE	301.480	301.330	301.413	301.359
OFFSETS	-14.246	-1.500	1.500	14.731

CHAINAGE 2350.000

CONTROL LINE MC10
X = 678764.580
Y = 7062961.172
Z = 304.749

Datum 300.00

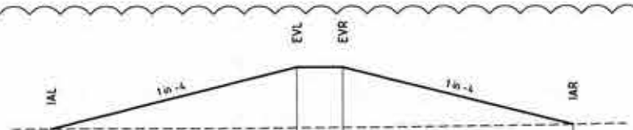


DESIGN HEIGHT	301.551	304.749	304.749	301.488
EXISTING SURFACE	301.551	301.526	301.525	301.488
OFFSETS	-14.291	-1.500	1.500	14.543

CHAINAGE 2300.000

CONTROL LINE MC10
X = 679051.820
Y = 7062886.637
Z = 304.317

Datum 298.00

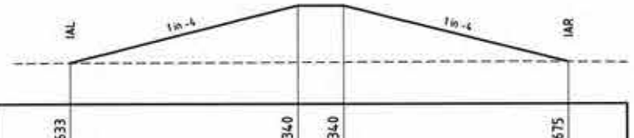


DESIGN HEIGHT	300.314	304.317	304.317	300.560
EXISTING SURFACE	300.314	300.370	300.392	300.560
OFFSETS	-17.511	-1.500	1.500	16.526

CHAINAGE 2600.000

CONTROL LINE MC10
X = 679006.324
Y = 7062907.256
Z = 304.340

Datum 298.00

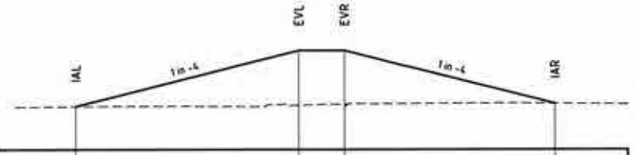


DESIGN HEIGHT	300.633	304.340	304.340	300.675
EXISTING SURFACE	300.633	300.661	300.671	300.675
OFFSETS	-16.328	-1.500	1.500	16.160

CHAINAGE 2550.000

CONTROL LINE MC10
X = 678960.218
Y = 7062926.597
Z = 304.422

Datum 298.00



DESIGN HEIGHT	300.790	304.422	304.422	300.987
EXISTING SURFACE	300.790	300.874	300.931	300.987
OFFSETS	-16.026	-1.500	1.500	15.237

CHAINAGE 2500.000

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No	APPROVAL
A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
C	7/07/2014	LEVEE LEVELS AMENDED	-	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

SCALE 1:200

DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
ANNOTATED CROSS SECTION
CONTROL LINE MC10
SHEET 8

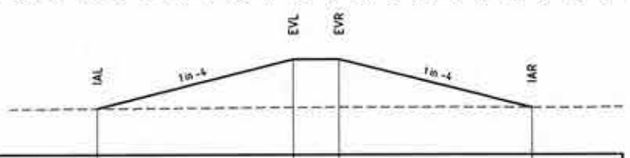
SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:200	CONSTRUCTION	30031182-XS-1008	C

150 mm ON ORIGINAL
A1

0

CONTROL LINE MC10
X = 679096.380
Y = 7062753.109
Z = 304.218

Datum 298.00

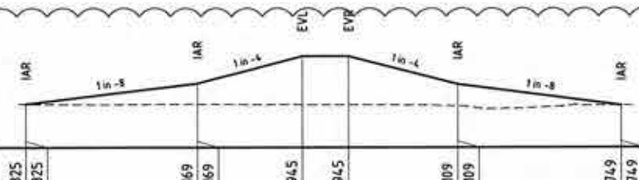


DESIGN HEIGHT	301.014		304.218	304.218	301.080
EXISTING SURFACE	301.014		301.093	301.100	301.080
OFFSETS	-14.316		-1.500	1.500	14.054

CHAINAGE 2750.000

CONTROL LINE MC10
X = 679113.763
Y = 7062604.785
Z = 303.945

Datum 298.00

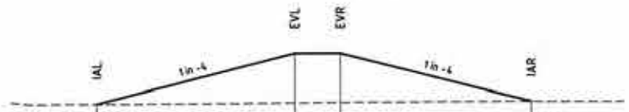


DESIGN HEIGHT	300.825	300.825	302.169	302.169	303.945	303.945	302.109	302.109	300.749	300.749
EXISTING SURFACE	300.825	300.825	300.818	300.818	300.784	300.775	300.696	300.696	300.749	300.749
OFFSETS	-19.531	-19.531	-8.368	-8.368	-1.500	1.500	8.607	8.607	19.316	19.316

CHAINAGE 2900.000

CONTROL LINE MC10
X = 679098.793
Y = 7062803.046
Z = 304.259

Datum 300.00

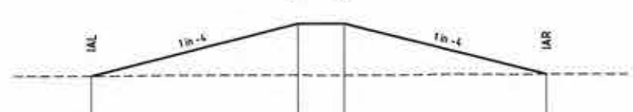


DESIGN HEIGHT	301.024		304.259	304.259	301.151
EXISTING SURFACE	301.024		301.089	301.112	301.151
OFFSETS	-14.443		-1.500	1.500	13.932

CHAINAGE 2700.000

CONTROL LINE MC10
X = 679103.785
Y = 7062653.780
Z = 304.136

Datum 298.00

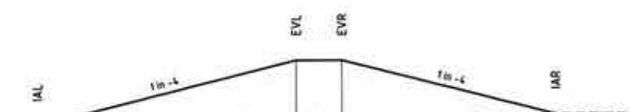


DESIGN HEIGHT	300.759		304.136	304.136	300.837
EXISTING SURFACE	300.759		300.800	300.795	300.837
OFFSETS	-15.009		-1.500	1.500	14.695

CHAINAGE 2850.000

CONTROL LINE MC10
X = 679085.978
Y = 7062850.839
Z = 304.301

Datum 298.00

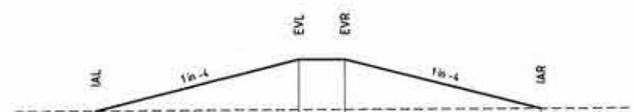


DESIGN HEIGHT	300.079		304.301	304.301	300.812
EXISTING SURFACE	300.079		300.476	300.521	300.812
OFFSETS	-18.387		-1.500	1.500	15.455

CHAINAGE 2650.000

CONTROL LINE MC10
X = 679096.174
Y = 7062703.153
Z = 304.177

Datum 298.00



DESIGN HEIGHT	300.854		304.177	304.177	300.979
EXISTING SURFACE	300.854		300.923	300.934	300.979
OFFSETS	-14.793		-1.500	1.500	14.291

CHAINAGE 2800.000

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	30/01/2014	ISSUED FOR CONSTRUCTION	019	AZ
B	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
C	16/05/2014	MCPHIE ST REALIGNMENT	032	AZ
D	7/07/2014	LEVEE LEVELS AMENDED	-	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

SCALE 1:200 2 0 2 4 6 8 10

DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
© ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD. 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

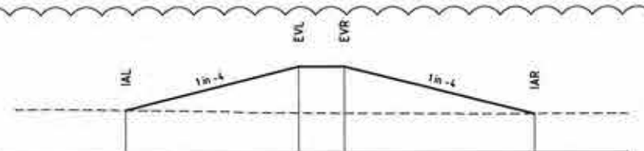
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
ANNOTATED CROSS SECTION
CONTROL LINE MC10
SHEET 9

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:200	CONSTRUCTION	30031182-XS-1009	D

150 mm ON ORIGINAL
A1
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

CONTROL LINE MC10
X = 679109.463
Y = 7062460.263
Z = 303.663

Datum 298.00

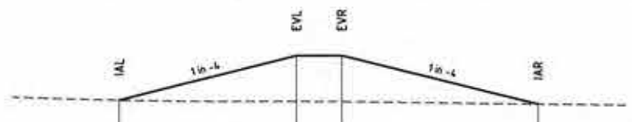


DESIGN HEIGHT	300.836	303.663	303.663	300.572	
EXISTING SURFACE	300.836	300.636	300.621	300.572	
OFFSETS	-12.807	-1.500	1.500	13.863	

CHAINAGE 3050.000

CONTROL LINE MC10
X = 679089.068
Y = 7062318.599
Z = 303.334

Datum 298.00

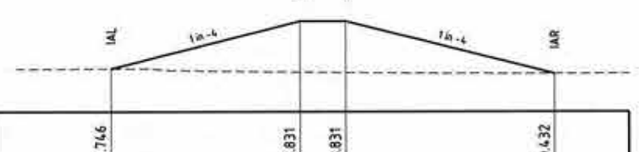


DESIGN HEIGHT	300.449	303.334	303.334	300.143	
EXISTING SURFACE	300.449	300.347	300.335	300.143	
OFFSETS	-13.039	-1.500	1.500	14.265	

CHAINAGE 3200.000

CONTROL LINE MC10
X = 679127.895
Y = 7062506.290
Z = 303.831

Datum 298.00

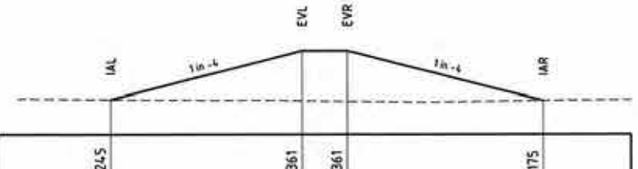


DESIGN HEIGHT	300.746	303.831	303.831	300.432	
EXISTING SURFACE	300.746	300.528	300.498	300.432	
OFFSETS	-13.840	-1.500	1.500	15.096	

CHAINAGE 3000.000

CONTROL LINE MC10
X = 679079.033
Y = 7062367.574
Z = 303.361

Datum 298.00

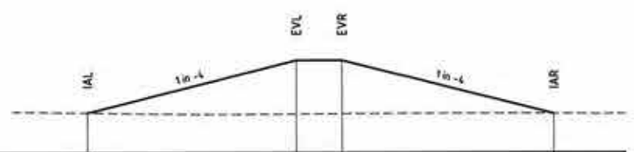


DESIGN HEIGHT	300.245	303.361	303.361	300.175	
EXISTING SURFACE	300.245	300.176	300.137	300.175	
OFFSETS	-13.961	-1.500	1.500	14.242	

CHAINAGE 3150.000

CONTROL LINE MC10
X = 679123.741
Y = 7062555.791
Z = 303.999

Datum 298.00

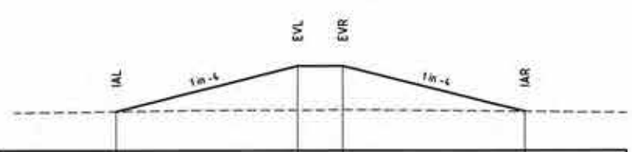


DESIGN HEIGHT	300.591	303.999	303.999	300.549	
EXISTING SURFACE	300.591	300.517	300.534	300.549	
OFFSETS	-15.130	-1.500	1.500	15.299	

CHAINAGE 2950.000

CONTROL LINE MC10
X = 679085.064
Y = 7062416.686
Z = 303.495

Datum 298.00



DESIGN HEIGHT	300.537	303.495	303.495	300.536	
EXISTING SURFACE	300.537	300.629	300.637	300.536	
OFFSETS	-13.330	-1.500	1.500	13.336	

CHAINAGE 3100.000

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	VVR No.	APPROVAL
	A	30/01/2014	ISSUED FOR CONSTRUCTION	019	AZ
	B	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
	C	16/05/2014	MCPHIE ST REALIGNMENT	032	AZ
	D	7/07/2014	LEVEE LEVELS AMENDED	-	A1

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

SCALE 1:200 2 0 2 4 6 8 10

DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

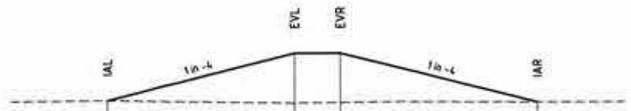
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
ANNOTATED CROSS SECTION
CONTROL LINE MC10
SHEET 10

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:200	CONSTRUCTION	30031182-XS-1010	D

150 mm ON ORIGINAL
A1

CONTROL LINE MC10
X = 679120.135
Y = 7062171.852
Z = 303.208

Datum 298.00

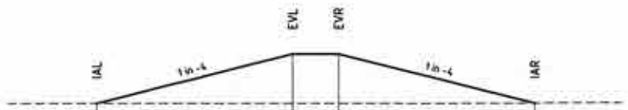


DESIGN HEIGHT	300.145		303.208	303.208	299.998	
EXISTING SURFACE	300.145		299.967	299.997	299.998	
OFFSETS	-13.749		-1.500	1.500	14.337	

CHAINAGE 3350.000

CONTROL LINE MC10
X = 679151.202
Y = 7062025.104
Z = 303.028

Datum 298.00

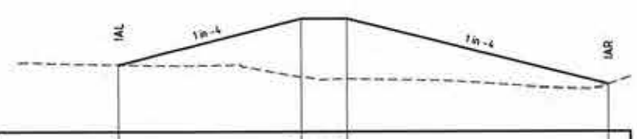


DESIGN HEIGHT	299.832		303.028	303.028	299.821	
EXISTING SURFACE	299.832		299.816	299.812	299.821	
OFFSETS	-14.284		-1.500	1.500	14.330	

CHAINAGE 3500.000

CONTROL LINE MC10
X = 679109.779
Y = 7062220.767
Z = 303.280

Datum 296.00

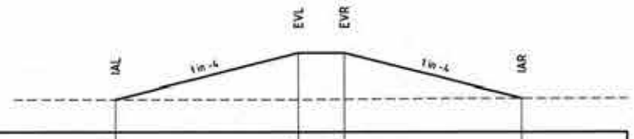


DESIGN HEIGHT	300.294		303.280	303.280	299.019	
EXISTING SURFACE	300.294		299.513	299.373	299.019	
OFFSETS	-13.444		-1.500	1.500	18.547	

CHAINAGE 3300.000

CONTROL LINE MC10
X = 679140.847
Y = 7062074.020
Z = 303.085

Datum 298.00

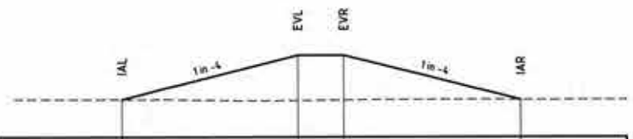


DESIGN HEIGHT	300.097		303.085	303.085	300.181	
EXISTING SURFACE	300.097		300.102	300.123	300.181	
OFFSETS	-13.450		-1.500	1.500	13.116	

CHAINAGE 3450.000

CONTROL LINE MC10
X = 679099.423
Y = 7062269.683
Z = 303.307

Datum 298.00

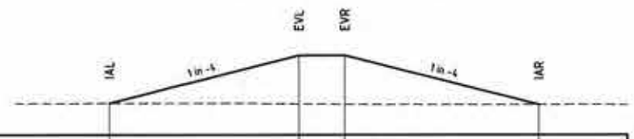


DESIGN HEIGHT	300.431		303.307	303.307	300.422	
EXISTING SURFACE	300.431		300.372	300.399	300.422	
OFFSETS	-13.003		-1.500	1.500	13.042	

CHAINAGE 3250.000

CONTROL LINE MC10
X = 679130.491
Y = 7062122.936
Z = 303.141

Datum 298.00



DESIGN HEIGHT	300.042		303.141	303.141	299.966	
EXISTING SURFACE	300.042		300.006	299.987	299.966	
OFFSETS	-13.896		-1.500	1.500	14.200	

CHAINAGE 3400.000

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	30/01/2014	ISSUED FOR CONSTRUCTION	019	AZ
B	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
C	7/07/2014	LEVEE LEVELS AMENDED	-	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

SCALE 1:200 2 0 2 4 6 8 10

DESIGNER
SMEC
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SOUTH BRISBANE QLD 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

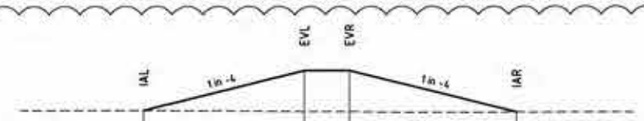
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
ANNOTATED CROSS SECTION
CONTROL LINE MC10
SHEET 11

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:200	CONSTRUCTION	30031182-XS-1011	C

150 mm ON ORIGINAL
A1

CONTROL LINE MC10
X = 679232.469
Y = 7061685.065
Z = 302.266

Datum 298.00

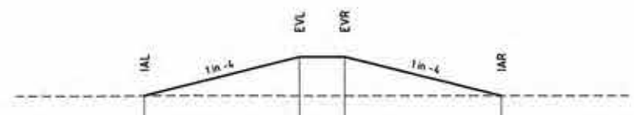


	IAL		EVL	EVR		IAR	
DESIGN HEIGHT	299.647		302.266	302.266		299.541	
EXISTING SURFACE	299.647		299.589	299.579		299.541	
OFFSETS	-11.976		-1.500	1.500		12.398	

CHAINAGE 3850.000

CONTROL LINE MC10
X = 679216.320
Y = 7061732.386
Z = 302.399

Datum 298.00

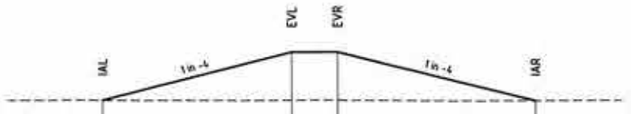


	IAL		EVL	EVR		IAR	
DESIGN HEIGHT	299.869		302.399	302.399		299.845	
EXISTING SURFACE	299.869		299.864	299.861		299.845	
OFFSETS	-11.621		-1.500	1.500		11.717	

CHAINAGE 3800.000

CONTROL LINE MC10
X = 679182.270
Y = 7061878.357
Z = 302.761

Datum 298.00

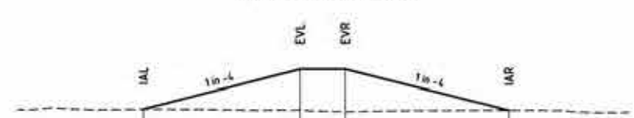


	IAL		EVL	EVR		IAR	
DESIGN HEIGHT	299.679		302.761	302.761		299.548	
EXISTING SURFACE	299.679		299.630	299.624		299.548	
OFFSETS	-13.827		-1.500	1.500		14.349	

CHAINAGE 3650.000

CONTROL LINE MC10
X = 679202.981
Y = 7061780.525
Z = 302.533

Datum 298.00

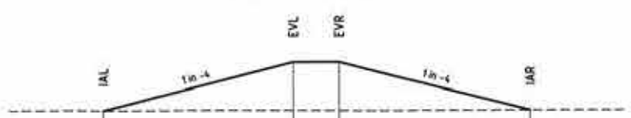


	IAL		EVL	EVR		IAR	
DESIGN HEIGHT	299.975		302.533	302.533		299.862	
EXISTING SURFACE	299.975		299.913	299.802		299.862	
OFFSETS	-11.732		-1.500	1.500		12.183	

CHAINAGE 3750.000

CONTROL LINE MC10
X = 679171.914
Y = 7061927.272
Z = 302.856

Datum 298.00

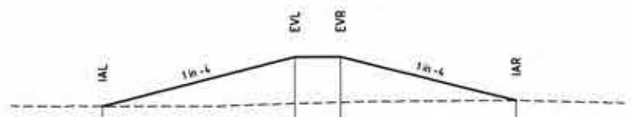


	IAL		EVL	EVR		IAR	
DESIGN HEIGHT	299.761		302.856	302.856		299.754	
EXISTING SURFACE	299.761		299.752	299.736		299.754	
OFFSETS	-13.879		-1.500	1.500		13.906	

CHAINAGE 3600.000

CONTROL LINE MC10
X = 679161.558
Y = 7061976.188
Z = 302.943

Datum 298.00

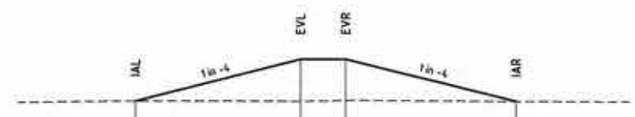


	IAL		EVL	EVR		IAR	
DESIGN HEIGHT	299.804		302.943	302.943		300.087	
EXISTING SURFACE	299.804		299.924	300.001		300.087	
OFFSETS	-14.057		-1.500	1.500		12.925	

CHAINAGE 3550.000

CONTROL LINE MC10
X = 679192.625
Y = 7061829.441
Z = 302.666

Datum 298.00



	IAL		EVL	EVR		IAR	
DESIGN HEIGHT	299.966		302.666	302.666		299.890	
EXISTING SURFACE	299.966		299.936	299.982		299.890	
OFFSETS	-12.300		-1.500	1.500		12.605	

CHAINAGE 3700.000

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	30/01/2014	REISSUED FOR SECTIONS B&D	019	AZ
C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
D	7/07/2014	LEVEE LEVELS AMENDED	-	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

SCALE 1:200

DESIGNER
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SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANDA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
ANNOTATED CROSS SECTION
CONTROL LINE MC10
SHEET 12

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:200	CONSTRUCTION	30031182-XS-1012	D

150 mm ON ORIGINAL
A1

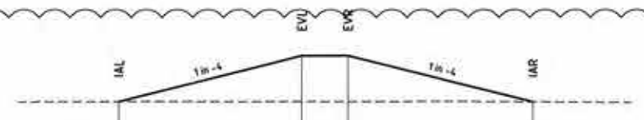
CONTROL LINE MC10
X = 679269.588
Y = 7061540.381
Z = 302.069

Datum 296.00

DESIGN HEIGHT	298.748		302.069	302.069		298.776
EXISTING SURFACE	298.748		299.005	299.161		298.776
OFFSETS	-14.784		-1.500	1.500		14.669

CHAINAGE 4000.000

CONTROL LINE MC10
X = 679248.797
Y = 7061392.339
Z = 301.957

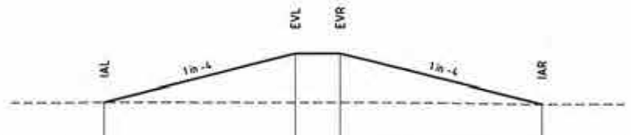


Datum 296.00

DESIGN HEIGHT	298.966		301.957	301.957		298.943
EXISTING SURFACE	298.966		298.970	298.958		298.943
OFFSETS	-13.463		-1.500	1.500		13.553

CHAINAGE 4150.000

CONTROL LINE MC10
X = 679262.955
Y = 7061589.881
Z = 302.123

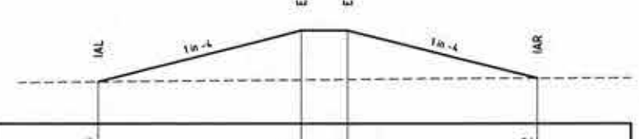


Datum 296.00

DESIGN HEIGHT	299.013		302.123	302.123		298.853
EXISTING SURFACE	299.013		298.992	298.991		298.853
OFFSETS	-13.941		-1.500	1.500		14.580

CHAINAGE 3950.000

CONTROL LINE MC10
X = 679258.916
Y = 7061441.304
Z = 301.996

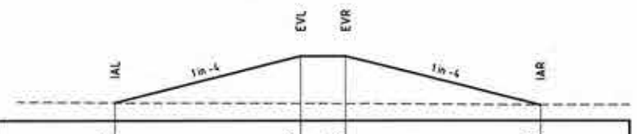


Datum 296.00

DESIGN HEIGHT	298.675		301.996	301.996		298.902
EXISTING SURFACE	298.675		298.790	298.812		298.902
OFFSETS	-14.784		-1.500	1.500		13.879

CHAINAGE 4100.000

CONTROL LINE MC10
X = 679248.618
Y = 7061637.745
Z = 302.188

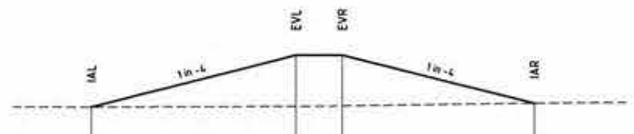


Datum 298.00

DESIGN HEIGHT	299.162		302.188	302.188		299.025
EXISTING SURFACE	299.162		299.119	299.105		299.025
OFFSETS	-13.601		-1.500	1.500		14.150

CHAINAGE 3900.000

CONTROL LINE MC10
X = 679267.917
Y = 7061490.467
Z = 302.033



Datum 296.00

DESIGN HEIGHT	298.683		302.033	302.033		298.901
EXISTING SURFACE	298.683		298.714	298.747		298.901
OFFSETS	-14.897		-1.500	1.500		14.027

CHAINAGE 4050.000

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	20/01/2016	ISSUED FOR CONSTRUCTION	008	AZ
B	31/03/2016	BIRKETT LEVEE REALIGNMENT	030	AZ
C	7/07/2016	LEVEE LEVELS AMENDED	-	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

SCALE 1:200

DESIGNER
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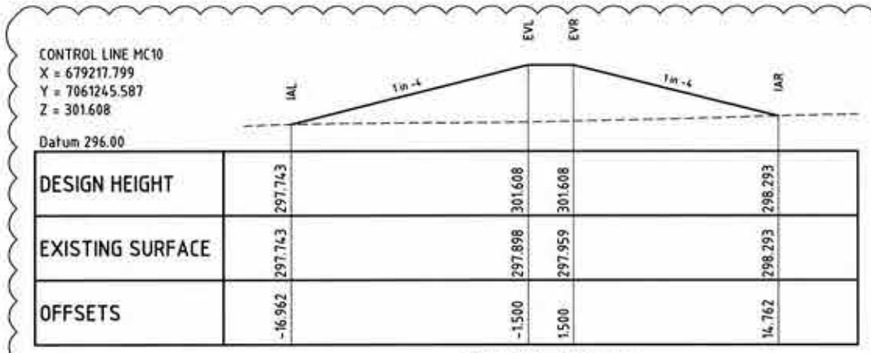
SMEC PROJECT No 30031182

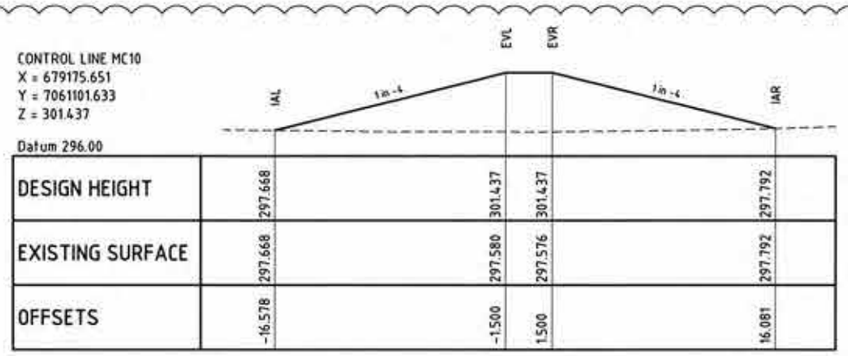
CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
ANNOTATED CROSS SECTION
CONTROL LINE MC10
SHEET 13

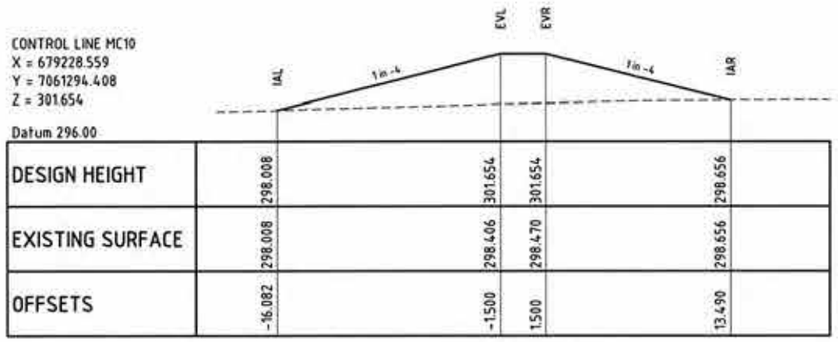
SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:200	CONSTRUCTION	30031182-XS-1013	C



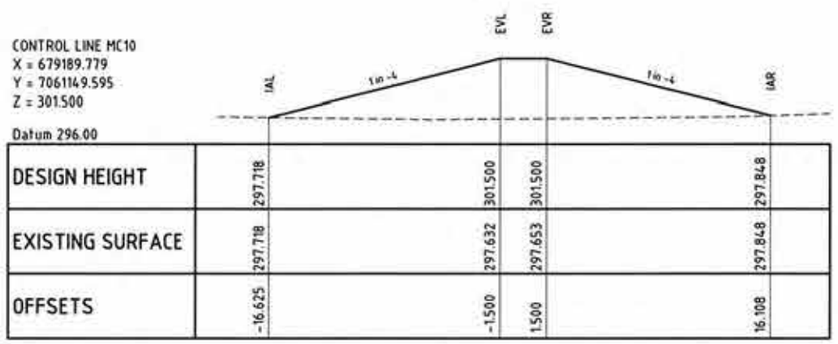
CHAINAGE 4300.000



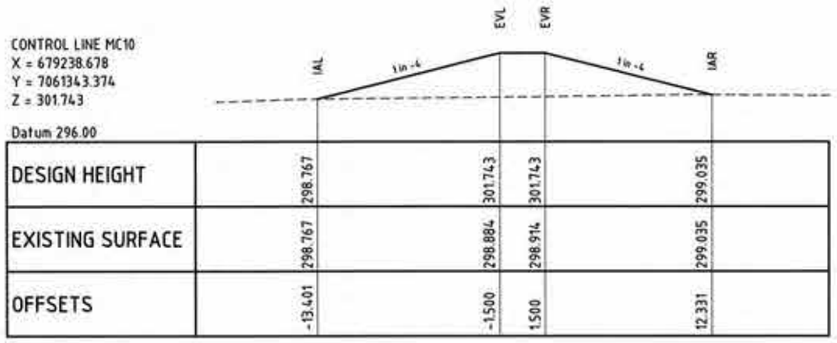
CHAINAGE 4450.000



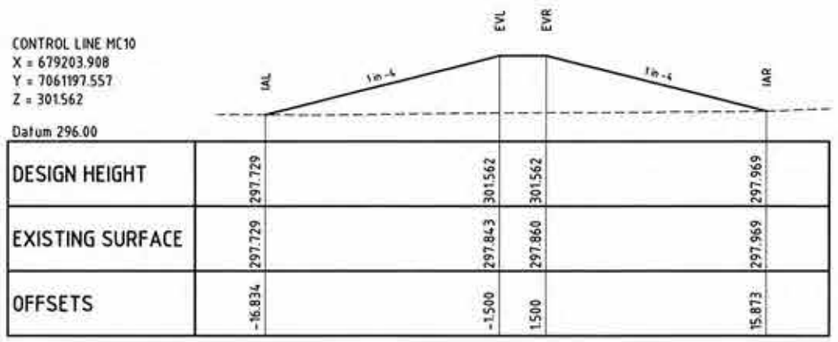
CHAINAGE 4250.000



CHAINAGE 4400.000



CHAINAGE 4200.000



CHAINAGE 4350.000

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	A	20/01/2014	ISSUED FOR CONSTRUCTION	068	AZ
	B	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
	C	7/07/2014	LEVEE LEVELS AMENDED	-	

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

SCALE 1:200 2 0 2 4 6 8 10

DESIGNER

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SMEC PROJECT No 30031182

CLIENT

maranoa REGIONAL COUNCIL

PROJECT TITLE

MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT

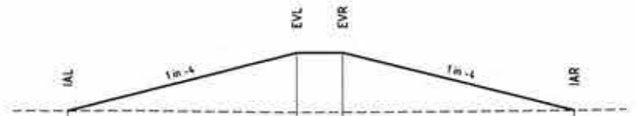
ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 14

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:200	CONSTRUCTION	30031182-XS-1014	C

155 mm ON ORIGINAL
A1

CONTROL LINE MC10
X = 679133.264
Y = 7060957.746
Z = 301.372

Datum 296.00

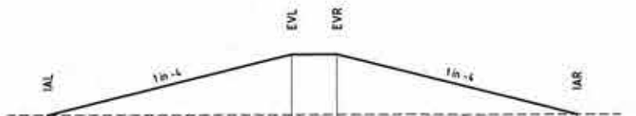


DESIGN HEIGHT	297.635	301.372	301.372	297.610	
EXISTING SURFACE	297.635	297.500	297.491	297.610	
OFFSETS	-16.447	-1.500	1.500	16.546	

CHAINAGE 4600.000

CONTROL LINE MC10
X = 679108.095
Y = 7060760.845
Z = 301.238

Datum 296.00

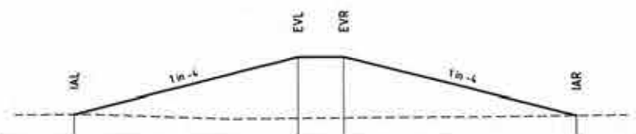


DESIGN HEIGHT	297.263	301.238	301.238	297.325	
EXISTING SURFACE	297.263	297.292	297.300	297.325	
OFFSETS	-17.399	-1.500	1.500	17.152	

CHAINAGE 4800.000

CONTROL LINE MC10
X = 679147.393
Y = 7061005.708
Z = 301.379

Datum 296.00

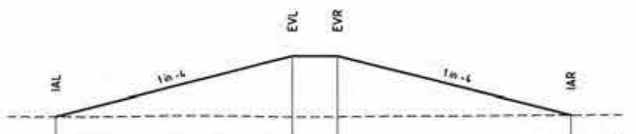


DESIGN HEIGHT	297.724	301.379	301.379	297.597	
EXISTING SURFACE	297.724	297.449	297.473	297.597	
OFFSETS	-16.117	-1.500	1.500	16.626	

CHAINAGE 4550.000

CONTROL LINE MC10
X = 679109.515
Y = 7060860.776
Z = 301.358

Datum 296.00

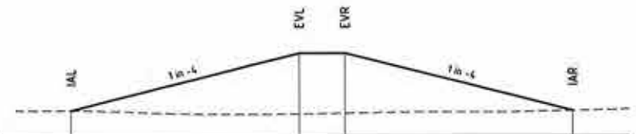


DESIGN HEIGHT	297.500	301.358	301.358	297.552	
EXISTING SURFACE	297.500	297.462	297.475	297.552	
OFFSETS	-16.929	-1.500	1.500	16.724	

CHAINAGE 4700.000

CONTROL LINE MC10
X = 679161.522
Y = 7061053.671
Z = 301.386

Datum 296.00

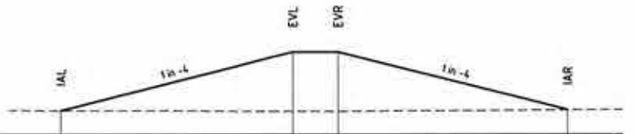


DESIGN HEIGHT	297.659	301.386	301.386	297.676	
EXISTING SURFACE	297.659	297.445	297.492	297.676	
OFFSETS	-16.405	-1.500	1.500	16.338	

CHAINAGE 4500.000

CONTROL LINE MC10
X = 679119.148
Y = 7060909.780
Z = 301.365

Datum 296.00



DESIGN HEIGHT	297.583	301.365	301.365	297.623	
EXISTING SURFACE	297.583	297.531	297.532	297.623	
OFFSETS	-16.626	-1.500	1.500	16.468	

CHAINAGE 4650.000

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
	B	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
	C	7/07/2014	LEVEE LEVELS AMENDED	-	

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

SCALE 1:200 2 0 2 4 6 8 10

DESIGNER

SMEC

SMEC AUSTRALIA PTY LTD
© ABN 47 065 475 149
LEVEL 1 · 154 MELBOURNE STREET
SOUTH BRISBANE QLD. 4101
PH 07 3029 6600 · FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT

maranoa REGIONAL COUNCIL

PROJECT TITLE

MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT

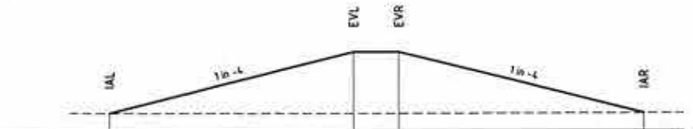
ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 15

SCALE	PHASE	PROJECT / DRAWING No	REVISION
1:200	CONSTRUCTION	30031182-XS-1015	C

150 mm ON ORIGINAL

A1

CONTROL LINE MC10
X = 679132.255
Y = 7060614.078
Z = 301.166

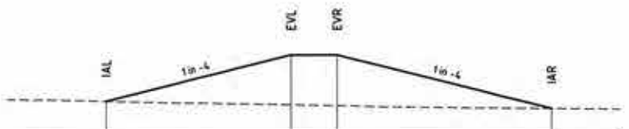


Datum 296.00

DESIGN HEIGHT	297.181		301.166	301.166		297.189
EXISTING SURFACE	297.181		297.146	297.149		297.189
OFFSETS	-17.438		-1.500	1.500		17.408

CHAINAGE 4950.000

CONTROL LINE MC10
X = 679222.377
Y = 7060496.125
Z = 300.993

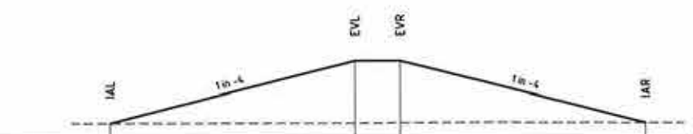


Datum 296.00

DESIGN HEIGHT	297.978		300.993	300.993		297.490
EXISTING SURFACE	297.978		297.752	297.696		297.490
OFFSETS	-13.559		-1.500	1.500		15.514

CHAINAGE 5100.000

CONTROL LINE MC10
X = 679116.587
Y = 7060661.499
Z = 301.190

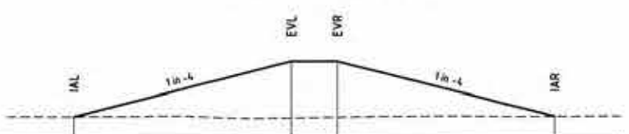


Datum 296.00

DESIGN HEIGHT	297.193		301.190	301.190		297.201
EXISTING SURFACE	297.193		297.202	297.213		297.201
OFFSETS	-17.488		-1.500	1.500		17.453

CHAINAGE 4900.000

CONTROL LINE MC10
X = 679185.893
Y = 7060530.229
Z = 301.117

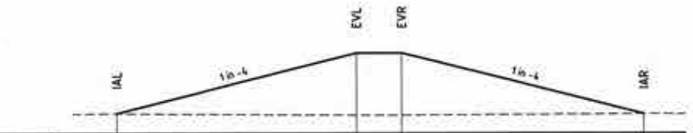


Datum 296.00

DESIGN HEIGHT	297.563		301.117	301.117		297.565
EXISTING SURFACE	297.563		297.481	297.529		297.565
OFFSETS	-15.719		-1.500	1.500		15.708

CHAINAGE 5050.000

CONTROL LINE MC10
X = 679109.004
Y = 7060710.862
Z = 301.214

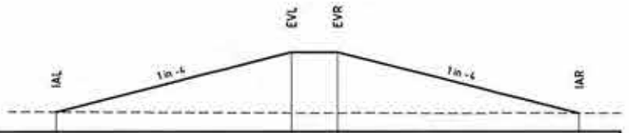


Datum 296.00

DESIGN HEIGHT	297.302		301.214	301.214		297.269
EXISTING SURFACE	297.302		297.194	297.192		297.269
OFFSETS	-17.147		-1.500	1.500		17.281

CHAINAGE 4850.000

CONTROL LINE MC10
X = 679155.572
Y = 7060569.914
Z = 301.141



Datum 296.00

DESIGN HEIGHT	297.293		301.141	301.141		297.190
EXISTING SURFACE	297.293		297.211	297.209		297.190
OFFSETS	-16.895		-1.500	1.500		17.304

CHAINAGE 5000.000

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
C	7/07/2014	LEVEE LEVELS AMENDED	-	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

SCALE 1:200 2 0 2 4 6 8 10

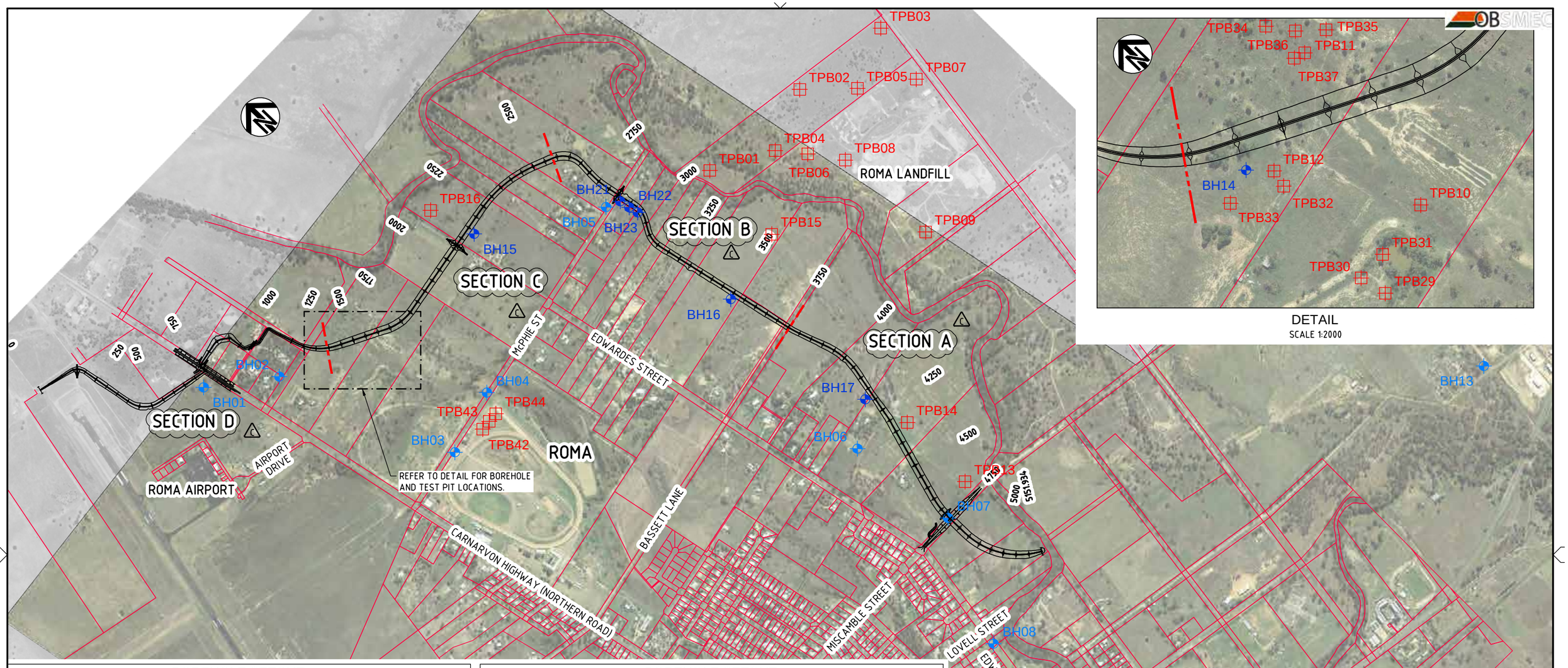
DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
© ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
ANNOTATED CROSS SECTION
CONTROL LINE MC10
SHEET 16

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:200	CONSTRUCTION	30031182-XS-1016	C

150 mm ON ORIGINAL
A1



DETAIL
SCALE 1:2000

BOREHOLE SETOUT

BOREHOLE	EASTING	NORTHING	R.L.	LATITUDE	LONGITUDE
BH01 (Exist.)	677453	7063248	-	-26.540003	148.781314
BH02 (Exist.)	677688	7063066	-	-26.541898	148.783590
BH03 (Exist.)	677952	7062372	-	-26.548128	148.786336
BH04 (Exist.)	678205	7062444	-	-26.547447	148.788865
BH05 (Exist.)	679045	7062614	-	-26.545806	148.797270
BH06 (Exist.)	679052	7061259	-	-26.558034	148.797531
BH07 (Exist.)	679104	7060819	-	-26.561998	148.798114
BH08 (Exist.)	678877	7060352	-	-26.566241	148.795902
BH09 (Exist.)	678829	7060048	-	-26.568991	148.795463
BH10 (Exist.)	678621	7059939	-	-26.570001	148.793391
BH11 (Exist.)	679161	7059642	-	-26.572613	148.798852
BH12 (Exist.)	679145	7059508	-	-26.573820	148.798709
BH13 (Exist.)	680978	7059736	-	-26.571533	148.817075
BH14	677931.047	7062952.378	301.490	-	-
BH15	678613.170	7062909.382	301.182	-	-
BH16	679125.878	7062016.657	299.783	-	-
BH17	679212.439	7061359.343	299.011	-	-
BH18	677526.818	7063351.668	302.420	-	-
BH19	677560.166	7063357.903	301.476	-	-
BH20	677590.388	7063360.726	301.207	-	-

BOREHOLE SETOUT

BOREHOLE	EASTING	NORTHING	R.L.	LATITUDE	LONGITUDE
BH21	679099.075	7062589.830	-	-	-
BH22	679106.959	7062548.424	-	-	-
BH23	679115.154	7062511.163	-	-	-
TPB01	679427.815	7062423.427	300.227	-	-
TPB02	679897.103	7062391.824	313.198	-	-
TPB03	680286.923	7062331.850	318.613	-	-
TPB04	679659.915	7062294.933	299.444	-	-
TPB05	680056.375	7062233.911	313.861	-	-
TPB06	679739.057	7062195.238	302.401	-	-
TPB07	680240.829	7062094.724	312.438	-	-
TPB08	679823.467	7062073.694	305.710	-	-
TPB09	679840.540	7061655.350	301.807	-	-
TPB10	678031.116	7062797.333	300.586	-	-
TPB11	678060.447	7062993.219	301.193	-	-
TPB12	677950.583	7062930.873	301.331	-	-
TPB13	679251.711	7060870.038	297.778	-	-
TPB14	679259.915	7061190.953	297.918	-	-
TPB15	679417.496	7062078.016	299.608	-	-
TPB16	678560.800	7063094.080	301.700	-	-
TPB29	677940.067	7062760.726	300.880	-	-

NOTES
1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.

BOREHOLE SETOUT

BOREHOLE	EASTING	NORTHING	R.L.	LATITUDE	LONGITUDE
TPB30	677934.061	7062789.307	300.965	-	-
TPB31	677967.614	7062790.223	299.536	-	-
TPB32	677946.255	7062912.751	301.302	-	-
TPB33	677895.510	7062940.236	301.895	-	-
TPB34	678052.110	7063041.470	301.160	-	-
TPB35	678093.002	7062994.458	301.256	-	-
TPB36	678070.194	7063016.144	301.220	-	-
TPB37	678049.585	7062997.314	301.164	-	-
TPB42	678092.404	7062356.942	303.080	-	-
TPB43	678131.573	7062359.779	302.999	-	-
TPB44	678170.320	7062362.000	302.824	-	-

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	30/01/2014	REISSUED FOR SECTIONS B&D	019	AZ
C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	O. CRACIUN
DESIGN CHECK	A. LAW
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
SCALE 1:2000 20 0 20 40 60 80 100
SCALE 1:7500 50 0 100 200 300

DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
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LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD. 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
GEOTECHNICAL INVESTIGATION AND BORROW PIT LOCATIONS OVERALL PLAN

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
AS SHOWN	CONSTRUCTION	30031182-GE-0101	C

150 mm ON ORIGINAL
A1

DCP SETOUT

DCP	EASTING	NORTHING
DCP001	677064.850	7063662.440
DCP002	677112.701	7063667.633
DCP003	677158.812	7063650.015
DCP004	677176.773	7063604.675
DCP005	677171.172	7063554.745
DCP006	677193.719	7063506.122
DCP007	677202.192	7063456.845
DCP008	677210.665	7063407.568
DCP009	677220.510	7063350.080
DCP010	677269.519	7063331.719
DCP011	677317.934	7063319.774
DCP012	677367.050	7063310.418
DCP013	677409.460	7063285.980
DCP014	677465.284	7063291.706
DCP015	677495.178	7063308.403
DCP018	677526.818	7063351.668
DCP019	677682.519	7063279.251
DCP020	677725.098	7063278.566
DCP021	677758.262	7063287.636

TEST PIT LOCATIONS

TEST PIT	EASTING	NORTHING
TP01	678476.974	7063382.737
TP02	683025.631	7059573.946
TP03	677064.850	7063662.440
TP04	677171.172	7063554.745
TP05	677220.510	7063350.080
TP06	677409.460	7063285.980
TP08	677725.098	7063278.566

TEST PIT LOCATIONS

TEST PIT	EASTING	NORTHING
TPx1	677483.891	7063387.895
TPx2	677557.020	7063047.447

BOREHOLE SETOUT

BOREHOLE	EASTING	NORTHING	LATITUDE	LONGITUDE
BH01* (Exist.)	677453	7063248	-26.540003	148.781314
BH18	677526.818	7063351.668	-	-
BH19	677560.166	7063357.903	-	-
BH20	677590.388	7063360.726	-	-

INSET 2

INSET 1

NOTES
1. FOR NOTES AND LEGEND REFER TO DRAWING 300182-GE-3010

ISSUED FOR CONSTRUCTION

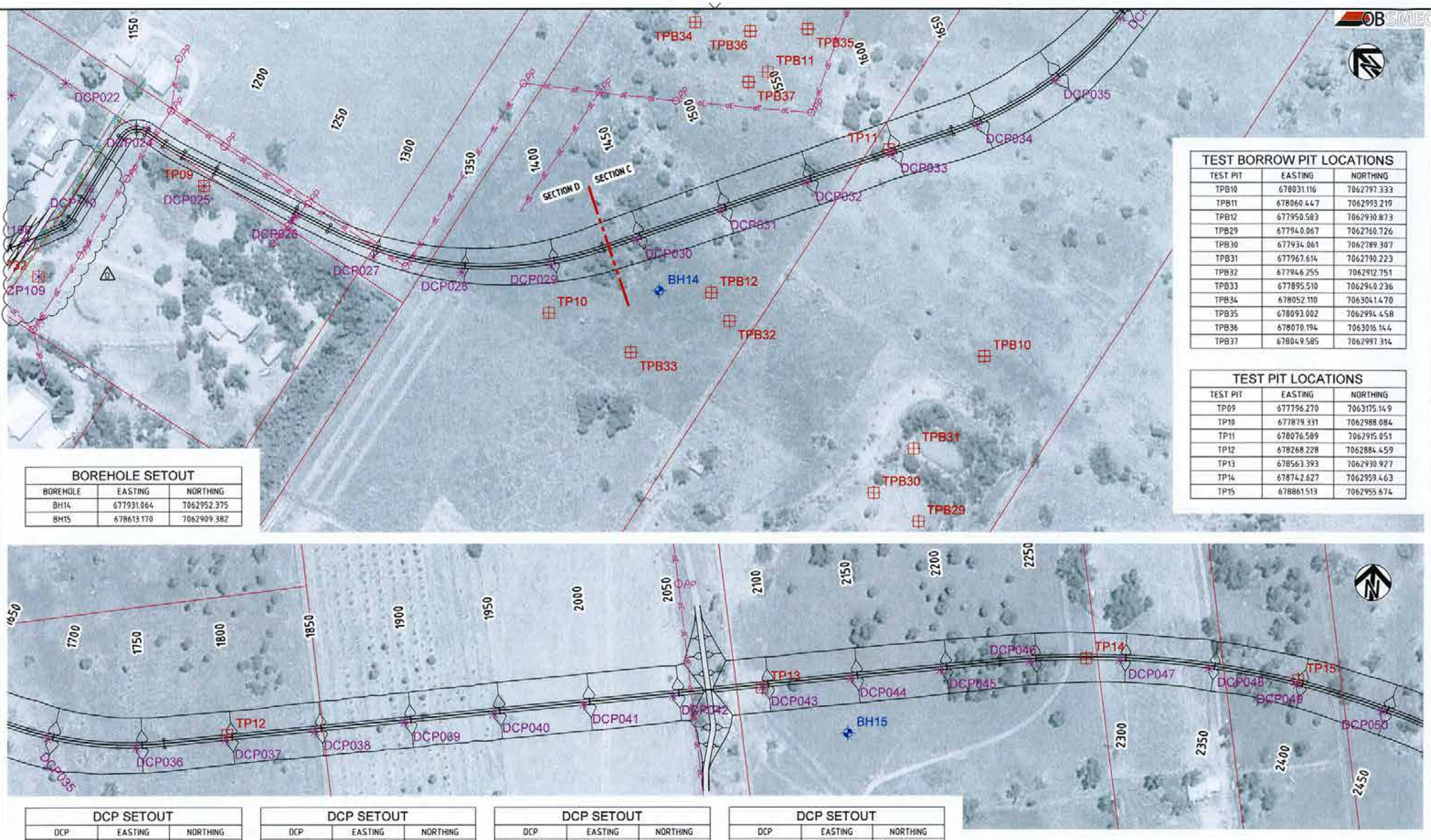
SMEC

maranoa REGIONAL COUNCIL

MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT

GEOTECHNICAL INVESTIGATION AND BORROW PIT LOCATIONS SHEET 1

300182-GE-3001



TEST BORROW PIT LOCATIONS		
TEST PIT	EASTING	NORTHING
TPB10	678031.116	7062797.333
TPB11	678060.447	7062993.219
TPB12	677950.583	7062930.873
TPB29	677940.067	7062760.726
TPB30	677934.061	7062789.307
TPB31	677967.614	7062790.223
TPB32	677946.255	7062912.751
TPB33	677895.510	7062940.236
TPB34	678052.110	7063041.470
TPB35	678093.002	7062994.458
TPB36	678070.194	7063016.144
TPB37	678049.585	7062997.314

TEST PIT LOCATIONS		
TEST PIT	EASTING	NORTHING
TP09	677796.270	7063175.149
TP10	677879.331	7062988.084
TP11	678076.589	7062915.051
TP12	678268.228	7062884.459
TP13	678563.393	7062930.927
TP14	678742.627	7062959.463
TP15	678861.513	7062955.674

BOREHOLE SETOUT		
BOREHOLE	EASTING	NORTHING
BH14	677931.064	7062952.375
BH15	678613.170	7062909.382

DCP SETOUT		
DCP	EASTING	NORTHING
DCP022	677782.937	7063270.518
DCP024	677796.636	7063220.161
DCP025	677796.256	7063175.145
DCP026	677816.747	7063126.799
DCP027	677833.764	7063079.915
DCP028	677861.792	7063038.645
DCP029	677899.079	7063005.527

DCP SETOUT		
DCP	EASTING	NORTHING
DCP030	677942.694	7062981.194
DCP031	677987.099	7062958.138
DCP032	678031.457	7062935.113
DCP033	678075.820	7062912.129
DCP034	678120.424	7062889.505
DCP035	678168.299	7062875.494
DCP036	678218.121	7062873.655

DCP SETOUT		
DCP	EASTING	NORTHING
DCP037	678267.554	7062881.324
DCP038	678316.877	7062889.562
DCP039	678366.169	7062897.855
DCP040	678415.459	7062906.102
DCP041	678464.799	7062914.368
DCP042	678514.104	7062922.664
DCP043	678563.393	7062930.927

DCP SETOUT		
DCP	EASTING	NORTHING
DCP044	678612.700	7062939.194
DCP045	678662.022	7062947.474
DCP046	678711.413	7062955.450
DCP047	678761.216	7062959.532
DCP048	678811.162	7062958.645
DCP049	678860.792	7062952.733
DCP050	678909.595	7062941.877

NOTES

1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	26/01/2016	ISSUED FOR CONSTRUCTION	008	AZ
B	28/01/2016	REISSUED FOR SECTIONS B&D	019	AZ
C	31/03/2016	BIRKETT LEVEE REALIGNMENT	030	AZ
D	16/05/2016	GOLDERS LEVEE REALIGNMENT	032	AZ

DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	O. CRACIUN
DESIGN CHECK	A. LAW
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

SCALE 1:1000 10 0 10 20 30 40 50

DESIGNER

SMEC

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SMEC PROJECT No 30031182

CLIENT

maranoa REGIONAL COUNCIL

PROJECT TITLE

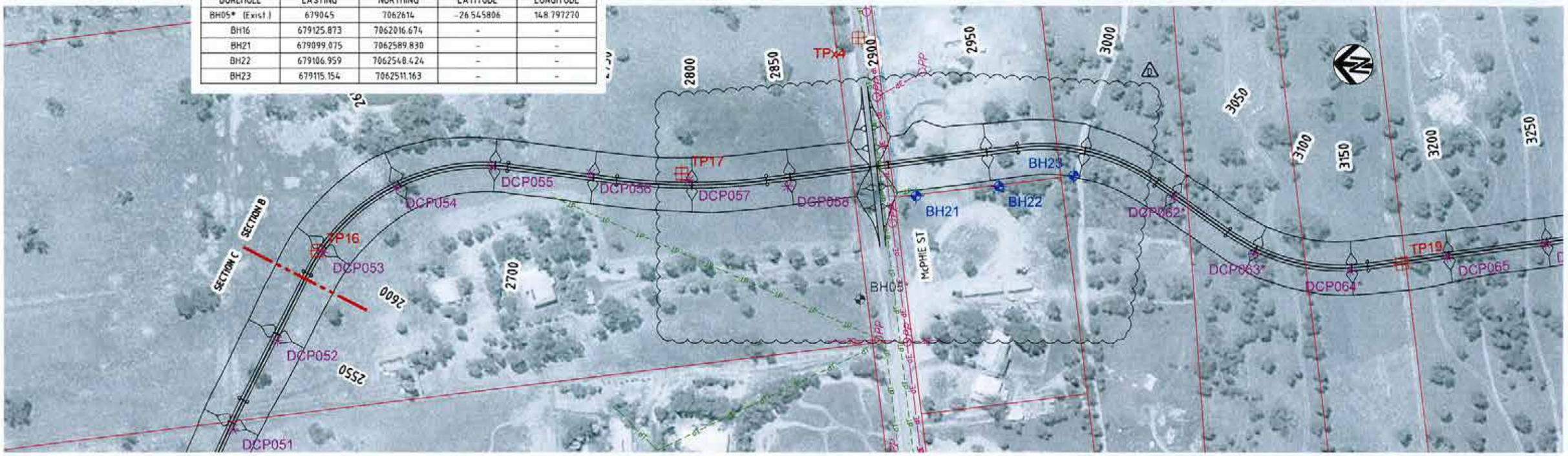
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT

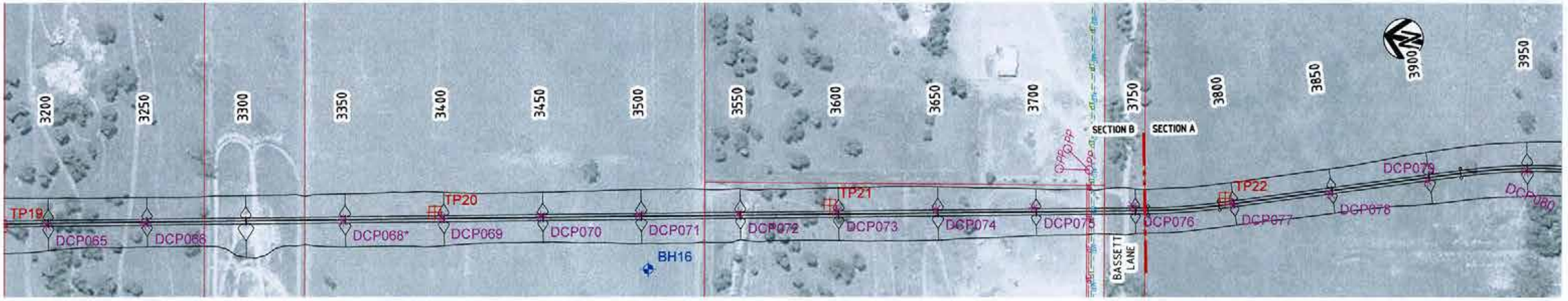
GEOTECHNICAL INVESTIGATION AND BORROW PIT LOCATIONS SHEET 2

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:1000	CONSTRUCTION	30031182-GE-1002	D

154 mm ON ORIGINAL
A1

BOREHOLE SETOUT				
BOREHOLE	EASTING	NORTHING	LATITUDE	LONGITUDE
BH05* (Exist.)	679045	7062614	-26.545806	148.797270
BH16	679125.873	7062016.674	-	-
BH21	679099.075	7062589.830	-	-
BH22	679106.959	7062548.424	-	-
BH23	679115.154	7062511.163	-	-





TEST PIT LOCATIONS		
TEST PIT	EASTING	NORTHING
TP16	679049.636	7062889.809
TP17	679101.596	7062708.730
TP19	679083.168	7062342.102
TP20	679132.694	7062127.988
TP21	679175.344	7061932.593
TP22	679218.008	7061737.183

DCP SETOUT		
DCP	EASTING	NORTHING
DCP051	678957.026	7062926.197
DCP052	679003.193	7062906.932
DCP053	679048.892	7062886.784
DCP054	679084.197	7062852.182
DCP055	679098.276	7062804.700
DCP056	679098.500	7062754.757
DCP057	679098.706	7062704.759

DCP SETOUT		
DCP	EASTING	NORTHING
DCP058	679099.152	7062654.733
DCP062*	679108.021	7062460.311
DCP063*	679082.386	7062417.599
DCP064*	679077.370	7062368.395
DCP065	679087.810	7062319.485
DCP066	679098.544	7062270.647
DCP068*	679119.851	7062172.942

DCP SETOUT		
DCP	EASTING	NORTHING
DCP069	679130.459	7062124.107
DCP070	679141.134	7062075.207
DCP071	679151.837	7062026.414
DCP072	679162.492	7061977.558
DCP073	679173.187	7061928.675
DCP074	679183.777	7061879.863
DCP075	679194.708	7061830.832

DCP SETOUT		
DCP	EASTING	NORTHING
DCP076	679205.097	7061782.120
DCP077	679215.813	7061733.293
DCP078	679230.679	7061685.558
DCP079	679246.811	7061638.293
DCP080	679261.249	7061590.411

* NOT YET UNDERTAKEN DUE TO PROPERTY ACCESS

TEST PIT LOCATIONS		
TEST PIT	EASTING	NORTHING
TPx4	679176.353	7062624.455

NOTES

1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	30/01/2014	REISSUED FOR SECTIONS B&D	019	AZ
C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
D	16/05/2014	MCPHIE ST REALIGNMENT	032	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	O. CRACIUN
DESIGN CHECK	A. LAW
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

SCALE 1:1000 (10 0 10 20 30 40 50)

DESIGNER

SMEC

SMEC AUSTRALIA PTY LTD
ABN 47 065 475 149
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SMEC PROJECT No 30031182

CLIENT

maranoa REGIONAL COUNCIL

PROJECT TITLE

MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT

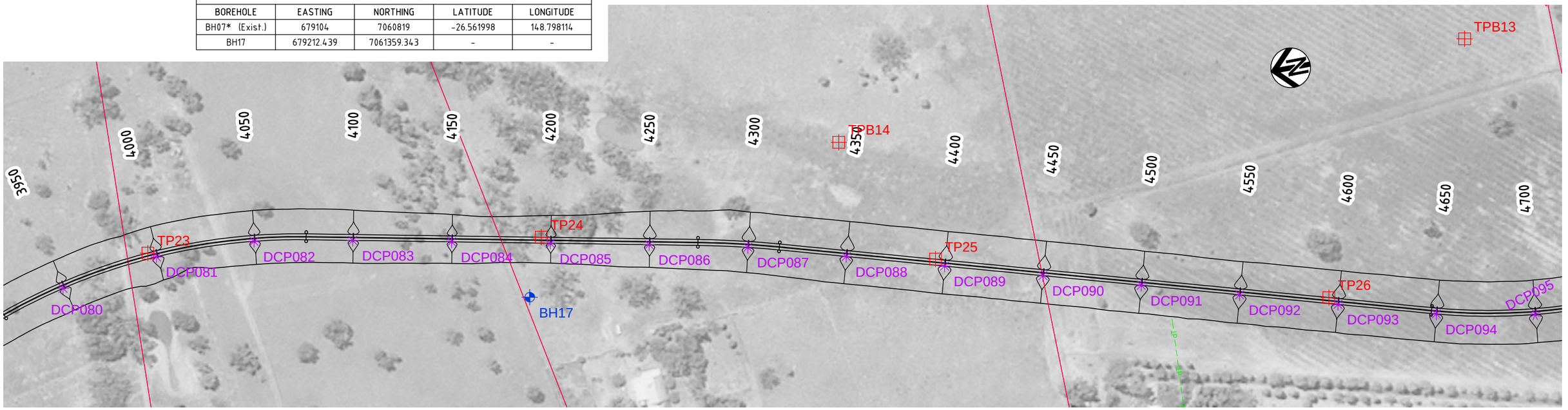
GEOTECHNICAL INVESTIGATION AND BORROW PIT LOCATIONS SHEET 3

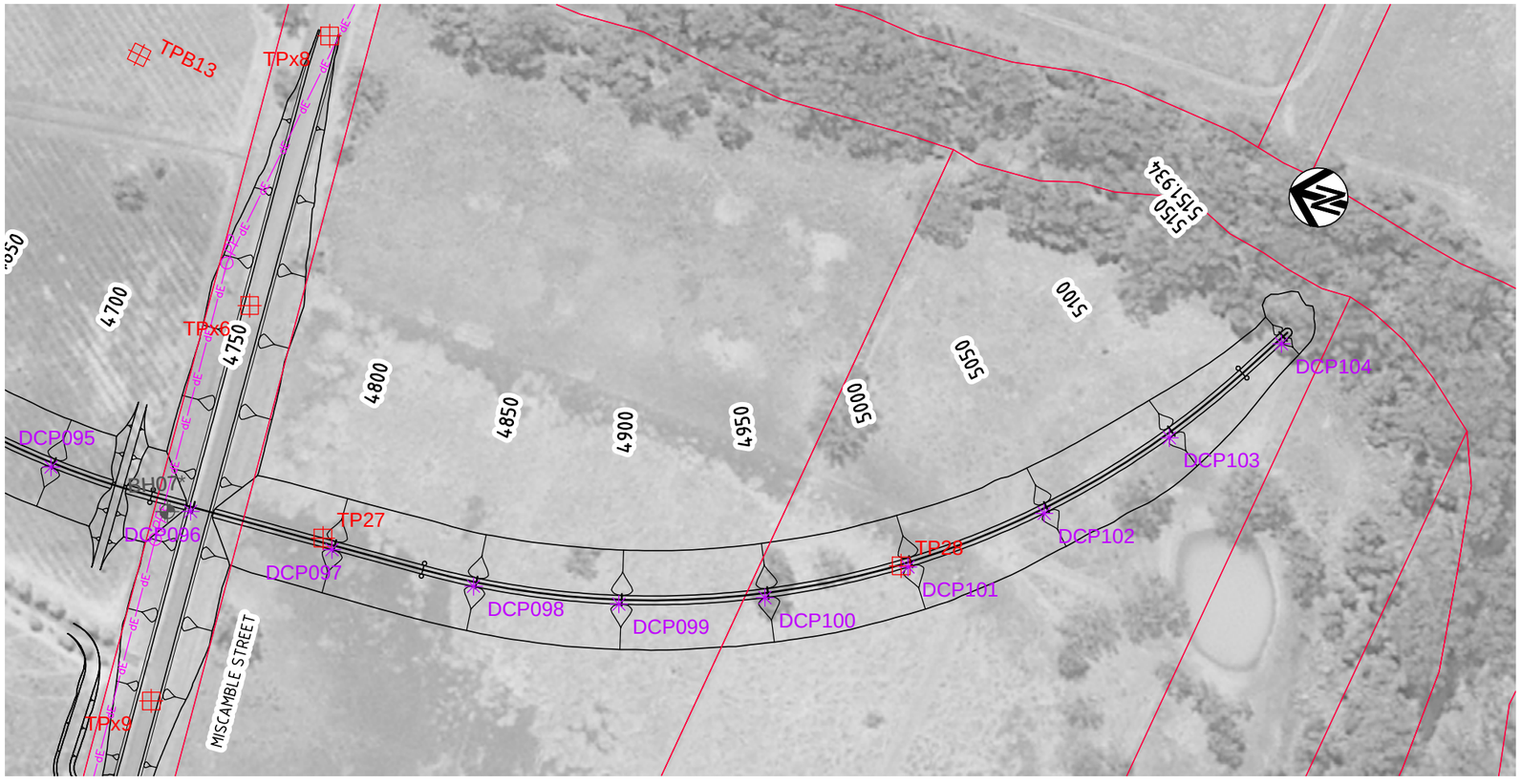
SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:1000	CONSTRUCTION	30031182-GE-1003	D

150 mm ON ORIGINAL

A1

BOREHOLE SETOUT				
BOREHOLE	EASTING	NORTHING	LATITUDE	LONGITUDE
BH07* (Exist.)	679104	7060819	-26.561998	148.798114
BH17	679212.439	7061359.343	-	-





TEST PIT LOCATIONS		
TEST PIT	EASTING	NORTHING
TP23	679270.704	7061544.963
TP24	679241.105	7061347.858
TP25	679192.721	7061153.992
TP26	679136.137	7060962.135
TP27	679109.563	7060765.397
TP28	679153.302	7060572.685

TEST BORROW PIT LOCATIONS		
TEST PIT	EASTING	NORTHING
TPB13	679251.711	7060870.038
TPB14	679259.915	7061190.953

TEST PIT LOCATIONS		
TEST PIT	EASTING	NORTHING
TPx6	679179.382	7060810.796
TPx8	679275.378	7060809.143
TPx9	679040.312	7060807.014

DCP SETOUT		
DCP	EASTING	NORTHING
DCP080	679261.249	7061590.411
DCP081	679268.028	7061540.952
DCP082	679266.909	7061491.329
DCP083	679257.685	7061442.094
DCP084	679247.362	7061392.881
DCP085	679237.306	7061343.938
DCP086	679227.101	7061294.896
DCP087	679216.327	7061246.059
DCP088	679202.473	7061198.126
DCP089	679188.381	7061150.174
DCP090	679174.141	7061102.163
DCP091	679160.027	7061054.270
DCP092	679145.994	7061006.255
DCP093	679131.890	7060958.338
DCP094	679117.847	7060910.445
DCP095	679108.118	7060861.135
DCP096	679106.279	7060811.424
DCP097	679106.609	7060761.424
DCP098	679107.471	7060711.432
DCP099	679114.918	7060662.029
DCP100	679130.399	7060614.571
DCP101	679153.541	7060570.286
DCP102	679183.671	7060530.479
DCP103	679219.951	7060496.147
DCP104	679261.133	7060467.899

NOTES
1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	O. CRACIUN
DESIGN CHECK	A. LAW
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
SCALE 1:1000 10 0 10 20 30 40 50

DESIGNER
SMEC
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SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
GEOTECHNICAL INVESTIGATION AND BORROW PIT LOCATIONS SHEET 4

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:1000	CONSTRUCTION	30031182-GE-1004	B

150 mm ON ORIGINAL
A1

BORROW TEST PIT LOCATIONS		
TEST PIT	EASTING	NORTHING
TPB01	679427.815	7062423.427
TPB02	679897.103	7062391.824
TPB03	680286.923	7062331.850
TPB04	679659.915	7062294.933
TPB05	680056.375	7062233.911
TPB06	679739.057	7062195.238
TPB07	680240.829	7062094.724
TPB08	679823.467	7062073.694
TPB09	679840.540	7061655.350
TPB15	679417.4962	7062078.016
TPB17	679700.608	7062784.210
TPB18	679698.333	7062762.661
TPB19	679696.761	7062735.526
TPB20	679734.936	7062785.471
TPB21	679735.403	7062760.806
TPB22	679728.831	7062726.024
TPB23	679767.657	7062789.857
TPB24	679768.107	7062751.403
TPB25	679771.749	7062714.629
TPB26	679798.232	7062789.909
TPB27	679811.761	7062756.517
TPB28	679819.055	7062730.728

TPB03 TPB07 TPB05 TPB02 TPB08 TPB09 TPB06 TPB28 TPB27 TPB24 TPB25 TPB26 TPB21 TPB23 TPB22 TPB20 TPB19 TPB17 TPB18 TPB04 TPB15 TPB01

3600 3700 3800 3900 4000 4100

NOTES
1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	30/01/2014	REISSUED FOR SECTIONS B&D	019	AZ
C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	O. CRACIUN
DESIGN CHECK	A. LAW
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

SCALE 1:2000 20 0 20 40 60 80 100

DESIGNER
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SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
GEOTECHNICAL INVESTIGATION AND BORROW PIT LOCATIONS SHEET 5

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:1000	CONSTRUCTION	30031182-GE-1005	C

150 mm ON ORIGINAL
A1

REFER BELOW FOR CONTINUATION

ROMA AIRPORT

1
RP87687

14
RP855185

5
RP880094

751.495

782.580

CARNARVON HIGHWAY (NORTHERN ROAD)

FOR CARNARVON HIGHWAY
PUP DETAILS REFER TO DRG
PU-1101

CONTROL LINE MC10

CONTROL LINE MCC1

73
WV1650

3
R8633

RP802116

41
SP154293

SECTION D

SECTION C

REFER DRG CL-1002 FOR CONTINUATION

6
RP880094

2
RP204592

40
SP154293

REFER ABOVE FOR CONTINUATION

PUP CONFLICT TABLE

ID	SERVICE	DATA SOURCE	CHAINAGE	TREATMENT	RELOCATION	REFERENCE DRAWING
T1-01	UNDERGROUND TELSTRA LINES	DBYD	955 (MC10)	SERVICE TO BE PROTECTED AS PER TYPICAL DETAIL FOR SERVICES UNDER LEVEE	UNDER	TC-0103
T1-02	UNDERGROUND TELSTRA LINES	SURVEY	1060 (MC10)	SERVICE TO BE PROTECTED AS PER TYPICAL DETAIL FOR SERVICES UNDER LEVEE	UNDER	TC-0103
W1-01	WATER MAIN	SURVEY	1170-1150 (MC10)	SERVICE TO BE PROTECTED AS PER TYPICAL DETAIL FOR SERVICES UNDER LEVEE	UNDER	TC-0103
E1-01	ERGON POWERLINES	SURVEY	1160 (MC10)	NONE REQUIRED. MINIMUM 3.0m CLEARANCE ABOVE THE LEVEE ACHIEVED	NIL	NIL

NOTES

1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.
2. FOR SETOUT DETAILS REFER TO DRAWING 30031182-CL-1005.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	30/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	28/03/2014	DESIGN AMENDED	026	AZ
C	16/05/2014	GOLDERS LEVEE REALIGNMENT	032	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

SCALE 1:1000 10 0 10 20 30 40 50

DESIGNER
SMEC
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SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
PUBLIC UTILITIES PLAN
SHEET 1

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:1000	CONSTRUCTION	30031182-PU-1001	C

150 mm ON ORIGINAL

A1

REFER DRG CL-1001 FOR CONTINUATION

SECTION D

SECTION C

EXISTING OVERHEAD ELECTRICAL AND POWER POLES TO BE RELOCATED

IRRIGATION SYSTEM TO BE REPLACED OVER LEVEE AS PER LAND OWNER REQUEST IN SINGLE CONDUIT

CONTROL LINE MC10

REFER BELOW FOR CONTINUATION

SECTION C

SECTION B

CONTROL LINE MC10

REFER ABOVE FOR CONTINUATION

REFER DRG CL-1003 FOR CONTINUATION

PUP CONFLICT TABLE						
ID	SERVICE	DATA SOURCE	CHAINAGE	TREATMENT	RELOCATION	REFERENCE DRAWING
W2-01	IRRIGATION CONDUIT	DBYD	1900 (MC10)	SERVICE TO BE RELOCATED ABOVE LEVEE	OVER	NIL
E2-01	ERGON OVERHEAD POWERLINES	SURVEY	2050 (MC10)	SERVICE TO BE PROTECTED AS PER TYPICAL DETAIL FOR SERVICES UNDER LEVEE	UNDER	TC-0103

NOTES

1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.
2. FOR SETOUT DETAILS REFER TO DRAWING 30031182-CL-1005.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	30/01/2014	REISSUED FOR SECTIONS B&D	019	AZ
C	28/03/2014	DESIGN AMENDED	026	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

SCALE 1:1000 10 0 10 20 30 40 50

DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
© ABN 47 065 475 149
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SOUTH BRISBANE QLD. 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
PUBLIC UTILITIES PLAN SHEET 2

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:1000	CONSTRUCTION	30031182-PU-1002	C

150 mm ON ORIGINAL
A1

CONTROL LINE MCP1

CONTROL LINE MC10

McPHIE STREET

BASSETT LANE

SECTION A

SECTION B

EXISTING OVERHEAD ELECTRICAL AND POWER POLES TO BE RELOCATED BY OTHERS

REFER ORG CL-1002 FOR CONTINUATION

REFER BELOW FOR CONTINUATION

REFER ABOVE FOR CONTINUATION

REFER ORG CL-1004 FOR CONTINUATION

PUP CONFLICT TABLE

ID	SERVICE	DATA SOURCE	CHAINAGE	TREATMENT	RELOCATION	REFERENCE DRAWING
E3-01	ERGON POWERLINES	SURVEY	2905 (MC10)	NONE REQUIRED. MINIMUM 3.0m CLEARANCE ABOVE THE LEVEE ACHIEVED	NIL	NIL
E3-02	ERGON POWERLINES	SURVEY	3720 (MC10)	NONE REQUIRED. MINIMUM 3.0m CLEARANCE ABOVE THE LEVEE ACHIEVED	NIL	NIL
T3-01	UNDERGROUND TELSTRA LINES	SURVEY	2905 (MC10)	SERVICE TO BE PROTECTED AS PER DETAIL 2	UNDER	PU-1020
T3-02	UNDERGROUND TELSTRA LINES	SURVEY	3720 (MC10)	SERVICE TO BE PROTECTED AS PER DETAIL 3	UNDER	PU-1020
T3-03	TELSTRA PIT	SURVEY	3720 (MC10)	PIT TO BE RELOCATED DUE TO CLASH WITH LEVEE	10m SOUTH	NIL
W3-01	UNDERGROUND WATER MAIN	SURVEY	2890 (MC10)	SERVICE TO BE PROTECTED AS PER TYPICAL DETAIL FOR SERVICES UNDER LEVEE	UNDER	TC-0103
W3-02	UNDERGROUND WATER MAIN	COUNCIL PLAN	2905 (MC10)	SERVICE TO BE PROTECTED AS PER DETAIL 2	UNDER	PU-1020
W3-03	UNDERGROUND WATER MAIN	SURVEY	3720 (MC10)	SERVICE TO BE PROTECTED AS PER DETAIL 3	UNDER	PU-1020

NOTES

1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.
2. FOR SETOUT DETAILS REFER TO DRAWING 30031182-CL-1005.

ISSUED FOR CONSTRUCTION

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	30/01/2014	REISSUED FOR SECTIONS B&D	019	AZ
C	28/03/2014	DESIGN AMENDED	026	AZ
D	16/05/2014	LEVEE ALIGNMENT AMENDED AND HOLD REMOVED	032	AV

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

SCALE 1:1000

DESIGNER

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SOUTH BRISBANE QLD. 4101
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SMEC PROJECT No 30031182

CLIENT

maranoa REGIONAL COUNCIL

PROJECT TITLE

MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
PUBLIC UTILITIES PLAN
SHEET 3

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:1000	CONSTRUCTION	30031182-PU-1003	D

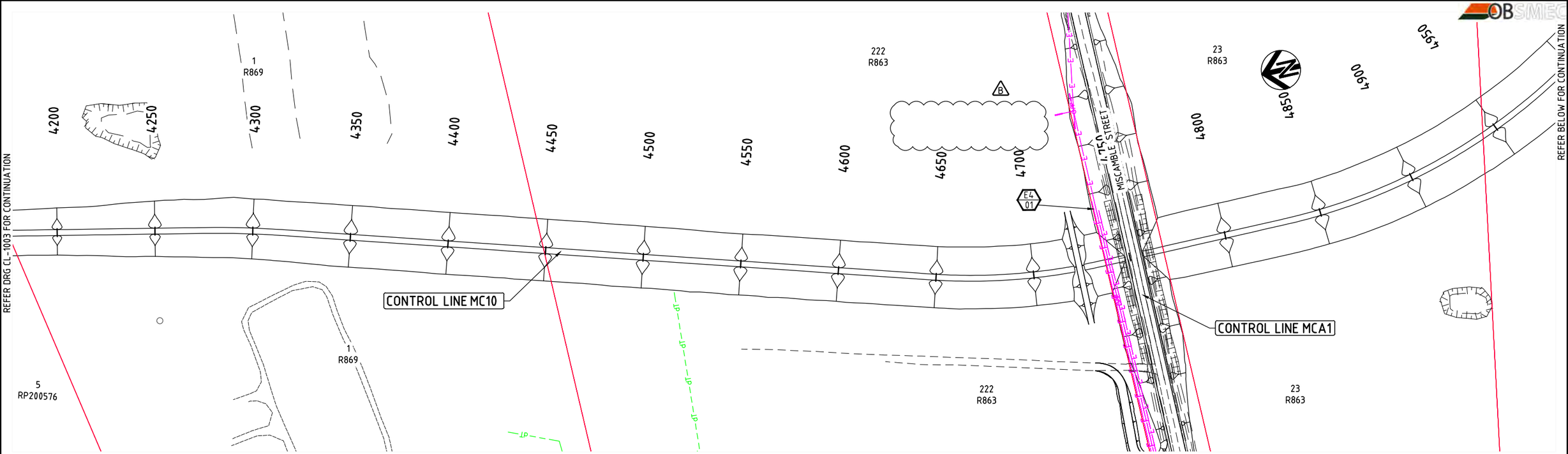
150 mm ON ORIGINAL

A1

REFER DRG CL-1003 FOR CONTINUATION

REFER BELOW FOR CONTINUATION

REFER ABOVE FOR CONTINUATION



PUP CONFLICT TABLE

ID	SERVICE	DATA SOURCE	CHAINAGE	TREATMENT	RELOCATION	REFERENCE DRAWING
E4-01	ERGON POWERLINES	SURVEY	4740 (MC10)	NONE REQUIRED. MINIMUM 3.0m CLEARANCE ABOVE THE LEVEE ACHIEVED	NIL	NIL

ISSUED FOR CONSTRUCTION

NOTES

1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.
2. FOR SETOUT DETAILS REFER TO DRAWING 30031182-CL-1005.

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	20/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
B	28/03/2014	DESIGN AMENDED	026	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING

SCALE 1:1000 10 0 10 20 30 40 50

DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
© ABN 47 065 475 149
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SMEC PROJECT No 30031182

CLIENT
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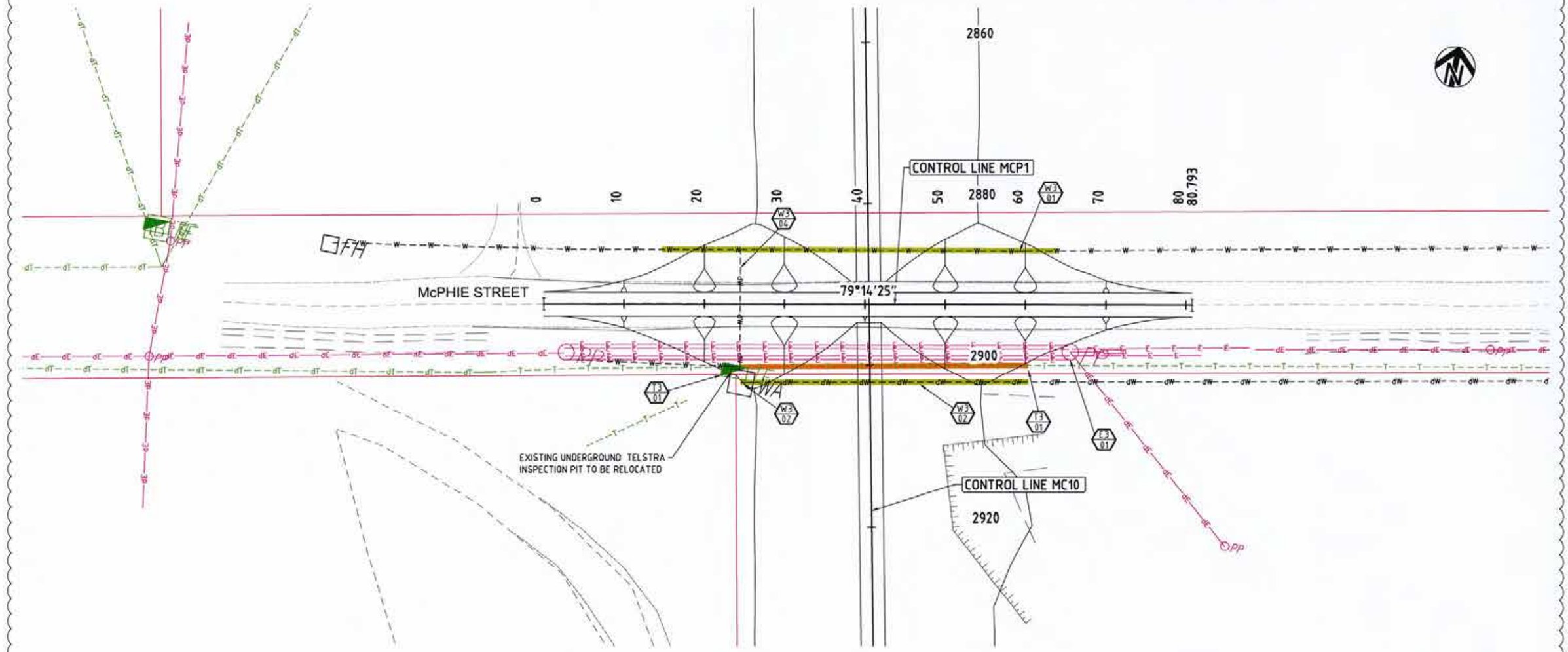
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
PUBLIC UTILITIES PLAN
SHEET 4

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:1000	CONSTRUCTION	30031182-PU-1004	B

150 mm ON ORIGINAL

A1



PLAN
SCALE 1:250

PUP CONFLICT TABLE

ID	SERVICE	DATA SOURCE	CHAINAGE	TREATMENT	RELOCATION	REFERENCE DRAWING
E3-01	ERGON POWERLINES	SURVEY	2905 (MC10)	NONE REQUIRED. MINIMUM 3.0m CLEARANCE ABOVE THE LEVEE ACHIEVED	NIL	NIL
T3-01	UNDERGROUND TELSTRA LINES	SURVEY	2905 (MC10)	SERVICE TO BE PROTECTED AS PER DETAIL 2	UNDER	PU-1020
T3-01	TELSTRA PIT	SURVEY	2905 (MC10)	PIT TO BE REMOVED AND REPLACED	NIL	NIL
W3-01	UNDERGROUND WATER MAIN	SURVEY	2890 (MC10)	SERVICE TO BE PROTECTED AS PER TYPICAL DETAIL FOR SERVICES UNDER LEVEE	UNDER	TC-0103
W3-02	UNDERGROUND WATER MAIN	COUNCIL PLAN	2905 (MC10)	SERVICE TO BE PROTECTED AS PER DETAIL 2	UNDER	PU-1020
W3-02	WATER METER	COUNCIL PLAN	2905 (MC10)	WATER METER TO BE REMOVED	NIL	NIL

NOTES
1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	A	30/01/2014	ISSUED FOR CONSTRUCTION	008	AZ
	B	28/03/2014	DESIGN AMENDED	026	AZ
	C	16/05/2014	LEVEE ALIGNMENT AMENDED AND HOLD REMOVED	032	AM

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	R. STRINGFELLOW

SCALES AT A1 SIZE DRAWING
SCALE 1:250 2.5 0 5 10

DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
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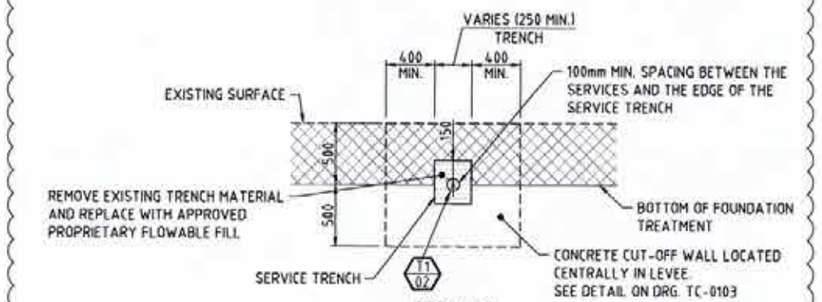
LEVEL 1, 154 MELBOURNE STREET
SOUTH BRISBANE QLD. 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

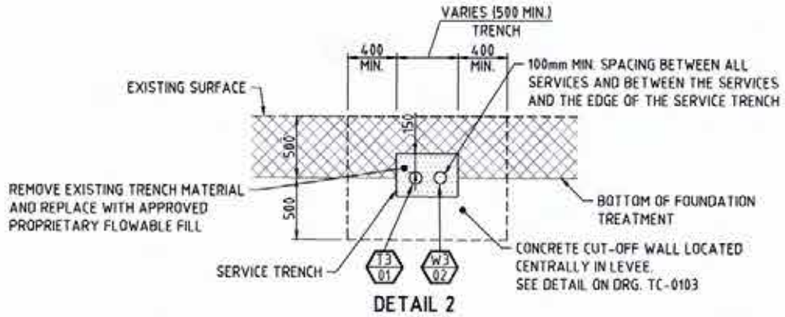
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
PUBLIC UTILITIES PLAN
McPHIE STREET

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:250	CONSTRUCTION	30031182-PU-1011	C

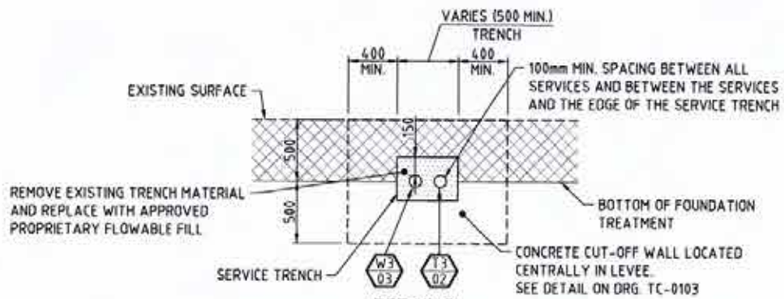
150 mm ON ORIGINAL
A1



DETAIL 1
TREATMENT FOR SERVICES UNDER LEVEE @ CH 1060
SCALE 1:25



DETAIL 2
TREATMENT FOR SERVICES UNDER LEVEE @ CH 2905
SCALE 1:25



DETAIL 3
TREATMENT FOR SERVICES UNDER LEVEE @ CH 3720
SCALE 1:25

NOTES
1. FOR NOTES AND LEGEND REFER TO DRAWING 30031182-DI-0011

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	A	28/03/2016	ISSUED FOR CONSTRUCTION	026	AZ
	B	16/05/2016	LEVEE ALIGNMENT AMENDED AND HOLD REMOVED	032	

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	A. ZANETTI

SCALES AT A1 SIZE DRAWING
SCALE 1:25 0.25 0 0.50 1.00

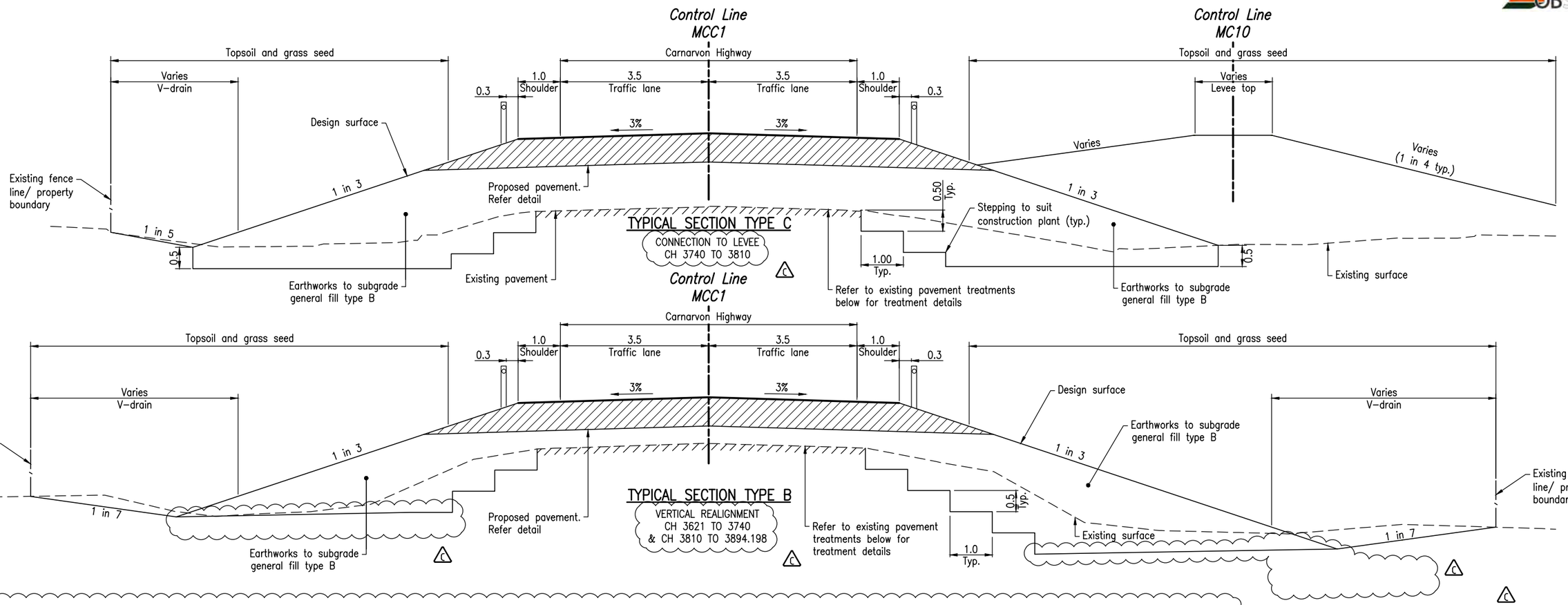
DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD 4101
PH 07 3029 9600 FAX 07 3029 9650
SMEC PROJECT No 30031182

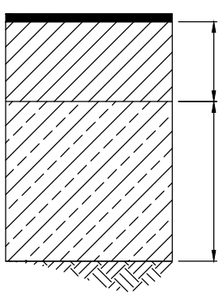
CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
PUBLIC UTILITIES PLAN
TREATMENT FOR SERVICES UNDER LEVEE

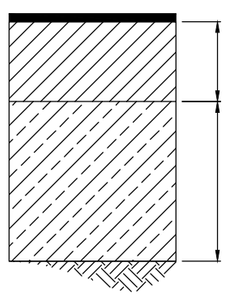
SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:25	CONSTRUCTION	30031182-PU-1020	B

150 mm ON ORIGINAL
A1





PAVEMENT DETAIL – TYPE 1
SOUTHERN (TOWN) SIDE
CH START – 3745
NTS



PAVEMENT DETAIL – TYPE 2
NORTHERN (CREEK) SIDE
CH 3745 – END
NTS

TYPICAL SPRAY SEAL DESIGN (WET & DRY SIDE)

Double Application Seal
- Prime = SAMI K2 or AMCO (Wet side) or AMC4 (Dry side) @ 1.1L/m²
  (cover aggregate as needed to suit construction logistics)
- Surfacing:
  First Application = PMB @ 0.9L/m² (14mm @ 80m²/m³)
  Second application = PMB @ 1.3L/m² (7mm @ 180m²/m³)

NOTE: Final surfacing to be designed by Contracts Administrator at the time of construction. Spray/ spread rates are indicative only.

¥ Cement dosage for CMB to be determined using local material to achieve 0.8<UCS<1.6MPa @ 7 days.

EXISTING PAVEMENT TREATMENT NOTES

1. Remove existing granular pavement to existing subgrade.
2. Expose subgrade to be inspected and any unsuitable material to be replaced with general fill type B to a depth of 0.5m at the discretion of Designer's Site Geotechnical Representative.
3. Proofroll existing subgrade prior to construction of a new embankment.
4. Subject to verification and written approval, the existing pavement material may be re–used in the CBR 35% Select Fill layer.

TRANSPORT AND MAIN ROADS USE ONLY

Road: Carnarvon Highway — Parish of: Roma
T.Dist: 3.499 km – 3.914 km — Aux Dwg No's.

Queensland Government — Downs South West Region

LG: Maranoa Regional Council
Revision A Microfilmed_____
TMR Dwg No.

ENGINEERING CERTIFICATION (RPEQ)

ENG. AREA	NAME	SIGNATURE	NO.	DATE
DRAINAGE	A. ZANETTI	A. ZANETTI	12112	31/03/14

NOTES

1. For pavement general notes refer to drawing 30031182–PD–0011.
2. For notes and legend refer to drawing 30031182–DI–0011.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	30/01/2014	ISSUED FOR CONSTRUCTION	019	AZ
B	28/02/2014	TMR COMMENTS	025	RS
C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	A. ZANETTI

SCALES AT A1 SIZE DRAWING
0 1.0 2.0m

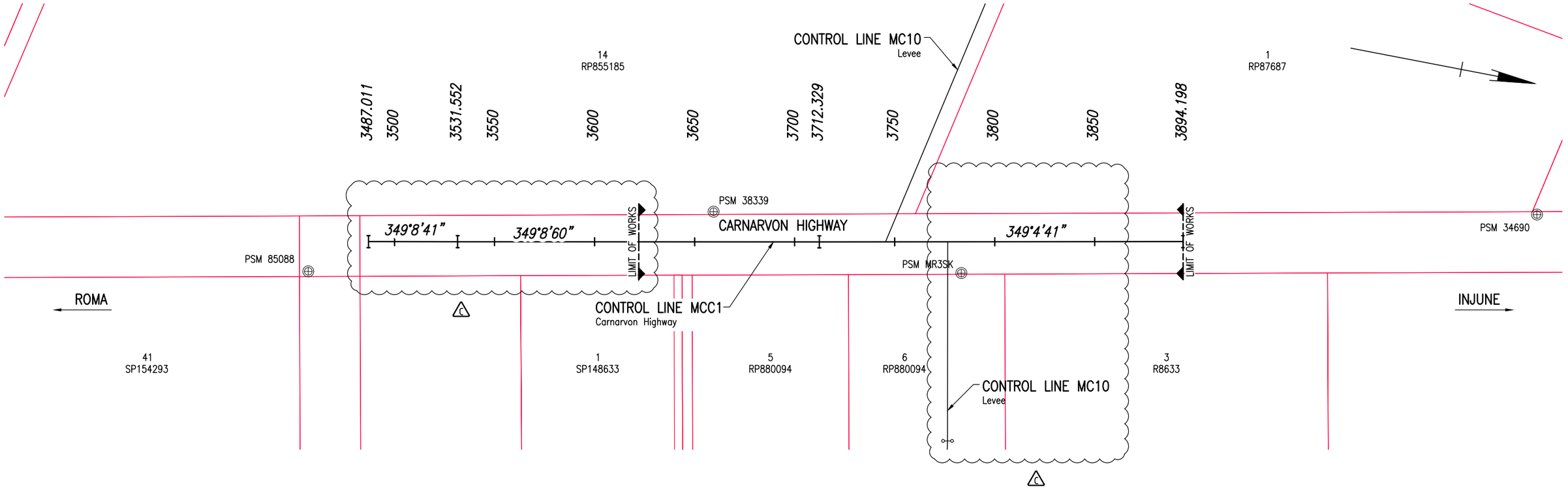
DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
© ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD. 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
TYPICAL CROSS SECTION

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:100	CONSTRUCTION	30031182–TC–1101	C

150 mm ON ORIGINAL
A1



SURVEY STATIONS

Station	Type	Easting	Northing	Height
PSMK	71141	677872.780	7061307.661	299.710
PSMK	38332	677647.060	7062476.827	301.001
PSMK	84725	677608.381	7062839.287	
PSMK	85088	677576.185	7063005.568	303.051
PSMK	38339	677508.729	7063198.878	303.425
PSMK	MR3SK	677515.460	7063326.300	302.995
PSMK	34690	677432.408	7063603.307	302.310
PSMK	639981	677318.603	7064184.564	304.921
PSMK	85030	675552.242	7061880.159	

CONTROL LINE MCC1

Pt	Chainage	Easting	Northing	Level	Bearing
START	3487.011	677555.923	7063032.384	303.327	349°08'40.56"
IP	3531.552	677547.534	7063076.128	303.392	
IP	3712.329	677513.505	7063253.673	304.881	
END	3903.801	677477.226	7063441.677	302.829	349°04'40.96"

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TRANSPORT AND MAIN ROADS USE ONLY

Road: Carnarvon Highway — Parish of: Roma
T.Dist: 3.499 km – 3.914 km — Aux Dwg No's.

Queensland Government — Downs South West Region

LG: Maranoa Regional Council
Revision A Microfilmed_____
TMR Dwg No.

ENGINEERING CERTIFICATION (RPEQ)

ENG. AREA	NAME	SIGNATURE	NO.	DATE
DRAINAGE	A. ZANETTI	A. ZANETTI	12112	31/03/14

NOTES

1. For notes and legend refer to drawing 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	A	30/01/2014	ISSUED FOR CONSTRUCTION	019	AZ
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	C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ

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DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	A. ZANETTI

SCALES AT A1 SIZE DRAWING

0 10 20 30 40m

DESIGNER

SMEC

SMEC AUSTRALIA PTY LTD
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LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD. 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT

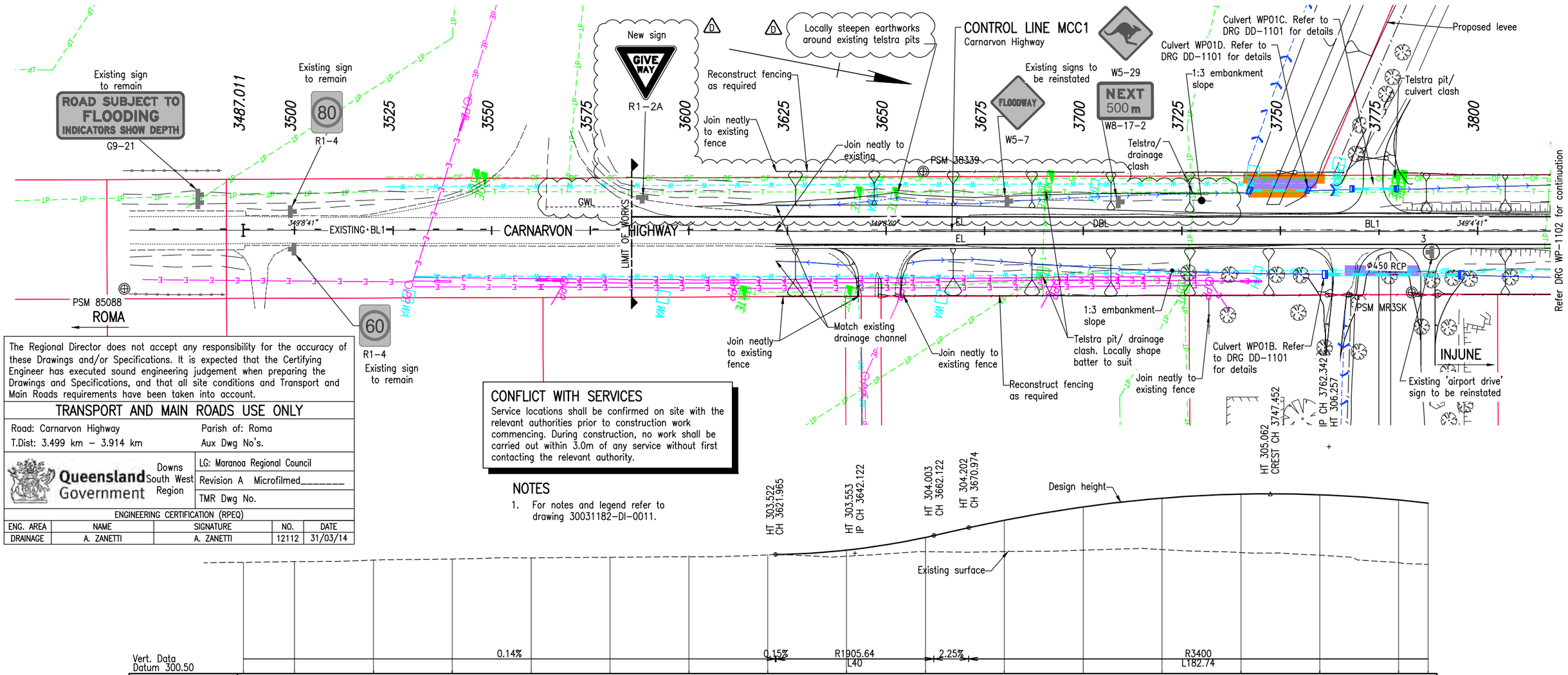
maranoa REGIONAL COUNCIL

PROJECT TITLE

MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
CONTROL LINE SETOUT

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:500	CONSTRUCTION	30031182-CL-1101	C

150 mm ON ORIGINAL
A1
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



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TRANSPORT AND MAIN ROADS USE ONLY

Road: Carnarvon Highway — Parish of: Roma
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Queensland Government — Downs South West Region

LG: Maranoa Regional Council
Revision A Microfilmed_____
TMR Dwg No.

ENGINEERING CERTIFICATION (RPEQ)

ENG. AREA	NAME	SIGNATURE	NO.	DATE
DRAINAGE	A. ZANETTI	A. ZANETTI	12112	31/03/14

CONFLICT WITH SERVICES

Service locations shall be confirmed on site with the relevant authorities prior to construction work commencing. During construction, no work shall be carried out within 3.0m of any service without first contacting the relevant authority.

NOTES

1. For notes and legend refer to drawing 30031182-DI-0011.

Pvt. Mkg.	EXISTING BL1 — BL1 — DBL — BL1
Type (TC)	Type B — Type C

Ewks.																		
	Cut	0	0	0	0	0	0	0	17	19	23	27	39	48	44	26	2	
	Fill	0	0	0	0	0	0	0	23	63	158	240	316	373	417	456	186	
Design Height		303.327	303.346	303.375	303.404	303.433	303.462	303.491	303.520	303.633	303.956	304.393	304.731	304.951	305.054	305.039	304.906	304.826
Natural Surface		303.322	303.342	303.381	303.408	303.437	303.451	303.465	303.514	303.477	303.594	303.598	303.632	303.648	303.574	303.507	303.316	303.269
Chainage		3487.011	3500	3520	3540	3560	3580	3600	3620	3640	3660	3680	3700	3720	3740	3760	3780	3787.484

Horiz.Data	
Operating Speed	Design Speed 90 km/h
Superelev.	Join Neatly into Existing Crossfalls: LHS and RHS -3% — LHS and RHS -3%

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
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	C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
	D	10/04/2014	BAR TREATMENT ADDED	-	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	A. ZANETTI

SCALES AT A1 SIZE DRAWING
Horizontal 0 5 10 15 20m
Vertical 0 1.0 2.0m

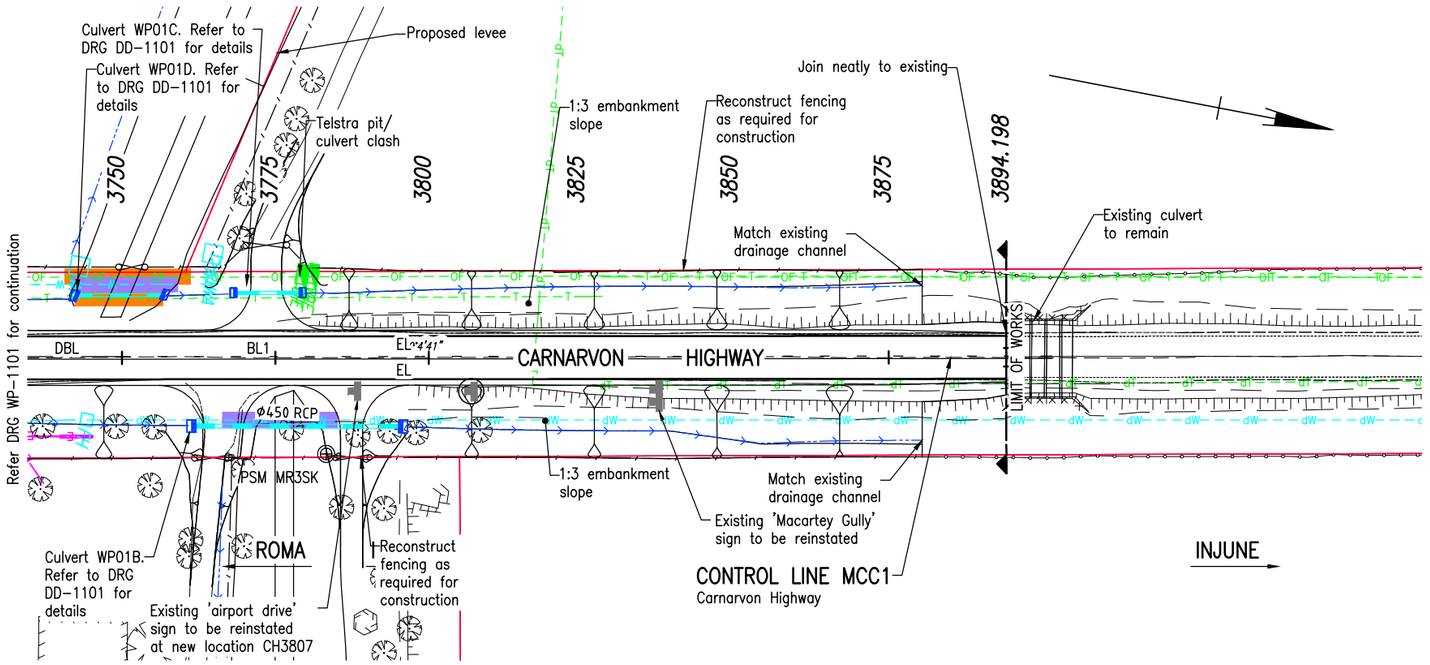
DESIGNER
SMEC AUSTRALIA PTY LTD
© ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD. 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

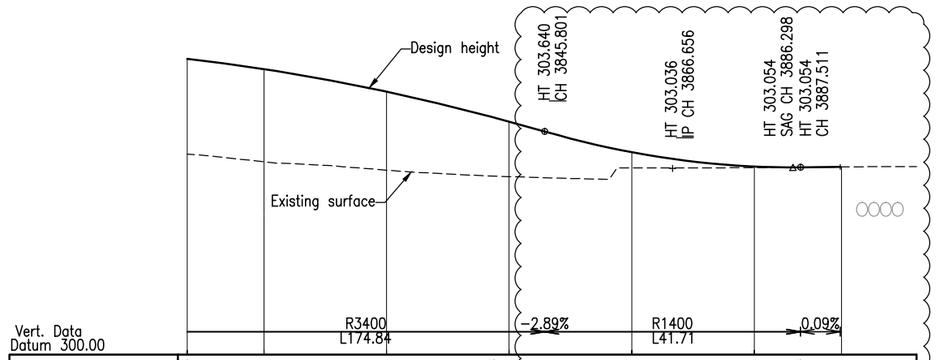
CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
WORKING PLAN AND LONGITUDINAL SECTION SHEET 1

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:500	CONSTRUCTION	30031182-WP-1101	D

150 mm ON ORIGINAL
A1





Pvt. Mkg.		BL1					
Type (TC)		Type C			Type B		
Ewks.	Cut	1	3	3	4	7	1
	Fill	315	494	432	297	148	195
Design Height		304.826	304.656	304.288	303.802	303.301	303.088	303.060
Natural Surface		303.269	303.144	303.009	302.903	303.046	303.049	303.060
Chainage		3787.484	3800	3820	3840	3860	3880	3894
Horiz.Data								
Operating Speed		Design Speed 90 km/h						
Superelev.		LHS and RHS -3%			LHS and RHS -3%		Join Neatly into Existing Crossfalls	

CONFLICT WITH SERVICES

Service locations shall be confirmed on site with the relevant authorities prior to construction work commencing. During construction, no work shall be carried out within 3.0m of any service without first contacting the relevant authority.

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TRANSPORT AND MAIN ROADS USE ONLY

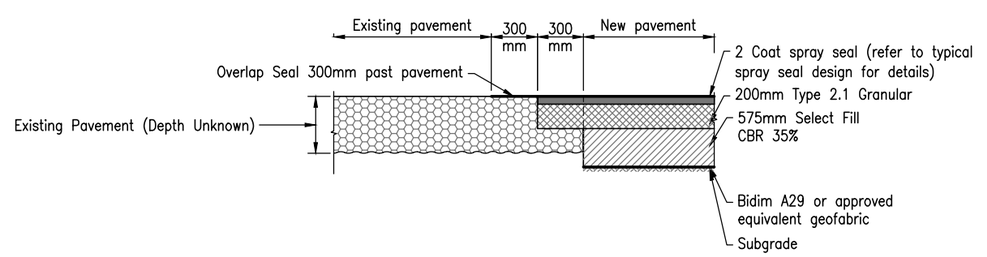
Road: Carnarvon Highway — Parish of: Roma
T.Dist: 3.499 km – 3.914 km — Aux Dwg No's.

Queensland Government — Downs South West Region

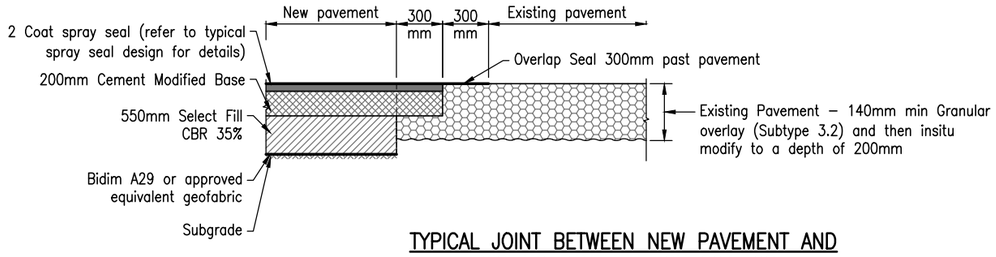
LG: Maranoa Regional Council
Revision A Microfilmed_____
TMR Dwg No.

ENGINEERING CERTIFICATION (RPEQ)

ENG. AREA	NAME	SIGNATURE	NO.	DATE
DRAINAGE	A. ZANETTI	A. ZANETTI	12112	31/03/14



TYPICAL JOINT BETWEEN NEW PAVEMENT AND EXISTING PAVEMENT CH3687.011



TYPICAL JOINT BETWEEN NEW PAVEMENT AND EXISTING PAVEMENT CH3894.198

NOTES

1. For notes and legend refer to drawing 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	A	30/01/2014	ISSUED FOR CONSTRUCTION	019	AZ
	B	28/02/2014	TMR COMMENTS	025	RS
	C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
	D	10/04/2014	BAR TREATMENT ADDED	-	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	A. ZANETTI

SCALES AT A1 SIZE DRAWING
Horizontal 0 5 10 15 20m
Vertical 0 1.0 2.0m

DESIGNER
SMEC AUSTRALIA PTY LTD
ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD. 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

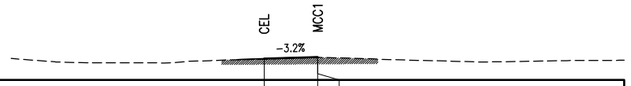
CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
WORKING PLAN AND LONGITUDINAL SECTION SHEET 2

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:500	CONSTRUCTION	30031182-WP-1102	D

150 mm ON ORIGINAL
A1

CONTROL LINE MCC1
X = 677534.650
Y = 7063143.352
Z = 303.491



Datum 302.00

DESIGN HEIGHT	303.380	303.491	303.491
EXISTING SURFACE	303.352	303.465	303.465
OFFSETS	-3.500	0.000	0.000

CHAINAGE 3600.000

CONTROL LINE MCC1
X = 677538.415
Y = 7063123.710
Z = null

Datum 300.00

DESIGN HEIGHT	302.941	303.196
EXISTING SURFACE	302.953	303.273
OFFSETS	-14.202	-11.090

CHAINAGE 3580.000

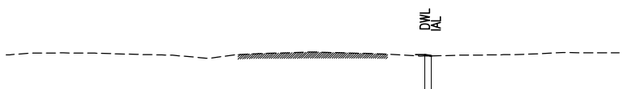
CONTROL LINE MCC1
X = 677545.944
Y = 7063084.425
Z = null

Datum 302.00

DESIGN HEIGHT	303.012	303.161
EXISTING SURFACE	303.131	303.264
OFFSETS	-9.854	-8.331

CHAINAGE 3540.000

CONTROL LINE MCC1
X = 677555.923
Y = 7063032.384
Z = null

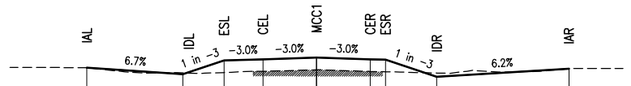


Datum 300.00

DESIGN HEIGHT	303.142	303.071
EXISTING SURFACE	303.062	303.071
OFFSETS	7.313	7.732

CHAINAGE 3487.011

CONTROL LINE MCC1
X = 677519.591
Y = 7063221.922
Z = 304.393

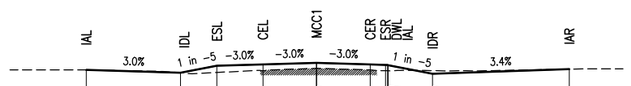


Datum 302.00

DESIGN HEIGHT	303.734	303.314	304.212	304.288	304.393	304.393	304.288	304.258	303.144	303.675
EXISTING SURFACE	303.734	303.394	303.424	303.505	303.598	303.598	303.491	303.472	303.390	303.675
OFFSETS	-14.985	-8.732	-6.039	-3.500	0.000	0.000	3.500	4.500	7.841	16.467

CHAINAGE 3680.000

CONTROL LINE MCC1
X = 677523.355
Y = 7063202.280
Z = 303.956

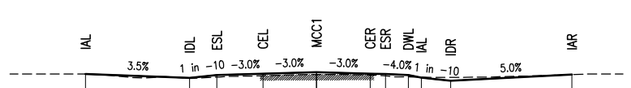


Datum 302.00

DESIGN HEIGHT	303.500	303.317	303.761	303.851	303.956	303.956	303.851	303.821	303.804	303.248	303.553
EXISTING SURFACE	303.500	303.306	303.329	303.449	303.594	303.594	303.491	303.445	303.440	303.439	303.449	303.553
OFFSETS	-15.026	-8.882	-6.500	-3.500	0.000	0.000	3.500	4.500	4.631	4.674	7.572	16.494

CHAINAGE 3660.000

X = 677527.120
Y = 7063182.637
Z = 303.633

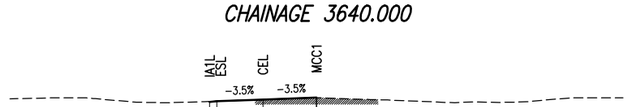


Datum 302.00

DESIGN HEIGHT	303.500	303.261	303.438	303.528	303.633	303.633	303.528	303.498	303.439	303.265	303.075	303.465
EXISTING SURFACE	303.500	303.222	303.301	303.399	303.477	303.477	303.436	303.394	303.318	303.296	303.293	303.465
OFFSETS	-15.070	-8.278	-6.500	-3.500	0.000	0.000	3.500	4.500	5.987	6.834	8.751	16.663

CHAINAGE 3640.000

CONTROL LINE MCC1
X = 677530.885
Y = 7063162.995
Z = 303.520



Datum 302.00

DESIGN HEIGHT	303.245	303.292	303.397	303.520	303.520
EXISTING SURFACE	303.269	303.286	303.398	303.514	303.514
OFFSETS	-6.973	-6.500	-3.500	0.000	0.000

CHAINAGE 3620.000

TRANSPORT AND MAIN ROADS USE ONLY

Road: Carnarvon Highway
T.Dist: 3.499 km – 3.914 km

Parish of: Roma
Aux Dwg No's.

Queensland Government — Downs South West Region

LG: Maranoa Regional Council
Revision A Microfilmed_____
TMR Dwg No.

ENGINEERING CERTIFICATION (RPEQ)

ENG. AREA	NAME	SIGNATURE	NO.	DATE
DRAINAGE	A. ZANETTI	A. ZANETTI	12112	31/03/14

NOTES

1. For notes and legend refer to drawing 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	30/01/2014	ISSUED FOR CONSTRUCTION	019	AZ
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TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	A. ZANETTI

SCALES AT A1 SIZE DRAWING

0 2 4 6 8m

DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
© ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD. 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

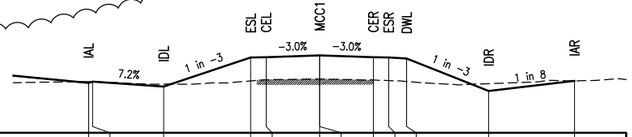
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
ANNOTATED CROSS SECTIONS
SHEET 1

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:200	CONSTRUCTION	30031182-XS-1101	D

150 mm ON ORIGINAL
A1

CONTROL LINE MCC1
X = 677504.473
Y = 7063300.481
Z = 305.039

Datum 300.00

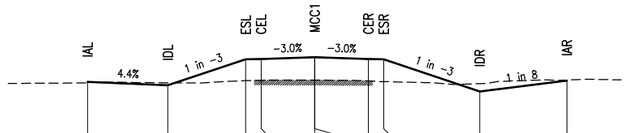


DESIGN HEIGHT	303.249	303.345	303.010	304.904	304.934	305.039	305.039	304.934	304.904	304.850	302.729	303.391		
EXISTING SURFACE	303.341	303.345	303.175	303.386	303.458	303.507	303.507	303.452	303.405	303.337	303.207	303.391		
OFFSETS	−15.082	−14.819	−10.181	−4.500	−3.500	0.000	0.000	3.500	4.500	5.673	11.026	16.627		

CHAINAGE 3760.000

CONTROL LINE MCC1
X = 677508.262
Y = 7063280.843
Z = 305.054

Datum 300.00

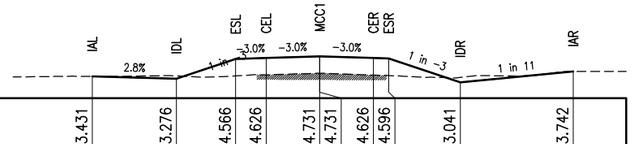


DESIGN HEIGHT	303.454	303.226	304.919	304.949	305.054	305.054	304.949	304.919	302.833	303.533				
EXISTING SURFACE	303.454	303.392	303.531	303.557	303.574	303.574	303.520	303.469	303.339	303.533				
OFFSETS	−14.819	−9.580	−4.500	−3.500	0.000	0.000	3.500	4.500	10.759	16.459				

CHAINAGE 3740.000

CONTROL LINE MCC1
X = 677515.826
Y = 7063241.565
Z = 304.731

Datum 302.00

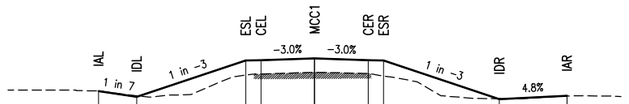


DESIGN HEIGHT	303.431	303.276	304.566	304.626	304.731	304.731	304.626	304.596	303.041	303.742				
EXISTING SURFACE	303.431	303.456	303.459	303.527	303.632	303.632	303.507	303.480	303.356	303.742				
OFFSETS	−14.843	−9.355	−5.483	−3.500	0.000	0.000	3.500	4.500	9.166	16.538				

CHAINAGE 3700.000

CONTROL LINE MCC1
X = 677489.315
Y = 7063379.032
Z = 303.802

Datum 300.00

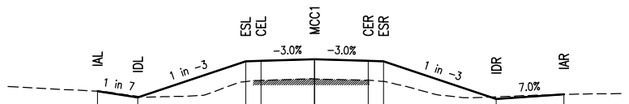


DESIGN HEIGHT	301.674	301.297	303.667	303.697	303.802	303.802	303.697	303.667	301.151	301.363				
EXISTING SURFACE	301.674	301.377	302.720	302.790	302.903	302.903	302.815	302.665	301.180	301.363				
OFFSETS	−14.097	−11.611	−4.500	−3.500	0.000	0.000	3.500	4.500	12.050	16.468				

CHAINAGE 3840.000

CONTROL LINE MCC1
X = 677493.104
Y = 7063359.394
Z = 304.288

Datum 300.00

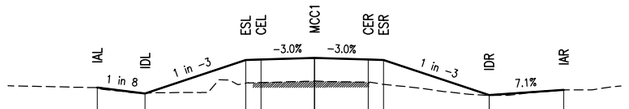


DESIGN HEIGHT	302.208	301.810	304.153	304.183	304.288	304.288	304.183	304.153	301.701	302.008				
EXISTING SURFACE	302.208	301.869	302.838	302.912	303.009	303.009	302.931	302.853	301.842	302.008				
OFFSETS	−14.164	−11.530	−4.500	−3.500	0.000	0.000	3.500	4.500	11.857	16.272				

CHAINAGE 3820.000

CONTROL LINE MCC1
X = 677496.894
Y = 7063339.756
Z = 304.656

Datum 300.00

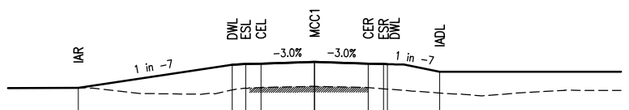


DESIGN HEIGHT	302.718	302.336	304.521	304.551	304.656	304.656	304.551	304.521	302.226	302.572				
EXISTING SURFACE	302.718	302.373	303.007	303.049	303.144	303.144	303.044	302.932	302.209	302.572				
OFFSETS	−14.179	−11.054	−4.500	−3.500	0.000	0.000	3.500	4.500	11.385	16.258				

CHAINAGE 3800.000

CONTROL LINE MCC1
X = 677500.683
Y = 7063320.118
Z = 304.906

Datum 300.00



DESIGN HEIGHT	303.219	304.733	304.771	304.801	304.906	304.906	304.801	304.771	304.762	304.279				
EXISTING SURFACE	303.219	303.081	303.196	303.246	303.316	303.316	303.239	303.161	303.141	302.883				
OFFSETS	−15.409	−5.375	−4.500	−3.500	0.000	0.000	3.500	4.500	4.746	8.162				

CHAINAGE 3780.000

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TRANSPORT AND MAIN ROADS USE ONLY

Road: Carnarvon Highway — Parish of: Roma
T.Dist: 3.499 km – 3.914 km — Aux Dwg No's.

Queensland Government — Downs South West Region

LG: Maranoa Regional Council
Revision A Microfilmed_____
TMR Dwg No.

ENGINEERING CERTIFICATION (RPEQ)

ENG. AREA	NAME	SIGNATURE	NO.	DATE
DRAINAGE	A. ZANETTI	A. ZANETTI	12112	31/03/14

NOTES

1. For notes and legend refer to drawing 30031182–DI–0011.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	30/01/2014	ISSUED FOR CONSTRUCTION	019	AZ
B	28/02/2014	TMR COMMENTS	025	RS
C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ
D	10/04/2014	BAR TREATMENT ADDED	-	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	A. ZANETTI

SCALES AT A1 SIZE DRAWING

0 2 4 6 8m

DESIGNER

SMEC

SMEC AUSTRALIA PTY LTD
© ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD. 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT

maranoa REGIONAL COUNCIL

PROJECT TITLE

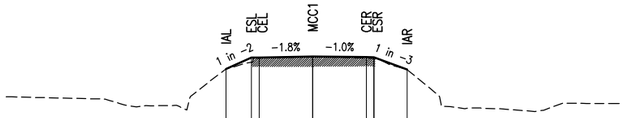
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
ANNOTATED CROSS SECTIONS
SHEET 2

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:200	CONSTRUCTION	30031182-XS-1102	D

150 mm ON ORIGINAL
A1

CONTROL LINE MCC1
X = 677479.083
Y = 7063432.053
Z = 303.060

Datum 298.00

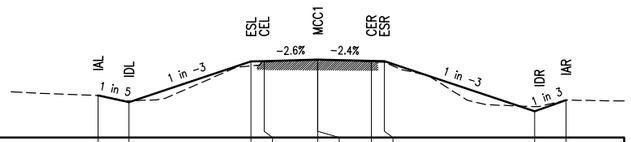


DESIGN HEIGHT	302.256	302.989	302.998	303.060	303.060	303.025	303.020	303.020	302.213
EXISTING SURFACE	302.256	302.692	302.955	303.060	303.060	302.957	302.941	302.941	302.213
OFFSETS	-5.656	-4.000	-3.500	0.000	0.000	3.500	4.000	4.000	6.162

CHAINAGE 3894.000

CONTROL LINE MCC1
X = 677481.736
Y = 7063418.307
Z = 303.068

Datum 298.00

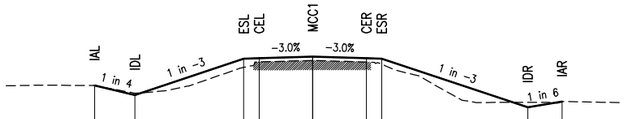


DESIGN HEIGHT	300.736	300.299	302.953	302.976	303.068	303.068	302.984	302.964	299.694	300.433
EXISTING SURFACE	300.736	300.374	302.664	302.939	303.049	303.049	302.940	302.895	300.000	300.433
OFFSETS	-14.333	-12.314	-4.351	-3.500	0.000	0.000	3.500	4.350	14.159	16.204

CHAINAGE 3880.000

CONTROL LINE MCC1
X = 677485.525
Y = 7063398.669
Z = 303.301

Datum 298.00



DESIGN HEIGHT	301.421	300.798	303.166	303.196	303.301	303.301	303.196	303.166	299.991	300.376
EXISTING SURFACE	301.421	300.921	302.600	302.956	303.046	303.046	302.952	302.804	300.317	300.376
OFFSETS	-14.233	-11.606	-4.500	-3.500	0.000	0.000	3.500	4.500	14.026	16.262

CHAINAGE 3860.000

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Queensland Government — Downs South West Region

LG: Maranoa Regional Council
Revision A Microfilmed_____
TMR Dwg No.

ENGINEERING CERTIFICATION (RPEQ)

ENG. AREA	NAME	SIGNATURE	NO.	DATE
DRAINAGE	A. ZANETTI	A. ZANETTI	12112	31/03/14

NOTES

1. For notes and legend refer to drawing 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	30/01/2014	ISSUED FOR CONSTRUCTION	019	AZ
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DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	A. ZANETTI

SCALES AT A1 SIZE DRAWING
0 2 4 6 8m

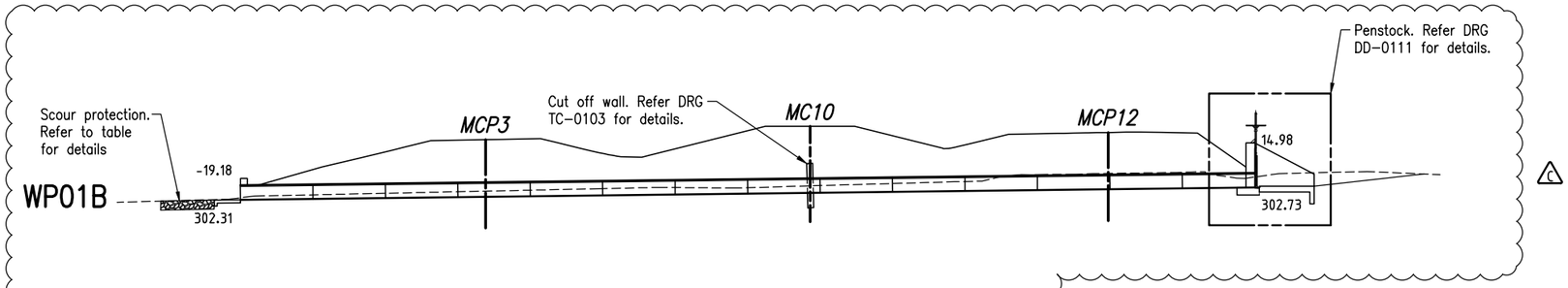
DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
© ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD. 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

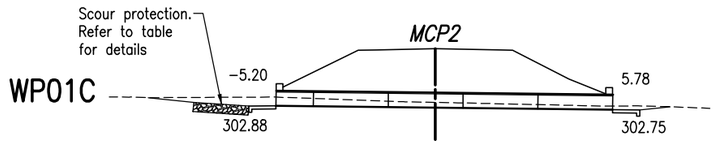
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
ANNOTATED CROSS SECTIONS
SHEET 3

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:200	CONSTRUCTION	30031182-XS-1103	D

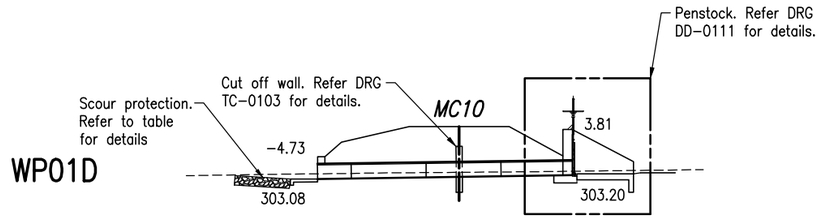
150 mm ON ORIGINAL
A1



450 RCP (14/2.44) (Class 3, Rubber Ring) (34.16 overall length) 793.8
Overlay Material 16.7m³, Bedding/Haunch Material 8.0m³
Standard Drawings – D04-221

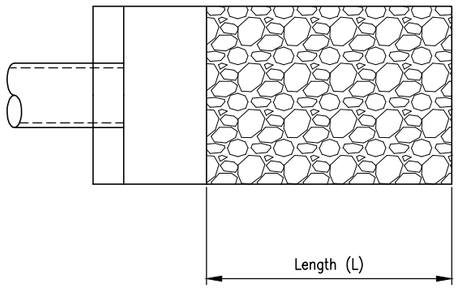


450 RCP (1/1.22 4/2.44) (Class 3, Rubber Ring) (10.98 overall length) 11.5
Overlay Material 5.2m³, Bedding/Haunch Material 2.5m³ (H2)
Standard Drawings – 1359, D04-221



450 RCP (1/1.22 3/2.44) (Class 3, Rubber Ring) (8.54 overall length) 740.5
Skew Angle 23° Skew Number 67 (8.54 overall length)
Overlay Material 4.1m³, Bedding/Haunch Material 1.8m³
Standard Drawings – D04-221

C



ROCK SCOUR PROTECTION DETAIL
N.T.S

TABLE A – ROCK SCOUR PROTECTION

Culvert	Length (L)	Minimum Rock Size (d_{50})	Depth	Volume (m^3)
WP01B	1.8 Minimum	200mm	300mm Nominal	0.5
WP01C	1.8 Minimum	200mm	300mm Nominal	0.5
WP01D	1.8 Minimum	200mm	300mm Nominal	0.5

C

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ENGINEERING CERTIFICATION (RPEQ)

ENG. AREA	NAME	SIGNATURE	NO.	DATE
DRAINAGE	A. ZANETTI	A. ZANETTI	12112	31/03/14

C

NOTES
1. For general notes refer drawing DI-0011.
2. For inlet and outlet rock scour protection refer to Table A

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	30/01/2014	ISSUED FOR CONSTRUCTION	019	AZ
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C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	L. EVANS
DESIGN CHECK	A. ZANETTI
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	A. ZANETTI

SCALES AT A1 SIZE DRAWING
0 1 2 3 4m

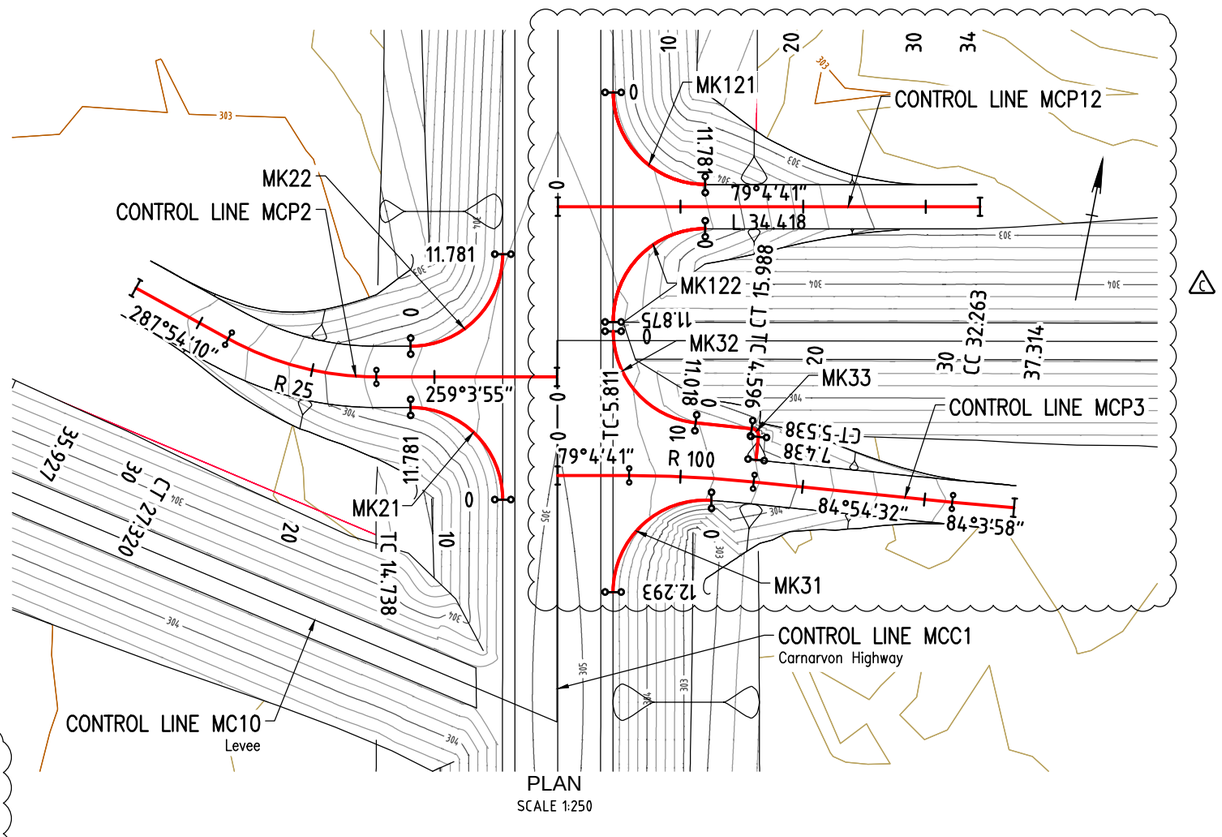
DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD. 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
DRAINAGE CROSS SECTION AND SCHEDULE

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
AS SHOWN	CONSTRUCTION	30031182-DD-1101	C

150 mm ON ORIGINAL
A1



PLAN
SCALE 1:250

CONTROL LINE MCP12

Pt	Chainage	Easting	Northing	Level	Bearing	Radius
START	0	677499.282	7063327.379	304.827	79°04'40.9"	
END	34.418	677533.077	7063333.900	302.837	79°04'40.9"	

CONTROL LINE MCP2

Pt	Chainage	Easting	Northing	Level	Bearing	Radius
START	0	677501.843	7063313.742	305.209	259°03'54.72"	
TC	14.738	677487.373	7063310.946	304.513	259°03'54.72"	
IP	21.029	677481.062	7063309.727	303.933		25
CT	27.32	677474.945	7063311.703	303.435	287°54'10.43"	
END	35.927	677466.755	7063314.349	303.163	287°54'10.43"	

CONTROL LINE MCP3

Pt	Chainage	Easting	Northing	Level	Bearing	Radius
START	0	677503.434	7063305.865	305.255	79°04'40.96"	
TC	5.811	677509.139	7063306.966	305.076	79°04'40.96"	
IP	10.899	677514.14	7063307.931	304.828		100
CT	15.988	677519.213	7063308.383	304.459	84°54'32.47"	
IP	32.263	677535.424	7063309.827	303.24		
END	37.314	677540.447	7063310.35	303.156	84°03'58.41"	

SETOUT DETAILS MK31

Chainage	Easting	Northing	Level	Radius
0	677516.103	7063306.244	304.679	−7.5
2	677514.174	7063305.74	304.810	−7.5
4	677512.446	7063304.745	304.921	−7.5
6	677511.041	7063303.33	305.013	−7.5
8	677510.058	7063301.594	305.083	−7.5
10	677509.568	7063299.661	305.128	−7.5
12	677509.604	7063297.668	305.147	−7.5
12.293	677509.654	7063297.379	305.148	−7.5

SETOUT DETAILS MK21

Chainage	Easting	Northing	Level	Radius
0	677499.387	7063303.083	305.128	−7.5
2	677498.752	7063304.973	305.107	−7.5
4	677497.641	7063306.629	305.059	−7.5
6	677496.133	7063307.934	304.984	−7.5
8	677494.335	7063308.795	304.889	−7.5
10	677492.373	7063309.152	304.776	−7.5
11.781	677490.601	7063309.024	304.661	−7.5

SETOUT DETAILS MK22

Chainage	Easting	Northing	Level	Radius
0	677489.657	7063313.934	304.666	−7.5
2	677491.547	7063314.569	304.785	−7.5
4	677493.204	7063315.68	304.878	−7.5
6	677494.508	7063317.188	304.945	−7.5
8	677495.37	7063318.987	304.987	−7.5
10	677495.726	7063320.948	305.003	−7.5
11.781	677495.598	7063322.721	304.997	−7.5

SETOUT DETAILS MK32

Chainage	Easting	Northing	Level	Radius
0	677505.626	7063318.255	305.050	−7.5
2	677506.261	7063316.364	305.050	−7.5
4	677507.371	7063314.708	305.022	−7.5
6	677508.879	7063313.403	304.965	−7.5
8	677510.677	7063312.541	304.886	−7.5
10	677512.639	7063312.184	304.789	−7.5
11.018	677513.656	7063312.205	304.733	−7.5

SETOUT DETAILS MK33

Chainage	Easting	Northing	Level	Radius
0	677513.656	7063312.205	304.718	
2	677515.648	7063312.383	304.609	
4	677517.64	7063312.56	304.467	
4.596	677518.233	7063312.613	304.421	0.6
5.538	677518.884	7063312.069	304.385	0.6
6	677518.925	7063311.609	304.395	
7.438	677519.053	7063310.176	304.423	

SETOUT DETAILS MK121

Chainage	Easting	Northing	Level	RADIUS
0	677501.939	7063337.363	304.57	−7.5
2	677502.573	7063335.473	304.587	−7.5
4	677503.684	7063333.816	304.577	−7.5
5.89	677503.36	7063329.999	304.545	−7.5
6	677505.191	7063332.511	304.542	−7.5
8	677506.99	7063331.65	304.474	−7.5
10	677508.952	7063331.292	304.365	−7.5
11.781	677510.724	7063331.42	304.233	−7.5

SETOUT DETAILS MK122

Chainage	Easting	Northing	Level	RADIUS
0	677511.406	7063327.885	304.305	
2	677509.516	7063327.25	304.455	
4	677507.859	7063326.14	304.573	
5.938	677503.949	7063326.446	304.657	−7.5
6	677506.554	7063324.632	304.659	
8	677505.692	7063322.834	304.721	
10	677505.335	7063320.872	304.765	
11.875	677505.481	7063319.008	304.79	

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TRANSPORT AND MAIN ROADS USE ONLY

Road: Carnarvon Highway — Parish of: Roma
T.Dist: 3.499 km – 3.914 km — Aux Dwg No's.

Queensland Government — Downs South West Region

LG: Maranoa Regional Council
Revision A Microfilmed_____
TMR Dwg No.

ENGINEERING CERTIFICATION (RPEQ)

ENG. AREA	NAME	SIGNATURE	NO.	DATE
DRAINAGE	A. ZANETTI	A. ZANETTI	12112	31/03/14

NOTES

1. For notes and legend refer to drawing 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
A	30/01/2014	ISSUED FOR CONSTRUCTION	019	AZ
B	28/02/2014	TMR COMMENTS	025	RS
C	31/03/2014	BIRKETT LEVEE REALIGNMENT	030	AZ

EXTERNAL REFERENCE FILES

TITLE	NAME
DRAFTER	B. TAYLOR
DRAFTING CHECK	J. RAISON
DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	A. ZANETTI

SCALES AT A1 SIZE DRAWING
0 2 4 6 8 10m

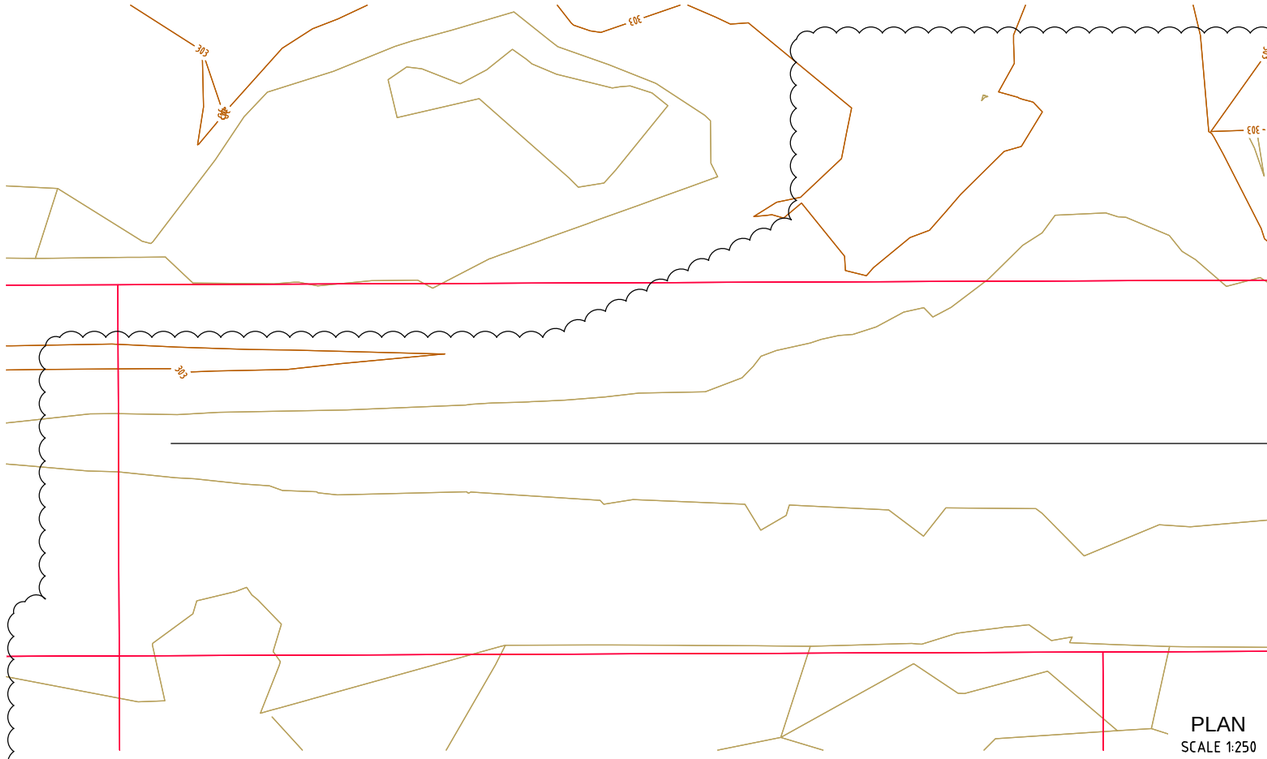
DESIGNER
SMEC
SMEC AUSTRALIA PTY LTD
© ABN 47 065 475 149
LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD. 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

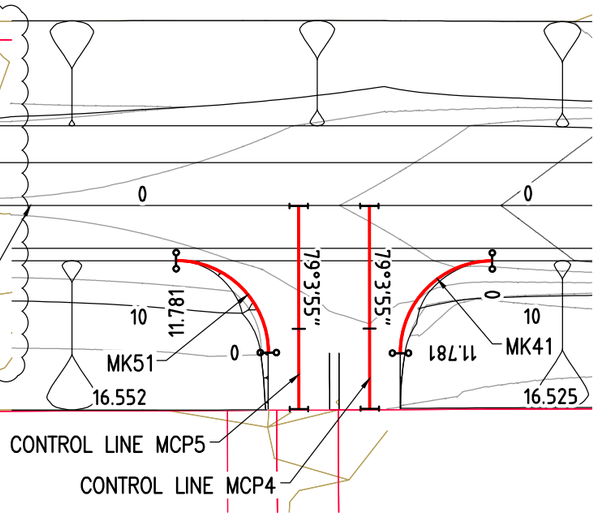
PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
PROPERTY ACCESS PLAN
SHEET 1

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:250	CONSTRUCTION	30031182-PA-1101	C

150 mm ON ORIGINAL
A1



PLAN
SCALE 1:250



CONTROL LINE MCP4

Pt	Chainage	Easting	Northing	Level	Bearing
START	0	677525.032	7063193.712	303.789	79°03'54.72"
END	16.525	677541.257	7063196.847	303.493	79°03'54.72"

CONTROL LINE MCP5

Pt	Chainage	Easting	Northing	Level	Bearing
START	0	677526.127	7063188.047	303.700	79°03'54.72"
END	16.552	677542.378	7063191.187	303.500	79°03'54.72"

SETOUT DETAILS MK51

Chainage	Easting	Northing	Level	Radius
0	677538.327	7063187.858	303.396	–7.5
2	677536.437	7063187.223	303.383	–7.5
4	677534.781	7063186.112	303.391	–7.5
6	677533.476	7063184.604	303.422	–7.5
8	677532.615	7063182.805	303.452	–7.5
10	677532.258	7063180.844	303.462	–7.5
11.781	677532.386	7063179.071	303.455	–7.5

SETOUT DETAILS MK41

Chainage	Easting	Northing	Level	Radius
0	677527.554	7063204.384	303.849	–7.5
2	677528.189	7063202.494	303.789	–7.5
4	677529.3	7063200.838	303.697	–7.5
6	677530.808	7063199.533	303.575	–7.5
8	677532.606	7063198.672	303.467	–7.5
10	677534.568	7063198.315	303.411	–7.5
11.781	677536.34	7063198.443	303.405	–7.5

The Regional Director does not accept any responsibility for the accuracy of these Drawings and/or Specifications. It is expected that the Certifying Engineer has executed sound engineering judgement when preparing the Drawings and Specifications, and that all site conditions and Transport and Main Roads requirements have been taken into account.

TRANSPORT AND MAIN ROADS USE ONLY

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NOTES

1. For notes and legend refer to drawing 30031182-DI-0011.

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DESIGN CHECK	J. CARROLL
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PROJECT DIRECTOR	A. ZANETTI

SCALES AT A1 SIZE DRAWING
0 2 4 6 8 10m

DESIGNER
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LEVEL 1 154 MELBOURNE STREET
SOUTH BRISBANE QLD. 4101
PH 07 3029 6600 FAX 07 3029 6650
SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
PROPERTY ACCESS PLAN
SHEET 2

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:250	CONSTRUCTION	30031182-PA-1102	C

150 mm ON ORIGINAL
A1
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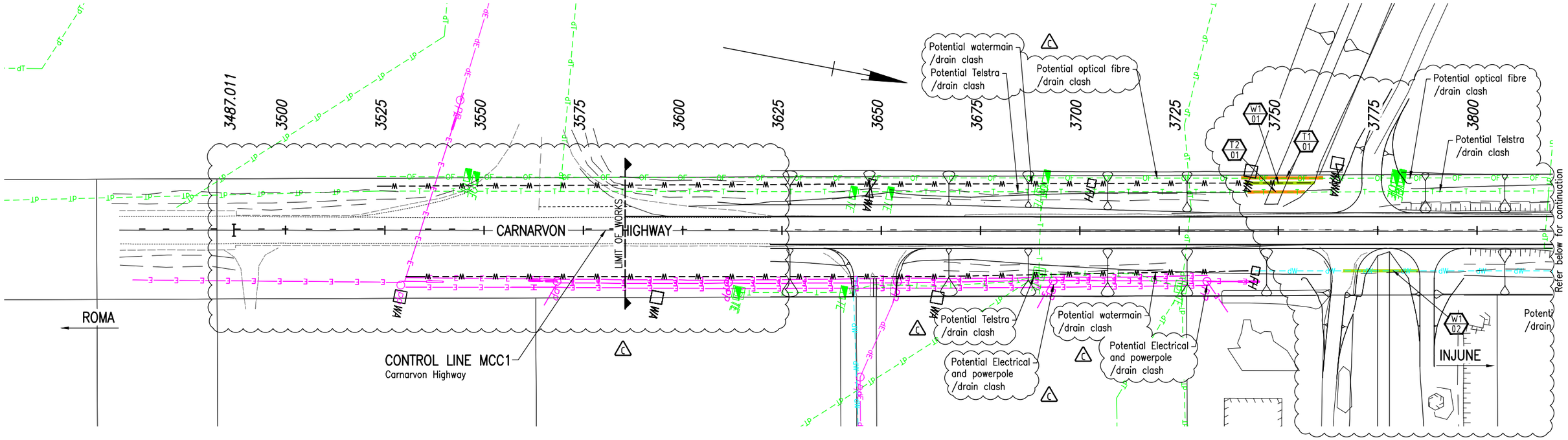

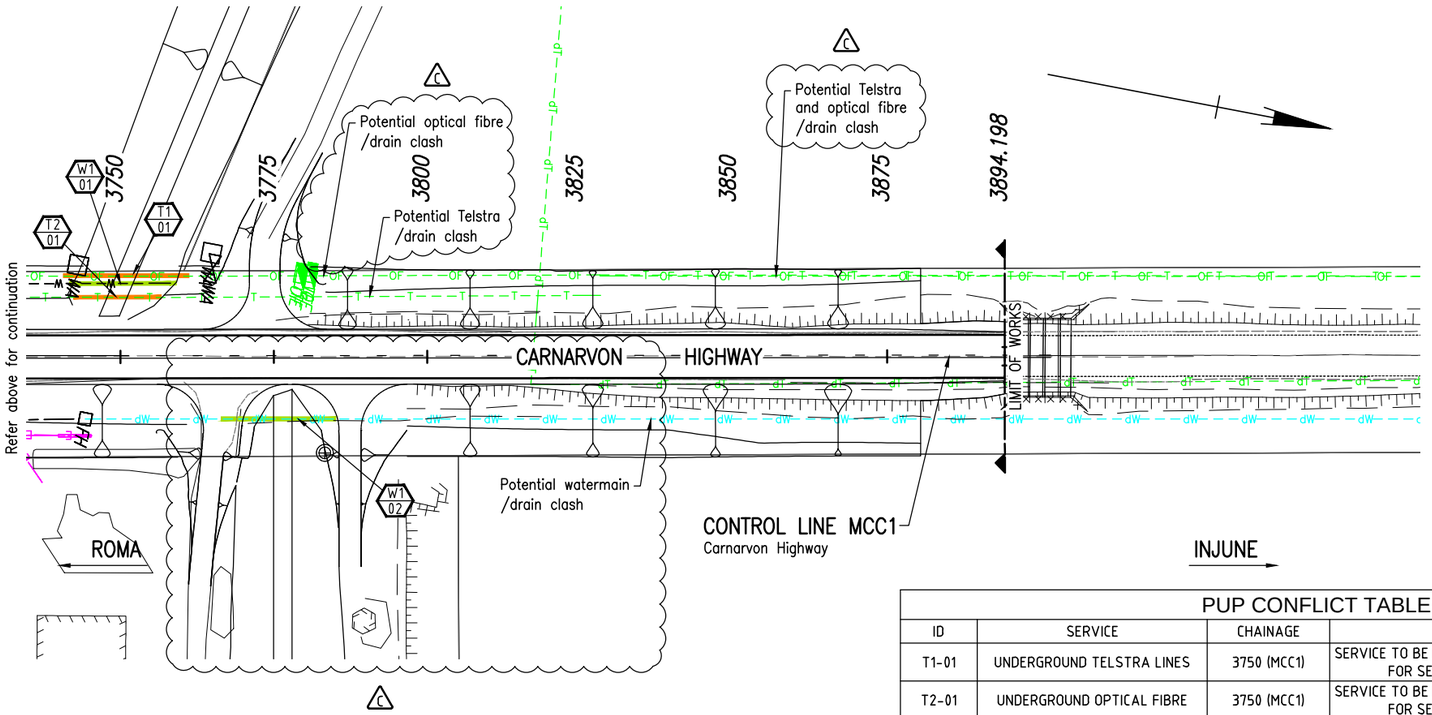

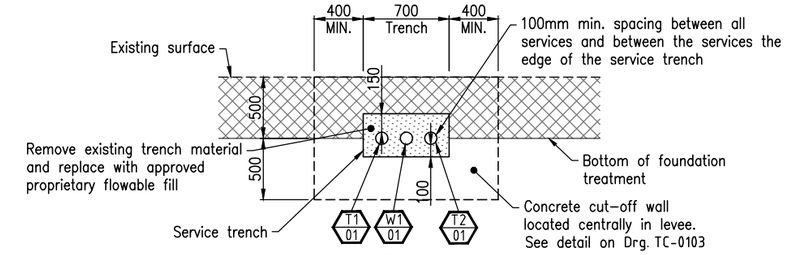

DETAIL 1
TREATMENT FOR SERVICES UNDER LEVEE @ CH 3750
Scale 1:25

CONFLICT WITH SERVICES

Service locations shall be confirmed on site with the relevant authorities prior to construction work commencing. During construction, no work shall be carried out within 3.0m of any service without first contacting the relevant authority.

The Regional Director does not accept any responsibility for the accuracy of these Drawings and/or Specifications. It is expected that the Certifying Engineer has executed sound engineering judgement when preparing the Drawings and Specifications, and that all site conditions and Transport and Main Roads requirements have been taken into account.

TRANSPORT AND MAIN ROADS USE ONLY

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Queensland Government — Downs South West Region

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Revision A Microfilmed_____
TMR Dwg No.

ENGINEERING CERTIFICATION (RPEQ)

ENG. AREA	NAME	SIGNATURE	NO.	DATE
DRAINAGE	A. ZANETTI	A. ZANETTI	12112	31/03/14

PUP CONFLICT TABLE

ID	SERVICE	CHAINAGE	NOTES
T1-01	UNDERGROUND TELSTRA LINES	3750 (MCC1)	SERVICE TO BE PROTECTED AS PER DETAIL 1 AND TREATMENT FOR SERVICES UNDER LEVEE ON DRG TC-0103
T2-01	UNDERGROUND OPTICAL FIBRE	3750 (MCC1)	SERVICE TO BE PROTECTED AS PER DETAIL 1 AND TREATMENT FOR SERVICES UNDER LEVEE ON DRG TC-0103
W1-01	UNDERGROUND WATER MAIN	3750 (MCC1)	SERVICE TO BE PROTECTED AS PER DETAIL 1 AND TREATMENT FOR SERVICES UNDER LEVEE ON DRG TC-0103
W1-02	UNDERGROUND WATER MAIN	3775 (MCC1)	SERVICE TO BE PROTECTED AS PER, TREATMENT FOR SERVICES UNDER LEVEE ON DRG TC-0103

NOTES

1. For notes and legend refer to drawing 30031182-DI-0011.

ISSUED FOR CONSTRUCTION

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
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DESIGNER	J. RAISON
DESIGN CHECK	J. CARROLL
PROJECT MANAGER	A. ZANETTI
PROJECT DIRECTOR	A. ZANETTI

SCALES AT A1 SIZE DRAWING
0 5 10 15 20m
0 0.5 1.0m

DESIGNER
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LEVEL 1 154 MELBOURNE STREET
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SMEC PROJECT No 30031182

CLIENT
maranoa REGIONAL COUNCIL

PROJECT TITLE
MARANOA REGIONAL COUNCIL
ROMA FLOOD MITIGATION PROJECT
PUBLIC UTILITIES PLAN

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
1:500	CONSTRUCTION	30031182-PU-1101	C

150 mm ON ORIGINAL
A1

APPENDIX B – CONSTRUCTION SPECIFICATIONS

Project Name:	Roma Flood Mitigation Project
Project Number:	30031182
Report for:	Maranoa Regional Council

PREPARATION, REVIEW AND AUTHORISATION

Revision #	Date	Prepared by	Reviewed by	Approved for Issue by
1 – Tender	24/5/2013	M Vranes		A Zanetti
2 – 50%	25/10/2013	J Carroll	A Law	A Zanetti
3 – 80% A & C	29/11/2013	J Carroll	A Law	A Zanetti
4 – 80% B & D	20/12/2013	J Carroll	A Law	A Zanetti
A – IFC A & C	17/01/2014	J Carroll	A Law	A Zanetti
B – IFC B & D	30/01/2014	J Carroll	A Law	A Zanetti
C – IFC CH	26/02/14	J. Carroll	S. Runge	A. Zanetti
D – IFC Reissue	16/05/14	J. Carroll	A. Law	A. Zanetti
E – Verifier Comments	02/06/14	J. Carroll	A. Law	A. Zanetti

ISSUE REGISTER

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Email: **Ashley.Zanetti@smec.com**

www.smec.com

CONSTRUCTION SPECIFICATION

FOR

ROMA FLOOD MITIGATION

DESIGN AND CONSTRUCT CONTRACT

For: Maranoa Regional Council

June, 2014

TABLE OF CONTENTS

PART A: GENERAL SCOPE OF WORKS

1.1 PROJECT BACKGROUND

The Roma Township is located in the Bungil Creek floodplain and has an extensive history of flooding, with a number of major flood events in the recent years resulting in significant damage to private property, public infrastructure and utilities. Three significant large flood events have occurred between March 2010 and February 2012, with the February 2012 flood being the largest flood event ever recorded in Roma and resulting in significant damage to over 500 premises.

As a result of the recent significant flood events the Roma Flood Study and Mitigation Project was developed, with an aim to minimize the flood risk to the Roma community and alleviate property inundation from the Bungil Creek catchment regional flooding. This project was broken up into three stages incorporating:

Stage 1: Flood study including hydrology and hydraulic modelling of selected design rainfall events and model calibration for the March 2010, April 2011, and February 2012 flood events;

Stage 2: Public consultation, development of a flood mitigation strategy and concept design of mitigation measures; and

Stage 3: Detailed design, construction and implementation of flood mitigation strategy.

1.2 DESCRIPTION OF THE SCHEME

The scope of the work executed under this Contract is to construct a levee approximately 5km long and associated infrastructure to protect the Roma Township.

1.3 DESCRIPTION OF WORKS

The principal items of work to be executed under this Contract as described herein and as shown on the drawings, include the following:

1) Mobilisation and demobilisation;
2) Dealing with water, including any pumping;
3) Creation of stockpiles areas;
4) Clearing and disposal of site vegetation;
5) Removal and stockpiling of topsoil;
6) Foundation excavation and preparation;
7) Construction of earthen levees to the design levels;
8) Disposal of spoil at locations as directed by the Principals Representative;
9) Topsoiling, hydromulching and seeding the crest and batters of the levee;
10) Installation of erosion protection including rip-rap;
11) Construction of cross drainage pipes;
12) Provision of temporary access roads where the works impact on existing roads and private accesses;
13) Property access ramps;
14) Road construction crossings at the Carnarvon Highway;
15) Construction of permanent road diversions where existing roads are cut off by the levee; and

1.4 STANDARDS

All materials, equipment and fittings supplied shall be new, and in accordance with the requirements of the relevant Australian Standard. Throughout this Specification, "AS" shall mean Australian Standard.

If any requirement of this Specification conflicts with the Standard requirements, then the specified requirements shall apply.

Wherever an Australian Standard or Code is specified herein, it shall mean the latest edition and/or amendment of that standard/code irrespective of the particular edition referred to in this Specification. The Standard Specification referred to in this Specification shall be considered to be part of the Contract Documents insofar as they apply to the works of this Contract.

1.5 INTERPRETATION

Principal means the Maranoa Regional Council.

Principals Representative means the person authorized by the Principal, to act with the full authority of the Principal. For the purposes of this Specification, the Principals Representative is Ross Drabble of Maranoa Regional Council.

Defects Liability Period means the period during which the Construction Contractor is responsible for making good defects in a part or the whole of any works. The Defects Liability Period shall also include routine maintenance items.

The Contractor means ‘Ostwald Brothers’.

The Designers Site Geotechnical Representative or DSGR is an experienced geotechnical professional from the design team. The Designers Site Representative is an experienced engineering professional from the design team.

1.6 WORK EXCLUDED

Not Used

1.7 PROCEDURE OF DOCUMENTS

In the event of any inconsistency between this document and any other documents, unless otherwise provided, the documents will rank in order of precedence in the order in which they are listed below:

- Project and company standards;
- Maranoa Regional Council Specification and Drawings
- DTMR specifications and standards;
- References to applicable Australian and International Standards; and
- “Issued for Construction” drawing

1.8 LOCATION OF WORKS

The site of the works of this Contract shall be in Roma (QLD) in the area bounded by Bungil Creek to the east, Roma Airport to the west, and Lovell Street to the south.

1.9 MATERIALS

All materials used in the works shall be handled, transported and stored in accordance with the relevant Australian Standard and the manufacturer's recommendations. Wherever any material or equipment is specified by a proprietary name or by the name of the manufacturer, such Specification is used for the purpose of describing the required standard and shall be considered as if followed by "or approved equivalent".

1.10 DRAWINGS

The following Drawings are issued with this Specification and shall be read in conjunction with this Specification and shall form part of the Contract Documents:

Table 1.1 – Drawing Schedule

DRAWING NUMBER	DRAWING TITLE	REVISION
DI-0001	LOCALITY PLAN	C
DI-0002	DRAWING INDEX	E
DI-0011	GENERAL NOTES AND LEGEND	F
SW-0001	SCOPE OF WORKS AND KEY PLANS	C
TC-0101	TYPICAL CROSS SECTION AND DETAILS SHEET 1	C
TC-0102	TYPICAL CROSS SECTION AND DETAILS SHEET 2	C
TC-0103	TYPICAL CROSS SECTION AND DETAILS SHEET 3	C
CL-1001	CONTROL LINE AND FENCING SETOUT SHEET 1	C
CL-1002	CONTROL LINE AND FENCING SETOUT SHEET 2	C
CL-1003	CONTROL LINE AND FENCING SETOUT SHEET 3	D
CL-1004	CONTROL LINE AND FENCING SETOUT SHEET 4	B
CL-1005	CONTROL LINE AND FENCING SETOUT TABLES	E
WP-1001	WORKING PLAN AND LONG SECTION CONTROL LINE MC10 SHEET 1	C
WP-1002	WORKING PLAN AND LONG SECTION CONTROL LINE MC10 SHEET 2	C
WP-1003	WORKING PLAN AND LONG SECTION CONTROL LINE MC10 SHEET 3	C

DRAWING NUMBER	DRAWING TITLE	REVISION
WP-1004	WORKING PLAN AND LONG SECTION CONTROL LINE MC10 SHEET 4	C
WP-1005	WORKING PLAN AND LONG SECTION CONTROL LINE MC10 SHEET 5	B
WP-1006	WORKING PLAN AND LONG SECTION CONTROL LINE MC10 SHEET 6	C
WP-1007	WORKING PLAN AND LONG SECTION CONTROL LINE MC10 SHEET 7	C
WP-1008	WORKING PLAN AND LONG SECTION CONTROL LINE MC10 SHEET 8	C
GA-0001	GENERAL ARANGEMENT - LEVEE CROSSINGS McPHIE STREET - PLAN AND SECTIONS	B
GA-0002	GENERAL ARANGEMENT - LEVEE CROSSINGS MISCAMBLE STREET - PLAN AND SECTIONS CONFORMING LAYOUT	B
GA-0003	GENERAL ARANGEMENT - LEVEE CROSSINGS MISCAMBLE STREET - PLAN AND SECTIONS ALTERNATIVE LAYOUT	C
PA-0001	PROPERTY ACCESS - LEVEE CROSSINGS PROPERTY ACCESS SHEET 1	C
PA-0002	PROPERTY ACCESS - LEVEE CROSSINGS PROPERTY ACCESS SHEET 2	C
PA-0003	PROPERTY ACCESS - LEVEE CROSSINGS PROPERTY ACCESS SHEET 3	C
PA-0101	PROPERTY ACCESS - LEVEE CROSSINGS PROPERTY ACCESS DETAILS	C
PD-0011	PAVEMENT GENERAL NOTES	E
PD-1001	PAVEMENT DETAILS	C
DD-0001	DRAINAGE CULVERT SECTIONS	D
DD-0111	DRAINAGE AND SERVICES DETAILS	B
DD-0111	PENSTOCK DETAILS SHEET 1	D

DRAWING NUMBER	DRAWING TITLE	REVISION
DD-0112	PENSTOCK DETAILS SHEET 2	B
XS-1001	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 1	B
XS-1002	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 2	B
XS-1003	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 3	C
XS-1004	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 4	C
XS-1005	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 5	C
XS-1006	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 6	B
XS-1007	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 7	B
XS-1008	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 8	B
XS-1009	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 9	B
XS-1010	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 10	B
XS-1011	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 11	B
XS-1012	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 12	C
XS-1013	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 13	B
XS-1014	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 14	B
XS-1015	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 15	B
XS-1016	ANNOTATED CROSS SECTION CONTROL LINE MC10 SHEET 16	B
GE-0101	GEOTECHNICAL INVESTIGATION AND BORROW PIT LOCATIONS OVERALL PLAN	D
GE-1001	GEOTECHNICAL INVESTIGATION AND BORROW PIT LOCATIONS SHEET 1	C

DRAWING NUMBER	DRAWING TITLE	REVISION
GE-1002	GEOTECHNICAL INVESTIGATION AND BORROW PIT LOCATIONS SHEET 2	C
GE-1003	GEOTECHNICAL INVESTIGATION AND BORROW PIT LOCATIONS SHEET 3	C
GE-1004	GEOTECHNICAL INVESTIGATION AND BORROW PIT LOCATIONS SHEET 4	B
GE-1005	GEOTECHNICAL INVESTIGATION AND BORROW PIT LOCATIONS SHEET 5	C
ST-1002	WALL LEVEE STRUCTURAL DETAILS	B
PU-1001	PUBLIC UTILITIES PLAN SHEET 1	C
PU-1002	PUBLIC UTILITIES PLAN SHEET 2	C
PU-1003	PUBLIC UTILITIES PLAN SHEET 3	C
PU-1004	PUBLIC UTILITIES PLAN SHEET 4	B
PU-1011	PUBLIC UTILITIES PLAN MCPHIE ST	B
PU-1020	PUBLIC UTILITIES PLAN TREATMENT FOR SERVICES UNDER LEVEE	B
TC-1101	CARNARVON HIGHWAY - TYPICAL CROSS SECTION	C
CL-1101	CARNARVON HIGHWAY - CONTROL LINE SETOUT	C
WP-1101	CARNARVON HIGHWAY - WORKING PLAN AND LONGITUDINAL SECTION SHEET 1	D
WP-1102	CARNARVON HIGHWAY - WORKING PLAN AND LONGITUDINAL SECTION SHEET 2	D
XS-1101	CARNARVON HIGHWAY - ANNOTATED CROSS SECTIONS SHEET 1	D
XS-1102	CARNARVON HIGHWAY - ANNOTATED CROSS SECTIONS SHEET 2	D
XS-1103	CARNARVON HIGHWAY - ANNOTATED CROSS SECTIONS SHEET 3	D
DD-1101	CARNARVON HIGHWAY - DRAINAGE CROSS SECTION AND SCHEDULE	D
PA-1101	CARNARVON HIGHWAY - PROPERTY ACCESS PLAN SHEET 1	C

DRAWING NUMBER	DRAWING TITLE	REVISION
PU-1101	Public Utilities Plan Carnarvon Highway	C

1) The Drawings issued with this Specification will be supplemented or superseded by such additional general and detailed Drawings as may be necessary as the work progresses.

2) Such additional general and detailed Drawings will show dimensions and details necessary for construction purposes more completely than are shown on the attached Drawings for all features of works. The Contractor will be required to perform the work on these features and in accordance with the additional general and detailed Drawings mentioned above. The Contractor shall check all Drawings carefully before construction and advise the Designers Site Representative of any discrepancies, errors or omissions and full instructions will be furnished to the Contractor should any discrepancies, errors or omissions be found. The Contractor shall allow at least 8 working days for the Designs Representative to issue his instruction.

1.11 **SERVICES**

It is the responsibility of the contractor to ensure all services are located, position marked and hand excavated as appropriate prior to undertaking any works at the site. It shall be the sole responsibility of the Contractor to locate all existing buried formal and informal, public and private services prior to and during works in the area and to advise the designer site representative to assess the protection measures required. The Contractor must seek the assistance from Authorities in confirming the location and depth of all services.

While not all services require augmentation under this contract, the Contractor is advised that as a minimum the following services are known to exist at the site:

- Telstra – Telecommunications underground cables throughout the works area;
- Ergon Energy - Overhead power lines;
- Maranoa Regional Council – Pressurised water mains, pressure sewer, gravity sewer mains and sewer rising mains throughout the works area;
- Private Irrigation lines; and
- Private plumbing lines.

1.12 **SURVEY**

BASE LINES AND BENCH MARKS

The contractor shall establish base lines and bench marks, as shown on the drawings, which the Contractor shall use to do the detailed set-out. Contractor shall have the bench marks verified with a qualified surveyor before adopting them as being a true benchmark for construction purpose. If such base lines or bench marks are disturbed in any way by the Contractor, they will be re–established by the Principal's Representative at the Contractor's expense.

DETAILED SET–OUT

The Contractor shall use appropriately qualified people to do the detailed set-out. Detailed set-out shall include establishment of all lines, levels and grades necessary for the earthworks construction. Full records of all field work shall be kept in accordance with

good surveying practice. Field books shall be available for inspection by the Principal's Representative at any time.

APPROVAL OF SET–OUT

The Contractor shall be responsible for the accuracy of the detailed set-out. On completion of the detailed set-out of each portion of the works, the Contractor shall notify the Principal's Representative, in writing, and shall obtain approval to proceed with construction. The Principal's Representative may elect to check the Contractor's set-out, but approval to proceed, whether or not the Principal's Representative has checked the set–out, shall not diminish the Contractor's responsibility for the accuracy of the work.

1.13 SITE SECURITY

The site shall be secured at all times from unauthorised access during the currency of the contract.

PART B: ENGINEERING SPECIFICATION FOR LEVEE EARTHWORKS, STRUCTURES, AND DRAINAGE

1 EARTHWORKS MATERIALS

1.1 GENERAL

This section identifies specification for acceptance of use of the following material types in the placement of earthworks for the works:

1) Topsoil
2) Type B: General Fill
3) Type C: Structural Fill
4) Type D: Rip Rap

No earthworks materials other than specified above shall be used on this project, unless formally agreed in writing with the Designer.

Placement of the above type materials shall occur at locations shown on the drawings.

Earthworks Materials management shall be undertaken by the Contractor. The Contractor shall be responsible for estimation of and placement of the relevant:

- Quantities of site won material available for use in the earthworks, and
- Quantities of material required to be imported from offsite to balance cut/ fill requirements

Materials compliance testing, documentation and facilitation of review shall be undertaken by the Contractor in accordance with this specification and the design documentation.

Note that this specification does not include provision for consideration or compliance testing relating to environmental issues. Refer to relevant Environmental reports/ specifications for guidance.

1.2 TYPE A- TOPSOIL

Topsoil shall be fertile, friable soil containing organic matter which is reasonably free from subsoil, refuse, tree roots larger than 20 mm in diameter and 300 mm in length, noxious weeds, clay lumps and stones larger than 50 mm diameter. All Topsoil shall comply with AS 4419.

The Contractor shall manage available quantities of topsoil to meet placement requirements.

Topsoil shall be spread over the embankments to achieve the design minimum thickness measured normal to the slope as shown on the drawings. Topsoil shall be placed at moisture content which will allow for uniform spreading and compaction.

1.3 TYPE B- GENERAL LEVEE FILL

Type B material shall be used for placement in areas specified in the drawings.

The contractor must demonstrate that any Type B material placed meets the minimum material classification (refer Clause 1.6) and placement requirements in accordance with this specification.

It is preferred that Type B materials comprise naturally formed material won from cuttings or borrow pits. If material mixing or treatment is required to allow material to conform to this specification, the contractor shall submit details to the Designers Site Geotechnical

Representative (DSGR) for review and approval. The Contractor shall allow 5 working days for review and approval of treated or mixed material. Review and approval of mixed or treated material to be used as Type B material shall constitute a **HOLD POINT**.

The fill shall have a low shrink/swell capacity. If suspected highly reactive soils are encountered (i.e. 'Black Soil') in either the levee foundation or potential borrow areas, relevant testing shall be carried out to further investigate the soil's shrink swell potential. Selected use of soils of moderate reactivity may be possible following verification by test results and confirmation by the DSGR. These soils may be able to be used as Type B select fill under the following provisos:

- Placement if possible be confined to only within the levee foundation or;
- Placement be confined to no nearer than a scraper width from the levee face if placed above the surrounding natural surface level within the embankment, and
- Placement within the embankment shall be confined to no higher than 1m below the final levee crest level.

The fill shall not contain any organic material, rocks, stones or any other hard materials that can retain on 75mm sieve size or any other unsuitable material, which could prejudice the integrity of the levee.

1.4 TYPE C- STRUCTURAL FILL

Type C material (Structural fill) shall be used for placement in areas specified in the drawings where special performance is required. Such areas include backfill around culverts and pipes penetrating through the levee. At these locations, low permeability, non- dispersive, fill shall be used to limit and mitigate preferential flow of water along the line of the pipe and through the levee. If non dispersive fill is unable to be sourced economically, consideration may be given to using type B fill modified with 2-3% lime. If this option is desired, the contractor shall submit a proposal to the designer detailing mixing trials, validation and testing proposed to demonstrate acceptability of the revised material.

The contractor must demonstrate that any Type C material placed meets the minimum material classification and placement requirements in accordance with this specification.

1.5 TYPE D- RIP RAP

Type D material (Rip Rap) shall be used for placement in areas specified in the drawings where it is sought to provide erosion/ scour resistance for the works. From available site investigations, it is considered likely that rip rap will be imported from off site. Type D fill shall comprise material that is clean, hard, dense, durable, and resistant to weathering, free from overburden, spoil, shale and organic matter. Laminated, fractured porous or physically weak rock shall not be used.

The contractor must demonstrate that any material placed in designated Type D area meets the minimum material classification and placement requirements in accordance with this specification. The Contractor shall submit to the Designer details of any product to be used as an alternative **HOLD POINT**.

1.6 MATERIALS CLASSIFICATION

This Section defines acceptability criteria for the various types of earthworks materials that will be used in the works, based on material classifications. Materials used in the earthworks shall conform to the requirements shown in Table A1 (Appendix A).

2 EXCAVATION

2.1 GENERAL REQUIREMENTS

Prior to commencement of clearing or excavation the Contractor shall make all enquires and investigations for the protection of services from damage and construct all temporary or permanent re-arrangements required under any of the relevant clauses of the General and Special Conditions of Contract and the relevant Authorities. The Contractor shall indemnify the Principal and the Principals Representative relating to the Contractor's failure to undertake necessary arrangements, which results in damage to the services.

2.2 PROGRAM

The Contractor shall not commence excavation for the Works, until in the opinion of the Principals Representative, sufficient plant and material are available at the site to ensure satisfactory, safe and uninterrupted progress of the works.

Some of the work is to be undertaken on private property. The Principal's Representative shall make all necessary enquiries and obtain relevant approvals to facilitate the proposed works within private property. At least seven days' notice to the Principal's Representative of the requirement to commence work within each property is required as a minimum.

2.3 PROTECTION OF SERVICES

In preparation for any excavation work, the Contractor shall carry out field investigation in association with the relevant Authorities and property owners to locate and mark the exact positions and routes of all services in the area of works. It is the Contractor's responsibility to gain accurate information regarding the depth, size, alignment and other services that may be in close proximity. Special precautions shall be taken where excavations are made near any other services. These include overhead power cables, underground power and telecommunication cables, drains, sewers and water mains and the like. For these assets and any other services not specifically mentioned, the Contractor shall:

- Comply with the notification requirements of the construction conditions on the Design Drawings.
- Take special care to ensure that the services are protected in accordance with the conditions specified by the controlling Authority.
- Arrange for a representative from the controlling Authority to be present, unless the Authority directs otherwise, whenever the Contractor is:
    - Proving the locations of services.
    - Excavating within three (3) metres of the service.
- Arrange with the appropriate Authority for the closure and subsequent restoration of any service that must be shut down while the Works are in progress.
- Adopt a method for uncovering and protecting the service from damage if the service must be uncovered and left exposed, to the satisfaction of the controlling Authority.
- Immediately inform the owner or controlling authority of any damage or interference to any service, structure or property.
- Carry out any temporary bypass and restoration of the services to the satisfaction of the respective Authorities and property owners.

It shall be noted that the assessment and location of services does not comprise part of the IFC design package. Accordingly, the contractor shall take all necessary measures to assess, measure control and mitigate impacts of services on the works and vice versa.

Existing services passing under or through the proposed levee shall be excavated and backfilled in accordance with the design drawings.

Hand excavation shall be used in close proximity to all such services until the exact location is determined.

Excavations containing underground services shall be backfilled so that the sub-grade is restored as nearly as possible to its original state of compaction. Where selected backfill has been placed by other utilities and has had to be removed, it shall be replaced as specified in the design documentation. All backfill shall be carefully deposited in the trench and around the utility service in layers and adequately compacted by appropriate hand rammers and tampers, or by use of effective mechanical equipment.

Extra care shall be taken by the Contractor to re-compact excavations near existing underground pipework, so that foundations of that pipework are restored.

The Contractor shall be responsible for any damage caused to existing services. The Contractor shall notify owners of utility services that are damaged by construction activities.

Before commencing excavation the Contractor shall ensure adequate measures are taken to protect or to temporarily remove any obstructions which may exist on or adjacent to the service centreline.

2.4 PROTECTION OF PROPERTY

The Contractor shall protect the property and infrastructure outside the limits of the works.

All care shall be taken to ensure that all properties etc. within and adjacent to the construction site shall not be damaged during the contract. The Contractor shall be responsible for any damage caused and costs incurred.

2.5 ALIGNMENT AND SETTING OUT

Set out for the components of the proposed diversions is provided on the drawings. The contractor shall ensure that the set out is correct as per the issued for construction drawings.

2.6 CLEARING AND GRUBBING

1) The entire areas to be excavated, plus a width of 6 metre from the edge of the excavation of levee cross section and perimeter zone around the structures shall be cleared of vegetation and grubbed by removal of all trees, scrub, grass and stumps, including removal of stumps and roots to a depth of 500mm below the natural surface or the finished surface of the excavation whichever is the lower.

2) All clearing shall be carried out to prevent as far as possible the loss of topsoil. Topsoil removed as part of the excavation necessary for the construction of works, shall be stockpiled separately for subsequent surface restoration at regular intervals around the levee in locations which do not interfere with levee works, traffic or normal land use.

3) Materials removed in the clearing operations shall be mulched or otherwise disposed of as approved by the Principals Representative and relevant local statutory Authorities. All materials to be mulched shall be piled, cut and split if necessary and when in a suitable condition shall be mulched.

4) Grub holes formed in the foundation area of any items in (1) above shall be filled and compacted promptly using sound material to prevent the infiltration and ponding of water by the method of compaction specified for the embankment foundation as described in this specification.

2.7 STRIPPING

1) The entire area where fill is to be placed shall be stripped to remove all topsoil and unsuitable materials. The unsuitable materials shall include all debris, very loose, loose, soft or firm material, clean sand and gravel, topsoil, vegetation and root affected material and all other perishable and or objectionable materials that may be unsuitable for use for permanent construction required under this Specification or support the proper compaction of the materials in the embankments.
2) Topsoil so stripped shall be temporarily stockpiled to be spread on newly filled and compacted surfaces to establish a vegetative cover.
3) Other material so stripped and excavated shall be stockpiled for rehabilitation of the borrow pits or offsite disposal as directed by the Principals Representative.

Stockpiles shall be in maximum 2 metre high stockpiles with 2 horizontal to 1 vertical slopes or disposal of as directed.

2.8 EXCAVATION FOR CUT-OFF TRENCH

1) Cut-off trenches shall be excavated to the width and depth as shown on the Drawings, unless otherwise approved in special cases by the DSGR.
2) If any shrinkage crack is observed at the bottom of the cut-off trench, prior to backfill, the depth of cut off trench shall be increased until no further crack is observed. The final base width of the cut off wall shall not be less than 0.6m.
3) If the material excavated from the trench, in the opinion of the DSGR, is re-useable with or without any treatment, the excavated material shall be separately stockpiled. The material not suitable for re-use shall be stockpiled for the rehabilitation of the borrow pits at regular intervals around the levee that do not interfere with levee works or normal land use as approved by the Principals Representative.

2.9 EXCAVATION FOR FOUNDATIONS

1) Foundations shall be excavated to the width and depth as shown on the Drawings, unless otherwise approved in special cases by the DSGR.
2) If any shrinkage crack is observed at the bottom of the cut-off trench, prior to backfill, the DSGR shall be notified.

2.10 EXCAVATION FOR STRUCTURES

1) Excavation for culverts, cut-off walls, sumps and headwalls shall in general be carried out by open trench or cut methods and unless otherwise stated, the requirements of this Specification and the design documentation shall apply to these methods. The Contractor shall obtain the approval of the DSGR if other methods are envisaged.

2) The Contractor shall ensure that the bed level of the excavation remains in an undisturbed condition, suitable for the installation of structures or pipes.

3) If, in the opinion of the DSGR, the foundation becomes unusable because of the neglect or other fault of the Contractor, the Contractor shall forthwith after being notified by the DSGR remove the unsuitable material and backfill the over-excavation to the satisfaction of the DSGR and at no expense to the Principal.

4) Where a foundation is over-excavated for any reason, the foundation shall be made good at the Contractor's cost in the following manner:-

a) Backfilling under concrete structure shall be made with concrete of compressive strength, f'c, not less than 15 MPa or with Type C material where detailed on the drawings.
b) Backfilling in pipe trenches shall be made with the pipe bedding specified in this Specification and written verification given to the Principals Representative.

2.11 EXCAVATION FOR BORROW MATERIALS

1) All sources of borrow materials shall be submitted for approval by the Contractor to the DSGR twenty working days before the planned commencement of operations. This is to allow for adequate testing and analysis of the material in order to ensure its suitability for use **HOLD POINT**

2) The commencement and on-going excavation of borrow pits will be the responsibility of the Contractor and Level 1 Supervisor to continually monitor the material excavated to ensure its conformance to requirements of the specification. The delivery of conforming material from borrow areas into the levee embankment constitutes a **HOLD POINT.**

3) The Contractor is responsible for the provision of adequate drainage, obtaining any permits required for entry to the land. The contractor shall also comply with any Environmental planning legislation, Local Government Planning Scheme, local laws, local planning policies and land owners as appropriate.

4) Borrow Pits require a clear exclusion corridor of 30m of existing undisturbed ground surface between the levee toe and the borrow area top of batter.

2.12 SECURING EXCAVATIONS

1) The Contractor shall be responsible for securing all excavations against movement by means of:-
   - Stable batters
   - Timbering
   - Sheet Piling
   - Protective Shields

or such other methods or combination of methods that will ensure the safety of all employees, the Public, animals and the protection of the Works, and public and private property. Should the Principals Representative determine that any excavation requires timbering, sheet piling or shields as necessary for security then the Contractor shall provide such measures as the Principals Representative may direct.

2) The Contractor shall provide protection for persons and animals as set out in the General and Special Conditions of Contract.

3) The Contractor shall make adequate provision for the protection of persons and livestock from injury liable to arise from the presence of the open excavation.

4) Removal of trench supports shall be carried out in a safe manner.

2.13 DRAINAGE AND DEWATERING

1) The Contractor shall take all necessary care to protect the works to prevent any surface water and groundwater entering the excavations.

2) In wet ground locations the Contractor shall design, install and operate a dewatering system including all necessary gravel and pipe drains, sumps, pumps and other equipment to maintain the excavation in a dry condition. Where necessary, external

dewatering in the form of a system of well points or other dewatering devices sunk in the ground in the vicinity of the trench shall be installed. The system shall be operated continuously from the time of excavation of the trench to the time of backfilling the trench. The dewatering shall be accomplished in a manner that will prevent loss of fines from the foundation, will maintain stability of the excavated sides and bottom of the excavation and will result in all construction operations being performed in the dry.

3) The Principals Representative shall approve the method of disposing water removed or diverted from the excavation.

4) The Contractor shall be responsible for and shall repair, at the Contractor's expense and to the approval of the Principals Representative, any damage to foundations, excavated slopes or any other part of the works, either permanent or temporary, caused by water, floods or failure of any part of the dewatering system.

5) No excavated material shall be stored so as to endanger the stability of the excavation and in no case stored so that the toe of the spoil bank is closer than 1 metre to the edge of the excavation.

2.14 **DISPOSAL OF SURPLUS SPOIL**

Notwithstanding the requirements of this “Specification”, any material surplus after completion of all earthworks, backfilling and site grading, together with any rejected or unsuitable material shall be disposed of at locations approved by the Principals Representative. Dumped spoil shall be placed, spread, levelled and compacted.

3 FOUNDATION PREPARATION

3.1 GENERAL

Embankment foundation preparation shall be conducted in accordance with this specification and design documentation.

The Contractor shall not commence placing any fill on the prepared areas until the DSGR have inspected these areas and given consent to proceed.

Inspection of areas upon which fill is to be placed shall constitute a **HOLD POINT**.

Where groundwater or seepage is encountered the Contractor shall notify the DSGR and any action to be taken shall, unless otherwise specified, be submitted to the DSGR for review. Review of the Contractor's proposals for the treatment of groundwater shall constitute a **HOLD POINT.**

3.2 PROOF ROLLING

The following areas shall be proof rolled:

- All foundations for embankments prior to placement of any fill material
- Over all of the formation at design cut floor level
- Over cut-fill transition zones
- Over the access ramp subgrades and top embankment access road

Proof Rolling shall be witnessed by the DSGR and shall constitute a **HOLD POINT**.

Proof rolling for cut and fill areas:

- Shall be conducted prior to any hauling or further material placement over the prepared area
- Shall be conducted within 2 days of stripping

Equipment nominated for use in test rolling procedures shall be approved by the DSGR before commencement of proof rolling and shall comply with the following requirements:

- Static smooth steel wheeled rollers shall have a mass of not less than 12 tonne and load intensity under either the front or the rear wheels of not less than 6 tonne per metre width of wheel.
- Pneumatic tyred plant shall have a ground contact pressure under either the front or rear wheels of not less than 450 kPa per tyre. The area over which this ground contact pressure shall be applied shall not be less than 0.035 m^2 per tyre.
- Compliance with the test rolling requirements shall be when an area withstands test rolling without visible deformation or springing. Material which is observed to deform or spring under loading is deemed unsuitable material.

3.3 UNSUITABLE MATERIAL

Where unsuitable material is encountered the Contractor shall submit to the DSGR for review the proposed in-situ treatment or extent of excavation required based on as encountered ground conditions **HOLD POINT.**

Unsuitable material is defined as material which, in its current position and state, is unsuitable for the support of layers of fill or pavement. It is identified by:

- Deformation, rutting, softness, yielding, distress, or instability under proof rolling or the loading from construction machinery

- A visual assessment of its properties, such as organic content or moisture content, which indicates that it will be unsuitable for its intended use
- Material that is of variable strength and/or compaction, loose, wet, soft, firm, containing high permeability layers, organics, roots, fissuring

3.4 FOUNDATIONS FOR LEVEES

Prior to the placement of fill, unsuitable material shall be assessed and removed by the Contractor. Following test rolling, the approved foundations shall then be scarified to a minimum depth of 50mm and moisture conditioned to ensure that an adequate bond will develop between the foundation and the first layer of filling.

The test rolling shall be carried out on the exposed surface, provided that it is flatter than 1H:4V, in accordance with the Contractor's approved proof rolling method and in accordance with Clause 3.2. Unstable areas detected by test rolling shall be rectified in accordance with the requirements of Clause 3.3.

Prior to earthfill placement, the embankment foundation shall be inspected by the DSGR. The DSGR inspection shall include witnessing the test rolling of the foundation in accordance with requirements listed in Section 3.2 of this Specification. This inspection constitutes a **HOLD POINT.**

4 PLACEMENT AND COMPACTION OF EARTHWORKS

Each load of the materials placed, whether from excavation or stockpile, shall be placed so as to secure, in the levee, the best distribution of the material and avoid pockets of non-homogeneous materials.

Layers of material shall not differ substantially from the surrounding material in the zone and the density shall be uniform throughout each compacted layer.

When each layer of material has been prepared in accordance with this sub clause, it shall be compacted and tested.

Delivery of imported material shall comprise a **HOLD POINT**.

Verification of conformity of selected material shall comprise a **HOLD POINT**.

The Contractor shall not proceed with subsequent layers of construction until testing for material and placement compliance has been completed, the work has been inspected and approval to proceed has been issued by the Contractor's Quality Team.

Prior to placement of a new layer of material the surface shall be adequately scarified to a minimum depth of 50mm and moisture conditioned to ensure that an adequate bond will develop between layers.The Contractor shall notify the Principal's Representative and the DSGR of any non-conformances within 24 hours of the results being available.

Minimum Testing and Acceptance criteria for Earthworks Materials shall be undertaken in accordance with Table A3 (Appendix A). The Contractor's testing program shall be such that the number of tests are not less than the testing frequencies specified hereinafter.

Placement and compaction of earthworks shall be completed in accordance with Table A2 (refer Annexure A). Placing and compaction of material should be witnessed by the Contractors Quality Team.

Appropriate dust suppression measures shall be implemented by Contractor.

4.1 Filters

Filter material shall be imported, hard, dense and durable crushed rock, natural sand or other material approved by the Principal, free from perishable matter, lumps or balls of clay or other deleterious materials conforming to the grading requirements shown in Table-1 following placement. The grading of the filter materials shall be approximately parallel to the specified grading limits.

Where filters comprise crushed rock, the source rock used for the production of filter materials shall be igneous or metamorphic rock with:

- a specific gravity not less than 2.65 tonne/m3;
- a Los Angeles Abrasion Loss at 500 revolutions not exceeding 35%;
- a Sodium Sulphate Soundness not exceeding 10% (overall weighted loss);
- a Degradation Factor not less than 45 in the case of acid igneous or metamorphic rock or a Secondary Mineral Content greater than 25% in the case of basic igneous source rock.
- a flakiness index not exceeding 25%
- a wet/dry strength variation not greater than 35%
- water absorption not exceeding 2.5%

Vesicular materials shall not be used for the production of filters. Where filters comprise natural sands, the source material used for the production of filter materials shall have:

- a Sodium Sulphate Soundness not exceeding 10% (overall weighted loss);
- a water absorption not exceeding 2.5%
- a particle density not less than 2.5 tonne/m3

Table-1 – Grading Requirements for Filters

Sieve Size (mm)	Percentage of Particles Passing Sieve (%)	
	Zone 2A (fine filter)	Zone 2B (Coarse Filter)
75		100
53		100-92
37.5		100-84
26.5		93-71
19		86-60
13.2		77-46
9.5	100	68-33
6.7	100-94	54-20
4.75	100-86	42-11
2.36	100-64	16-0
1.18	76-40	5-0
0.6	50-20	
0.425	40-12	
0.3	30-6	
0.15	15-0	
0.075	3-0	

The Contractor shall provide details, source and description of the filter materials including test results for the Principal's approval. The Principal may organise further testing of the filter material as required. The approval of the filter materials by the Principal shall constitute a **HOLD POINT**.

4.2 Placement of Filter Materials

Filter material shall be placed to the levels, lines, slopes and dimensions shown on the Drawings. Foundations for filter at the toe of the existing embankment shall be graded to slope toward the downstream batter point.

Blending of filter materials on the dam embankment, to produce the required grading, will not be permitted.

Unless otherwise approved by the Principal, filter material shall be placed in generally horizontal layers of not greater than 300mm finished thickness, except that no less than 2 approximately equal layers shall be placed for each filter zone. The Contractor's procedures for the placement of the filter zones shall be such as to prevent segregation, the formation of voids in the filter zone, contamination of filter materials or damage to the filter layer when adjacent earthworks materials are placed. Filter zones shall be constructed so that there is no differential height between adjacent filter zones unless otherwise shown on the Drawings.

The Contractor shall submit for review by the Principal, his procedures for placement of the filter material. Submission of the Contractor's procedures for placement and compaction of the filter material shall constitute a **HOLD POINT**.

The filter material shall be placed moist. Care shall be taken to ensure that no contamination of the filter occurs and that the filter is free draining after compaction. All filters below the level of the top of the parapet wall base shall be compacted as follows:

- Zone 2A - to a density index not less than 75% as determined in accordance with AS1289.5.6.1; and
- Zone 2B – with a minimum of 4 passes of a vibrating smooth drum roller meeting the requirements specified in Clause 5.11

Above the level of the base of the parapet wall there is no compaction requirement (minimum density ratio) specified for filter materials and the degree of compaction obtained shall be only that necessary for stability, safe working and workability considerations.

Once placed, filters shall be maintained in a moist condition until covering materials are placed.

Filter materials that become contaminated by other materials or which, after placement, do not conform to the requirements of the Specification, shall be removed and replaced at the Contractor's expense.

Testing requirements for filters

Filter Material	Grading	Compliance Test – one test for each 1000m^3 for each of Zone 2A and 2B material prior to placement. Record Test – one test for each 500m^3 for Zone 2A material after compaction Record Test – one test for each 1000m^3 for Zone 2B material after compaction.
	LA Abrasion, Wet-Dry Strength, Sodium Sulphate Soundness, Degradation Factor, Flakiness Index, Water Absorption	Compliance Test – One test for each source of filter material carried out prior to delivery. Test to be carried out within the first 500m^3 of material produced.
	Field Density, Field Permeability	Compliance Test – every lot (lot not to exceed one days production or 500m^3) for Zone 2A. Record Test – one test for each 500m^3 for Zone 2A materials. Record Test – one test for each 1000m^3 for Zone 2B material.

5 TESTING AND ACCEPTANCE OF EARTHWORKS

The Contractor shall supply written verification that the minimum requirements have been complied with and supply the verification with the lot package. The Contractor shall carry out testing for compliance to the frequency and value requirements listed in Appendix - 1. All testing shall be conducted and verified by a NATA accredited NATA Geotechnical testing authority. The Contractor shall not proceed with subsequent layers of construction until testing for material and placement compliance has been completed, the work has been inspected and approval to proceed has been issued.

The Contractor shall notify the Principal's Representative and the DSGR of any non-conformances within 24 hours of the results being available.

Level 1 supervision of the works shall be undertaken in accordance with the requirements of AS3798-2007. The Level 1 supervisor shall provide written evidence to the Design team that the works witnessed and undertaken were done in accordance with this specification. Verification details shall be submitted to the Principals Representative for review and acceptance of each lot.

Following a non-conformance, a report shall be sent to the DSGR and Principal's Representative clearly describing the details of the non-conformance. The non-conformance report (NCR) shall include details of the proposed resolution and shall have non-conforming verification records attached. The closed out NCR shall have documentation that the proposed resolution measures have been carried and shall identify that all permanent works conform to specification. It is a requirement that all NCRs be accompanied with written and signed evidence by the Level 1 Supervisors daily report verifying the details of the works carried out.

All minimum requirements of the specification are presented in respect to material properties, earthworks levels and position, and earthworks placement and compaction. All test results and associated verification reports shall be submitted to the Principals Representative for review prior to completion of the contract. This shall constitute a **HOLD POINT**.

At least 2 working days prior to commencement of earthworks, the contractor shall submit an inspection and testing plan to the Principals Representative for review and approval. This shall constitute a **HOLD POINT**.

Minimum Testing and Acceptance criteria for Earthworks Materials shall be undertaken in accordance with Table A3 (Appendix A). The Contractor's testing program shall be such that the lot sizes are not greater than the sizes given in Appendix A and the number of tests are not less than the testing frequencies specified hereinafter.

Earthworks Levels and Positions shall be constructed to levels as shown on the Drawings. Acceptable tolerances for Earthworks Levels and Positions are as per Table A4 (Appendix A).

Testing and acceptance of Earthworks with respect to placement and compaction shall be undertaken in accordance with Table A5 (Appendix A).

6 HOLD POINTS

Table A6 (Appendix A) summarises requirements for Hold Points that are relevant to this specification.

7 BACKFILLING AND SURFACE RESTORATION AT STRUCTURES

7.1 GENERAL REQUIREMENTS

1) The Contractor shall complete the backfilling of all excavations carried out in accordance with this specification without undue delay as soon as testing and/or curing of the works constructed therein permits. For concrete works, this shall be permitted when the concrete strength achieves 25 MPa.

2) Except where otherwise directed or approved by the Principals Representative for safety reasons, the Contractor shall remove all supports for the excavations as backfilling progresses. Removal of supports shall be carried out so as not to endanger personnel or the Works. Any voids left by the removal of supports shall be backfilled to the same standard specified for the adjacent excavation.

3) All backfilling operations, including removal of supports or excavations, shall be conducted in a manner that will prevent disturbance of the pipes, fittings or pipe bedding and any other damage to the Works.

4) The backfill shall not be placed until the pipe bedding has been brought to the required lines and levels as shown on the Drawings and thoroughly compacted.

7.2 BACKFILL MATERIAL

1) All backfill materials placed within or beneath the levee and around structures shall be Type C in accordance with this Specification and the design documentation.

2) The appropriate backfill for different type of backfilling shall be as specified in the relevant Clauses of this Specification and on the Drawings (if required).

3) Normal compaction by small tamping rollers may be resumed in the vicinity of the pipes in accordance with pipe manufacturer's recommendations.

7.3 PIPE HAUNCHING AND COVERING

1) All sections of the pipeline shall be backfilled to a minimum height of 300mm minimum above the top of the pipe with Type C fill unless otherwise specified on the Drawings.

2) During backfilling operations the backfill shall be placed symmetrically so as to keep the backfill on both sides of the pipeline at the same level. Care shall be taken in compacting to avoid disturbing the pipe.

3) The backfill shall be compacted with hand tampers or whacker packers (where possible), in layers not more than 150 mm thick, to obtain a dry density in excess of 98% of the maximum dry density.

8 LANDSCAPING

8.1 GENERAL

The batters of the levee are to be covered with topsoil and grass seeding so as to provide low maintenance, long term stabilization of the surface against erosion and to provide acceptable appearance to the area.

The restoration works includes, but is not limited to:

- Supply of topsoil (or reuse of stockpiled topsoil as appropriate), topsoil, grass seeding and water.
- Spreading, fertilising and cultivating topsoil.
- Temporary stabilisation of surfaces prior to grass growth.
- Maintenance of grassed areas for the duration of the Defects Liability Period. Maintenance will include, but not limited to, watering, application of fertiliser and cultivating the grass as appropriate.

8.2 GRASS TYPE

All grass seeds shall be Buffel Grass and applied at a rate of 3kg/Ha. Grass seeding shall comply with TMR technical standard MRTS 16C.

The cover seed to be used is seasonal specific. During October to March Japanese Millet, sterile hybrid version. During Aptril to September Wimmera Rye, sterile hybrid version. Both are to be applied at a rate of 10kg/Ha.

The contractor should ensure that any cattle stay off the area until the Buffel grass is established.

8.3 FERTILISER

All fertilisers shall be pre-packed and certified commercially prepared mix, having a N:P:K ratio of 8:4:10 (commonly known as 'orchard fertiliser') and shall be delivered to the site in standard bags showing weight, composition and vendor's name and be available for inspection on site.

Fertiliser shall be applied at a rate of 50 g/sq.m.

8.4 SUB-GRADE PREPARATION

The Contractor shall prepare sub-grades prior to the spreading of topsoil as specified below.

Spray existing weeds with herbicide Glyphosate in any of its registered formulations at the maximum rate specified on the label for the control of weed(s) two weeks before cultivation. Areas to be ripped shall not be worked when sub-soil is wet or plastic.

Allow for clearing and removing stones exceeding 25 mm and any rubbish brought to the surface during cultivation.

Trim surfaces to shape after cultivation.

9 EROSION PROTECTION

Where specified on the drawings additional erosion protection is required above the protection provided by a grassed surface. Two different erosion protection treatments have been specified:

1) Rip Rap Rock Protection (Type D material)

2) Turf Reinforced Matting

3) Reno Mattress

9.1 RIP RAP ROCK PROTECTION – Type D

9.1.1 General

Rip rap rock protection shall be constructed in the locations and in accordance with the Drawings.

Rip rap shall have a uniform appearance overall and shall not have noticeable overall irregularities in horizontal and vertical alignments. Individual rocks shall be hard, durable and clean and should be free from cracks, cleavage planes, joints, seams, chemical alteration or weathering which would result in the breakdown of the rock in a riverine environment.

The overall thickness of rip rap installed shall not be less than twice the D(50) of the rock.

9.1.2 Submittals

At least fourteen (14) days prior to the supply of any rock, the Contractor shall provide documentation to demonstrate that the rock to be supplied complies with the requirements of this Specification. The documentation to be provided shall include but not necessarily be limited to:

- details of the quarry from which the rock is to be supplied, including identification of the sections of the quarry where rock complies with the requirements of this Specification;
- a test report from a NATA registered Independent Testing Authority on the physical and chemical properties of the rock to be supplied. The report shall include the results of a petrographic analysis and laboratory testing of the rock;
- details of the Contractor's Quality Assurance System, including details of the quality control procedures, which ensures that the quality of rock supplied during the Contract complies with this Specification.

Should the Contractor wish to vary the source of rock supplied either within the quarry or by changing quarries, the Contractor shall submit additional documentation (as listed above) to demonstrate that the rock from the new source complies with the requirements of this Specification.

9.1.3 Acceptance of Type D Riprap

Acceptance of rock for the primary and secondary armour layers and riprap material shall satisfy all of the following criteria:

- rock shall be rough and angular;

- the ratio of the maximum dimension of any rock to the minimum dimension, measured at right angles to the maximum dimension shall not exceed 2.5;
- rock shall be essentially unweathered without significant quantities of deleterious minerals such as analcime and expansive clay minerals or unfavourable lineations within the microfabric;
- igneous rock shall have not more than 15% (by volume) olivine and shall exhibit no zones of secondary alteration such as chloritisation;
- rock shall show no signs of stress-relief;
- the characteristics listed in the above below:

Dry density:	2,650 kg/m^3 minimum
Saturated point load strength index (is_{50}):	5.0 MPa minimum
Los Angeles abrasion value:	30% maximum
Sodium sulfate weight loss:	12% maximum

- The design drawings note the D_{50} for required for the rock, the rock shall also meet the following properties:

D_{50} (mm) as specified in the drawings	**Minimum D_{100} (mm)**	**Minimum D_{10} (mm)**
300	400	100
550	750	300

9.1.4 Construction

Rip rap shall be placed in a manner which ensures that the larger rocks are uniformly distributed throughout the protection works and that the smaller rocks effectively fill the spaces between the large rocks without leaving any large voids. The layers of placed rock shall be of even thickness and of even grading.

The placing operations shall minimise the chances of rock running loose and damaging adjacent areas. Rock deposited in areas outside the rock protection zone shall be recovered.

9.2 TURF REINFORCED MATTING

9.2.1 General

The following types of Turf Reinforced Matting (TRM) have been specified on the drawings:

1) Enkamat 7018 with Greenarmour

9.2.2 Submittals

1) Certification:

a) The Contractor shall provide the Principals Representative a certificate stating the name of the TRM manufacturer, product name, style, chemical compositions of filaments or yarns and other pertinent information to fully describe the geotextile.

b) The Manufacturer is responsible for establishing and maintaining a quality control program to assure compliance with the requirements of the specification. Documentation describing the quality control program shall be made available upon request.

c) The manufacturer's certificate shall state that the furnished TRM meets MARV requirements of the specification as evaluated under the manufacturer's quality control program. The certificate shall be attested to by a person having legal authority to bind the Manufacturer.

2) Manufacturing Quality Control (MQC) test results shall be provided upon request.

3) Independent Performance Test Results shall be provided upon request.

9.2.3 Delivery, Storage, And Handling

1) TRM labeling, shipment and storage shall follow ASTM D 4873.

2) Product labels shall clearly show the manufacturer or supplier name, style name, and roll number.

3) Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate.

4) Each TRM roll shall be wrapped with a material that will protect the geotextile from damage due to shipment, water, sunlight, and contaminants.

5) The protective wrapping shall be maintained during periods of shipment and storage.

6) During storage, TRM rolls shall be elevated off the ground and adequately covered to protect them from the following: Site construction damage, extended exposure to ultraviolet (UV) radiation, precipitation, chemicals that are strong acids or strong bases, flames, sparks, temperatures in excess of 71 deg C (160 deg F)m and any other environmental condition that might damage the TRM.

9.2.4 Quality Assurance Sampling, Testing, And Acceptance

1) TRM shall be subject to sampling and testing to verify conformance with this specification. Sampling for testing shall be in accordance with ASTM D 4354.

2) Acceptance shall be in accordance with ASTM D 4759 based on testing of either conformance samples obtained using Procedure A of ASTM D 4354, or based on manufacturer's certifications and testing of quality control samples obtained using Procedure B of ASTM D 4354.

3) Quality Assurance Sampling and Testing will be waived for ISO 9001:2000 Certified Manufacturing Facilities. Documentation of ISO 9001:2000 Certification shall be provided upon request.

9.2.5 Installation

9.2.5.Enkamat 7018 with Greenarmour:

1) Installation shall be as per the manufacturers guidelines and the design drawings.

2) Before installation the slope shall have a smooth profile free from vegetation, roots and stones.

3) Overlaps shall be a minimum of 150mm and shall be secured at 1metre centres.

4) Topsoil and seeding shall be as per Section 8.

5) Product Details:

Table 9.1 – Enkamat 7018 with Greenarmour

Property	Test Method	Units	Property Requirement
Thickness	ASTM D-6525	mm	18
Mass Per Unit Area	ASTM D-6566	G/sq m	290
Tensile Strength	ASTM D-6818	kN/m	2.0 x 1.2

Tensile Strength	1/20,000
Tensile Elongation	1/20,000
Light Penetration (% Passing)	1/20,000

9.3 Reno Mattress

9.3.1 General

The following reno mattresses have been reviewed and approved for use:

Maccaferri Castoro 230mm thick PVC coated mesh rock mattress

9.3.2 Mattress

Reno mattresses shall be “Castoro” type manufactured from double tweisted, hecagonally woven wire mesh of nominal 60×80 mesh, with 2.4mm o/d frame wire and 2.0mm o/d mesh wire, complete with diaphragms at 1m centres.

Diaphragms shall consist of two layers of mesh having the base of the Mattress and diaphragms manufactured from one continuous mesh panel.

All wire shall be mild steel Galmec coated (95% Zn + 5% Al Mischmetal) and heat bonded through extrusion with an additional 0.5mm heavy duty grey PVC coating.

9.3.3 Rock Fill

The filling rock to be used in gabion baskets and mattresses shall be produced from dense, hard durable and clean rock. The rock shall resist weathering actions of air and water, it shall not be cracked or have visible defects which may reduce ists structural capabilities.

Rock with a density of 2400kg/m3 or higher are preferable. The wet dry strength of the aggregate shall be 100kN or greater

There are two types of rock fill specified depending on the required velocity:

Table 9.3 – Reno Mattress Rockfill

Type	Size (mm)	D50 (m)	Critical Velocity
Type I	70 – 100	0.085	3.6

Type	Size (mm)	D50 (m)	Critical Velocity
Type II	70 – 150	0.120	4.5

The contractor shall provide details of the quarry from which the rock is to be supplied including identification of the sections of the quarry where rock complies with the requirements of this specification.

The contractor shall also supply a test report from a NATA registered independent Testing authority on the physical and chemical properties of the rock to be supplied. The report shall include the results of a perrogrpahic analysis and laboratory testing of the rock.

9.3.4 Installation

The reno mattress shall be installed as per the manufacturers requirements. The longest side of the reno mattress shall be installed perpendicular to the flow direction. The mattress shall be fixed as per the manufacturers requirements.

PART C: ENGINEERING SPECIFICATION FOR CONCRETE AND STRUCTURES

1 CONCRETE

1.1 GENERAL REQUIREMENTS

1) Concrete, the constituent materials of the concrete and all workmanship associated with the supply and placing of the concrete shall comply with the following Australian Standards and any additional requirements of this Specification.

AS 1012	Methods of Testing Concrete.
AS 1141	Methods for Sampling and Testing of Aggregates.
AS 1170	Loading Code - Parts 1 and 2.
AS 1379	The Specification and Supply of Concrete.
AS 1478	Chemical Admixtures for Concrete.
AS 1527	Two-Part Polysulphide-Based Sealing Compounds.
AS 1554	Structural Steel Welding, Part 3 - Welding Of Reinforcing Steel.
AS 2327	Composite Construction in Structural Steel and Concrete.
AS 2758.1	Aggregates and Rock For Engineering Purposes - Concrete Aggregates.
AS 3582.1	Supplementary Cementations Materials for Use with Portland and Blended Cement - Fly Ash.
AS 3600	Concrete Structures Code.
AS 3610	Formwork for Concrete.
AS 3735	Concrete Structures for Retaining Liquids.
AS 3972	Portland and Blended Cements.
AS 4671	Steel Reinforcing Materials
ASTM D1752, 60T Type II	Resin Bonded Cork Fillers.
ASTM C309	Liquid Membrane - Forming Compounds for Curing Concrete.
ACI 403	Guide for Use of Epoxy Compounds with Concrete.
BS 2571	Specification for Flexible PVC Compounds.

2) No concrete shall be mixed on site for use in the Works unless the Principals Representative or the designer site representative (DSR) has approved the batching and mixing equipment. No ready mixed concrete shall be supplied for use in the Works unless the Principals Representative and DSR has approved the source of supply.

3) The Contractor shall submit for approval of the Principals Representative and the DSR, prior to the supply of any concrete, details of all materials to be used including their respective sources and the concrete mix proportions **HOLD POINT**. Unless approved by the DSR, the Contractor shall not make any subsequent changes to the materials or to the mixes.

4) These approvals of equipment, source of supply, material and mix proportions shall not constitute approval of the quality of the concrete.

1.2 COMPOSITION OF CONCRETE

1) Concrete shall be made with cement, coarse aggregate, fine aggregate and water.

2) Cement shall be "Type GP" - General-purpose cement conforming to the requirements of AS 3972, Portland and blended cement. The minimum quantity of cement used in one cubic metres of concrete shall be 400 kilograms. The maximum water:cement ratio shall not exceed 0.45 by mass unless otherwise specified on the Drawings.

3) Cement shall be supplied from an approved TMR registered Cementitious Materials Supplier. Consignment notes indicating the source of supply of cement, date of manufacture, company test number, type of cement, silo number and date of dispatch shall be forwarded to the DSR for all cement supplies.

4) Calcium chloride shall not be used in manufacture of concrete. An approved air-entraining admixture shall be used in the concrete. The amount to be added shall be determined by the Contractor and approved by the DSR. Any further admixtures shall not be used except with the approval of the DSR.

5) Aggregates shall meet the requirements of AS 2758.1 except that in relation to Clause 9.1 of AS 2758.1, the overall weighted average loss of the aggregate shall not exceed 10% for coarse aggregates and 8% for fine aggregates when tested in accordance with Part 24 of AS 1141 (Sodium Sulphate Soundness Test).

6) Samples of the aggregates proposed to be used shall be made available to the DSR for testing if required, prior to initial use and at regular intervals during the contract period. The maximum aggregate size shall not exceed 20mm.

1.3 CONCRETE STRENGTH

1) Concrete shall comply with the requirements for water cement ratio and strength as shown on the Drawings.

2) Compressive strength testing shall be the responsibility of the Contractor, in accordance with AS 1012 and the quality assessed as prescribed in AS 3600. Concrete failing to meet the requirements of this Code shall be rejected and replaced by the Contractor at no cost to the Principal.

3) Unless otherwise shown, the characteristic compressive strength of structural concrete shall not be less than 32 MPa at 28 days.

4) The frequency of compressive strength testing shall be as per MRTS 70.

1.4 REINFORCEMENT

1) The Contractor shall detail, supply, bend and accurately place all steel reinforcement shown on the Drawings.

2) All steel reinforcement shall comply with the following Australian Standards:

AS 1302	Steel Reinforcing Bars for Concrete.
AS 1303	Steel Reinforcing Wire for Concrete.
AS 1304	Welded Wire Reinforcing Fabric for Concrete.

3) Reinforcement supports shall be of non-corrodible material.

4) Unless otherwise shown, clear cover from external faces of in-situ concrete to nearest bar shall be 65 mm in the case of unformed surfaces in contact with earth and 50 mm for all other surfaces.

5) Unless otherwise shown, all splices, bends and hooks in reinforcement shall be in accordance with AS 3600.

1.5 SLUMP

The slump for each grade of concrete shall meet the requirements as specified in Table 11.4 of MRTS 70 and shall be within the tolerances given in AS 3600, viz. of ± 15 for 80 mm or ± 30 for greater than 80 mm.

1.6 MAXIMUM SIZE OF COARSE AGGREGATE

The maximum size of aggregate shall be 20mm.

1.7 PLACEMENT AND FINISH OF CONCRETE FOR STRUCTURES

1) All concrete structures shall be built in a workmanlike manner and to the lines, grades and dimensions shown on the Drawings.

2) Structures shall be located as indicated on the Drawings

3) No concrete shall be placed until the steel reinforcement has been placed and the DSR has approved embedded metalwork, formwork and other surfaces against which the concrete is to be placed **HOLD POINT**.

4) In addition to meeting the requirements of AS 3600 for concreting in extreme weather conditions, no concrete shall be placed when the temperature of the surrounding area is higher than 38^{O}C or less than 5^{O}C.

5) The placement of concrete around pipes shall be planned in a manner that will ensure that there is no possibility of the pipes being floated or otherwise moved out of position.

6) All concrete shall be thoroughly compacted so as to produce concrete having very low absorption and permeability.

7) Loads shall not be applied to concrete placed in permanent work without the prior approval of the DSR and the Principals Representative may at any time direct the Contractor to remove any loading imposed on concrete placed in permanent work.

8) Over-excavation under concrete shall be backfilled with concrete as specified in this specification.

Subject to each individual case being approved by the DSR, construction joints may be located at the discretion of the Contractor.

9) In the case of concrete surfaces forming the interior surfaces of structures or the exposed exterior surfaces of structures, the permissible variation from the specified lines shall not exceed a rate of 4 millimetres in 1 metre nor shall any dimension vary by more than 12 mm overall. All other concrete surfaces shall be formed so that the thickness of the finished concrete shall not be less than specified.

10) Unless otherwise shown in the Drawings, all corners shall be provided with 15mm × 15mm chamfers or fillets.

2 CROSS DRAINAGE CULVERTS

2.1 TRENCHING FOR CROSS DRAINAGE CULVERTS

The Contractor is required to construct cross drainage culverts at the locations shown on the drawings. The Contractor shall also extend the pipework of existing culverts and reinstall the sumps as necessary on these culverts where the raised levee extends over the existing works.

PRECAST CONCRETE CULVERTS

2.1.1 Pipe Culverts

All new concrete pipe culverts shall be rubber ring jointed in accordance with the design documentation and tested in accordance with AS/NZS 4058.

The supply, handling and installation of all pipe culverts shall be undertaken in accordance with the manufacturer's recommendations.

The bedding material shall be as specified on the drawings and compacted with hand tampers or other similar equipment approved by the DSGR in layer not more than 150mm thick after compaction.

The required degree of compaction shall be as specified in Annexure A of this Specification.

The bedding shall be formed so as to continuously support the pipes at the required levels.

The Contractor shall ensure that the full depth of bedding specified for the pipeline is provided under all the joints and that the joints are neither unsupported nor on points of concentrated load.

Where it is necessary to leave 'bell holes' or otherwise omit temporarily a section of pipe bedding during the making of a pipe joint, the bedding material specified for that section of the pipeline shall be placed and thoroughly compacted to make good the deficiency.

The cut-off trench for the levee foundation is to extend underneath pipe culverts through levees and is to be constructed prior to installing pipe culverts.

If holes are provided to assist in the lifting of precast concrete culverts, they shall be sealed with concrete or plastic plugs as per the manufacturers recommendations.

2.1.2 Box Culverts

Box culverts shall be in accordance with the design documentation and AS 1597.2.

The supply, handling and installation of all box culverts shall be undertaken in accordance with the manufacturer's recommendations.

Box culvert joints shall be covered with a bandage cover in accordance with Clause 12.3.4 of MRTS03.

The box culverts are to be laid on cast in-situ base slabs in accordance with TMR Standard Drawings 1316 and 1318. The foundation for the box culverts and headwalls is to be stripped of topsoil and unsuitable material and to be treated as per the levee foundations in Section 4.4 above. From the foundation level to the underside of base slab

and headwalls shall be filled with Type C Material. The required degree of compaction shall be as specified in Annexure A of this Specification.

The cut-off trench for the levee foundation is to extend underneath box culverts and is to be constructed prior to constructing the base slab.

2.2 BACKFILLING CULVERTS

2.2.1 Pipe Culverts Under Road Embankments

All precast concrete pipes are to be laid to the grade specified in the drawings. For pipes which don't penetrate through or beneath the levee the bedding shall be "H2" support in accordance with the AS/NZS 3725.

2.2.2 Pipe Culverts Through Levees

For all pipes which penetrate through the levee the bedding shall be on a minimum of 100mm for pipe diameters 600mm or less, 150mm for pipe diameters of 1800mm, of Type C non dispersive material (Section 2.4) in accordance with the drawings (bedding class U in accordance with the AS/NZS 3725).

The haunch zone shall be backfilled with an approved proprietary flowable fill product or Controlled Low Strength Material (CLSM).

Overlay material up to the top of the levee shall be Type C material. The required degree of compaction shall be as specified in Annexure A of this Specification.

2.2.3 Box Culverts

Box culverts are to be backfilled with Type C non dispersive material (Section 1.4 above) as specified on the drawings. The required degree of compaction shall be as specified in Annexure A of this Specification.

2.3 CONCRETE CUTOFF WALLS

Concrete cut-off walls for all precast concrete drainage pipes shall be provided to the extent and details shown on the drawings. Cut off-walls shall be a minimum of 200mm thick grade N32 concrete.

Cut-off walls shall be founded on undisturbed natural material or where in fill, on fill compacted in accordance with requirements for Type C fill noted in this Specification and undisturbed after compaction by trenching or other excavation activity. All cut-off walls shall extent a minimum of 300mm below the bottom of the bedding material and 300mm beyond the side of pipe trenches into undisturbed ground.

2.4 PENSTOCKS

Penstocks are to be provided on all pipe penetrations through levees. Penstocks shall be Model 25S-T Stainless Steel Penstocks (open top frame) by Ludowici or an approved equivalent. Penstocks are to be installed as per the manufacturer's instructions and the design drawings.

2.5 CONCRETE HEADWALLS

Headwalls shall be constructed in accordance with the design documentation.

2.6 FLOWABLE FILL

Flowable fill or CLSM shall be supplied from a manufacturing plant which has third party certification to AS 9001 by a JAS-ANZ accredited assessment body. The Contractor must be able to provide:

(a) the flowable fill or CLSM mix design, including:
- the source, type and proportions of the constituent materials;
- aggregate gradings and saturated surface-dry densities;
- chemical admixtures details and manufacturer's recommended method of use;
- the nominated slump and where a super-plasticizer is used, the final slump; and
- documentary evidence that the mix will comply with the specified requirements of the Contract under consideration, from either previous production of the mix (the test results shall not be more than 12 months old) or full details of a trial mix undertaken.

(b) evidence, either through trial mixes (in accordance with AS 1012.2) or production testing, that the flowable fill or CLSM will comply with the requirements of this Specification.

2.6.1 Materials

Cement shall comply with AS 3972.

Admixtures shall comply with AS 1478.1.

Fly Ash shall comply with AS 3582

Aggregates shall be free of reactive or expansive materials and be compatible with the CLSM flow characteristics.

The maximum size of coarse aggregates used shall not exceed the values as specified in Section 1.6

2.6.2 Properties

The flowable fill or CLSM shall comply with the properties detailed below.

(a) 28 day Strength – 5MPa

(b) Slump – 150 – 200mm

(c) Maximum size of coarse aggregate – 10mm

(d) Flowable fill or CLSM shall be homogeneous, free of lumps of unmixed material and without segregation.

2.6.3 Placement

The method of placement shall be such as to ensure no foreign materials enter the mix.

Where CLSM is used as conduit and culvert backfill, the Contractor shall establish a placement process to ensure conduits and culverts will not float, or otherwise become dislodged, during placement of CLSM. CLSM shall be installed in accordance with AS 2566.2 Part 2: Appendix K.

The Contractor shall retain a copy of the delivery information specified in AS 1379: Clause 1.8. 3 “Identification Certificate”

PART D: SPECIFICATION FOR ROAD CONSTRUCTION

1 COMPACTION OF EARTHWORKS AND PAVEMENTS

1.1 GENERAL

Unless shown otherwise on the Drawings or as specified in the Scope of Work; all earthworks, including subgrades; fill material; backfill; and pavements; shall be compacted to the requirements specified herein. Whereby there is a conflict of information, the order of preference for information will be the Contracts Administrator, Issued for Construction (IFC) drawings, Main Roads Specification and Annexure followed by this construction specification.

The Contractor shall provide and operate sufficient rollers for compaction of the work. Drawn-type rollers shall be provided with a tractor having sufficient weight and power to pull the roller at a satisfactory speed under actual working conditions. The rollers so provided, and their towing tractors, if any, shall be maintained in good mechanical condition. Equipment shall be approved before transport to site.

At locations where it would be impractical to use mobile power compacting equipment, materials shall be compacted by hand held or excavator mounted equipment that will achieve the specified compaction.

The formation shall receive a final shaping with a grading machine supplemented with handwork where necessary to ensure a smooth surface and uniform cross sections. When final shaping is complete, the finished surface shall conform to the line, grade and cross section shown on the drawings. There shall be no roots, sods, other deleterious matter or stones, which do not meet the requirements of this specification.

1.1.1 COMPACTION STANDARDS

Compaction testing shall be in accordance with AS 1289.5. The reference density for each type of material shall be established and monitored in accordance with AS 3798 section 7.3 and 7.4 and tested in accordance with AS 1289.5.4.1 or AS 1289.5.4.2 as applicable.

Where the Principal's Representative cannot test the material, owing to the presence of large stones or for other reasons, he may direct that the material be compacted by a minimum 8 passes of a smooth wheeled roller of minimum 10 tonne static weight, or other equipment considered necessary to achieve the required compaction. The Contractor shall carry out any additional work to achieve the specified compaction according to Section 16.5.

1.2 MOISTURE CONTENT

Compaction of cohesive materials shall be carried out with the moisture content of the material within the tolerance for optimum moisture content specified in Table 5. The correct uniform moisture content shall be obtained by watering or drying and mixing the material

1.3 NUCLEAR DENSITY GAUGES

Nuclear density gauges may be used for field density testing. Testing shall comply with AS 1289 method 5.8.1, or with the relevant AASHTO or ASTM Standard, or approved equivalent.

In addition to the required standard operational checks and calibration, at least three initial field density results shall be compared to densities obtained by sand replacement

or other approved methods to AS 1289 or AASHTO, ASTM, or approved equivalent standard, for the same test locations.

If corresponding results differ by more than 1%, the Principal's Representative may direct that use of the nuclear gauge be discontinued. The Principal's Representative reserves the right to request further density correlation checks if the gauge, the operator, or the fill material is changed during the course of the work, or for any other reason.

All test results shall be reported in accordance with the approved testing standard.

1.4 COMPACTION REQUIREMENTS

1.4.1 Cohesive Materials

Unless otherwise specified or shown on the drawings, cohesive materials shall be compacted to achieve relative compaction, as determined by AS 1289.5.1.1 for Standard Compaction Method and AS1289.5.2.1 for Modified Compaction Method, of not less than as specified in Table 5.

Table 5 - Compaction Requirements for Cohesive Materials

Material	Tolerance on moisture content relative to Optimum Moisture Content (OMC)	Relative Compaction and Method
Sub-grade in excavations and trenches	+1.0%, -2.0%	98 standard
Sub-grade for fill and backfill	+1.0%, -1.0%	98 standard
Sub-grade for pavements and slabs	+1.0%, -1.0%	100 standard
Fill	+1.0%, -1.0%	100 standard
Backfill	+1.0%, -2.0%	98 standard
Top 300 mm of backfill in trench under pavement	+1.0%, -1.0%	98 modified
Pavement material	+1.0%, -1.0%	98 modified

1.4.2 Cohesionless Materials

Unless otherwise specified or shown on the drawings, cohesionless materials shall be compacted to achieve density indices, when determined in accordance with AS 1289.5.5.1 and AS 1289.5.6.1 using Standard Compaction, of not less than those stated in Table 6.

Table 6 - Compaction Requirements for Cohesionless Materials

Material	Density Index
Sub-grade in excavations and trenches	65
Sub-grade for fill and backfill	65
Sub-grade for pavements and slabs	70
Fill	70
Backfill	70

1.5 COMPACTION TESTING AND ACCEPTANCE

The Contractor shall test all subgrades, fill, backfill and pavements.

The Contractor shall carry out testing for compliance with the requirements of this Specification using the acceptance criteria of Appendix 1. The Contractor shall not proceed with subsequent layers of construction until testing for compliance has been completed; the work has been inspected and written approval to proceed has been issued. The Contractor shall notify the Principal's Representative of any non-conformances within 24 hours of the results being available.

The Contractor's testing program shall be such that the lot sizes are not greater than the sizes given in Table 7 and the testing frequencies and number of tests per lot are not less than those specified hereinafter.

Table 7 – Compaction Test Requirements

Construction Activity	Compaction Test* Required	Maximum Lot Size	Testing Frequency
Fill Area Surface	MDR	n/a	1 test per material type
	RC, DI	10,000M2	1 test per 2,000m^2 minimum of 2
Excavated Subgrade	MDR	n/a	1 test per material type
	RC, DI	5,000m2	1 test per 500m^2 minimum of 4
Embankments Below Subgrade	MDR	n/a	1 test per material type
	RC, DI	500m3	1 test per 50m^3 minimum of 4
Embankments at subgrade	MDR	n/a	1 test per material type
	RC, DI	5,000m2	1 test per 500m^2 minimum of 4
Pavements	MDR	2,500t	1 test per material type
	RC, DI	5,000m2	1 test per 500m^2 minimum of 4
* MDR - Moisture Density Relationship RC, DI - Relative compaction, density index			

2 TOLERANCES

Earthworks and road works shall be finished to smooth and uniform surfaces which shall conform within the following tolerances to the lines, grades and cross-sections shown on the drawings.

2.1 FORMATION LEVEL

Finished surfaces in fill shall not vary more than +50, -0 mm from the specified level. The surface shall not vary more than 25 mm over 3 m.

Finished surfaces formed by blasting shall not vary more than +0, -400 mm from the specified levels. Finished surfaces formed by ripping shall not vary more than +0, -150 mm from specified levels.

2.2 PAVEMENT SUBGRADE WIDTH

The subgrade width shall not be less than the specified width or more than 150 mm greater than the specified width. The edges of the subgrade shall not vary more than 50 mm inside or 100 mm outside the specified position.

2.3 FORMATION WIDTH

The widths measured on each side from the road centreline to the toes of cut batters and the tops of fill batters shall not be less than the widths specified, and no portion of cut batters shall encroach within these widths.

2.4 BATTER SLOPES

At all levels, the average slope of the batters shall not be steeper than the slope specified, and no point on the completed batter shall vary from the average plane more than 100 mm in the case of cut batters in earth, or 150 mm in the case of cut batters in rock and in the case of fill batters.

2.5 BATTER LINE

Unless approved otherwise, cut batters shall be constructed such that the top of the batter is not more than 150 mm outside the batter line shown on the drawings.

Fill batters shall be constructed such that the toe of the batter is not more than 150 mm outside the batter line shown on the drawings.

3 ROADWORKS

3.1 GENERAL

Over the whole area and distances shown on the Drawings or as specified in the Scope of Work, the hardstand areas and roads shall be formed, reformed, graded, boxed, trimmed and piped.

Excavation shall be made to specified depths and widths, and the table pipes, side pipes, Vee-pipes and catch pipes to the boundaries of the areas shall be constructed to the details shown on the drawings.

3.2 PREPARATION OF ROADBED

The roadbed is that portion of the subgrade or existing formation upon which the pavement is to be constructed. Preparation of the roadbed shall include all required work to restore, correct or prepare the roadbed to a condition suitable for the construction of the specified pavement. It shall also include the trimming and compaction of the shoulder formation. Immediately prior to placing subsequent material thereon, the finished roadbed and the shoulder formation shall be compacted as specified in Section 1.4. The surface of the roadbed and shoulder formation shall be smooth and uniform, true to the specified levels, grades and cross sections within the tolerance specified in Section 2.2 to the lines, grades and cross sections shown on the drawings.

Unless otherwise specified, existing pavements shall be scarified to a depth of not less than 75 mm before additional material is spread.

Before any pavement materials are placed on the compacted roadbed, the roadbed shall be tested and test rolled in accordance with Section 1.5.

3.3 GRAVEL AND CRUSHED ROCK PAVEMENT CONSTRUCTION

3.3.1 GENERAL

Gravel and crushed rock pavement construction includes the supply, spreading, compaction and trimming of crushed rock, gravel or sand, or mixtures thereof to the lines, grades, thicknesses and cross sections shown on the Drawings or as specified in the Scope of Work.

3.3.2 MATERIALS

The Contractor shall be responsible to investigate and obtain the materials for pavement construction. The Contractor shall arrange for all material quality testing and shall submit details of the proposed materials to the Principal's Representative for approval prior to delivery to site.

Should the Contractor wish to construct the pavement using different materials then the Contractor shall submit the proposed materials to the Engineer for approval. Such submission shall be made sufficiently early so that the works programme is not delayed.

Plant production materials used shall comply with the requirements of MRTS 05 for the relevant categories.

Testing of materials shall be in accordance with AS 1141 and AS 1289.

The Contractor shall blend and process the pavement materials such that the grading of materials complies with MRTS 05 for the relevant classification.

Materials from borrow pits shall comply with MRTS 05 for relevant classification.

3.3.2.1 Pavement Materials Naturally Occurring (Gravels and Composites)

The crushed limestone for the sub-base course shall be obtained from an approved source and shall be free from sand, roots and other foreign material.

Naturally occurring paving material gravels shall be selected and processed where necessary to confirm with the specified requirements. Processing shall include, where necessary, screening, separation, recombining, addition of other approved materials and any other operation necessary to produce a paving material to conform to the specified requirements.

The material for use in any course shall conform to the grading in Table 8.

Table 8

Grading Requirements – Naturally Occurring Pavement Material

AS Metric Sieve mm	(%) Passing by Weight			
	1	2	3	4
75.0	100			100
37.5	80-100	100		80-100
19	50-80	70-100	100	60-100
9.5	35-65	50-80	70-100	50-95
4.75	25-50	35-65	50-80	40-80
2.36	15-40	25-50	35-65	30-65
0.425	7-20	10-30	15-35	20-50
0.075	3-13	4-16	6-20	5-25

Table 9

Grading Requirements – Naturally Occurring Pavement Material

Properties	Maximum values
Liquid Limit	25
Plasticity Index (P.I.)	6
Linear Shrinkage	3
Base course CBR (4 days soak)	80
Sub-base CBR (4 days soak)	50

The above table is based on aggregate of uniform specific gravity and the Engineer may require that appropriate corrections be applied to the percentage of the test sample passing the various sieves when aggregates of varying specific gravities are used.

3.3.2.2 Crushed Rock Base

The whole of the material supplied shall be crushed from freshly quarried stone of an approved source and consist of hard durable rock free from sand, organic matter or other deleterious matter.

The pavement material shall have a nominal size of 20 mm and when compacted in the pavement and shall comply with the following requirements.

AS Sieve Size (mm)	% Passing by Weight
19.0	100
9.5	70-80
4.75	45-65
2.36	30-50
0.425	12-30
0.075	3-12

The ratio of the portion passing 0.075mm sieve to the portion passing 0.425mm sieve shall fall within the range 0.4 to 0.6.

1. Properties	2. Maximum values
3. Liquid Limit	4. 25
5. Plasticity Index (P.I.)	6. 5
7. Linear Shrinkage	8. 3
9. Base course CBR (4 days soak)	10. 90
11. LA Abrasion test	12. 40

The Los Angeles Abrasion Loss shall not exceed 40%.

3.3.3 SPREADING

Where pavement material is to be spread on a prepared base other than existing pavement, the first layer shall be spread and compacted immediately after the subgrade has been approved, in order to minimise the entry of water, or drying out, or deformation of the subgrade.

The pavement material shall be spread in even and equal layers to the width shown on the drawings, at such a rate that after compaction the final thickness shall not be less than that specified. The maximum thickness of layers before compaction shall be 200 mm.

Each layer shall be spread and thoroughly compacted before the next layer is spread, and the Contractor shall keep the lower layer in good condition during the spreading of the succeeding layer. No layer of pavement material shall be spread until the previous layer has been tested by the Contractor for conformance to this specification and approval obtained.

Care shall be taken to prevent segregation of pavement. Where segregation does occur, the materials shall be remixed and respread to the approval of the Principal's Representative.

3.3.4 COMPACTION OF PAVEMENT

Following inspection and acceptance of the sub-grade the sub-base shall be placed in a single layer and in such a manner that the sub-grade is not disturbed.

The sub-base shall be watered and mixed, so that the moisture content does not exceed optimum, graded and rolled to achieve the specified shape and density. Each layer of material shall be fully compacted in accordance with Section 16 of this specification.

Compaction shall begin at the sides of the pavement and progress gradually to the centre. Each pass of the roller shall be parallel with the centreline of the roadway and uniformly over-lap each preceding pass. On sections of pavement with one-way cross-fall, compaction shall begin at the low side of the pavement and progress gradually to the high side. Any deficiencies in level shall be made good as compaction proceeds. Where directed the compacted or partially compacted materials shall be scarified after level correction to ensure adequate bonding.

Compaction shall commence immediately after spreading and before existing moisture in the material has evaporated. Where necessary, the Contractor shall water the material to assist in compaction. All material spread each day shall be compacted sufficiently to provide a dense surface to prevent the entry of excessive amounts of water. Any unstable areas that develop shall be removed, replaced and re- compacted before further layers are added.

3.3.5 PAVEMENT COURSE TOLERANCES

All pavement courses, consisting of one or more layers of the same material, shall be finished to smooth and uniform surfaces and shall conform to the lines, grades, thicknesses and cross section shown on the drawings, within the following tolerances:

Level - The top of each pavement course shall not vary from the specified level by more than 12 mm. Where pavements are constructed against a kerb and channel or pipeage pit concrete apron the edge of the pavement shall be constructed flush with the edge of the channel unless otherwise specified or shown on the Drawings or as specified in the Scope of Work.

Thickness - The thickness of the base course of the pavement shall not be less than that specified or shown on the drawings. The total thickness of the pavement shall not be less than the specified thickness by more than 12 mm.

Shape - No point on the finished surface shall vary more than 10 mm from a 3 m straight edge laid parallel or perpendicular to the centreline of the roadway

PART E: SPECIFICATION FOR MONITORING AND TESTING

1 LEVEE MONITORING AND MAINTENANCE

1.1 MONITORING

Prior to the end of the Defects Liability Period, an inspection of the entire levee system should be undertaken by the Designer and Principals Representative. From consideration of the significance that the role the levee and diversion system plays in protecting the community of Roma, it is recommended that the Principal arrange for a maintenance strategy to be developed to ensure adequate performance of the levee system. It is recommended that this strategy comprises development of an operations manual in combination with regular inspections and maintenance.

Regular yearly inspections are recommended to be carried out by experienced personnel and cover all associated works and identification of any issues that may affect the serviceability or performance of the levee system (burrow holes, trees, scouring, piping, seepage, weed build up etc.). Particular attention should be paid to drainage structures, valves etc. and associated earthworks, to ensure the system is functioning correctly. The documented results from the annual inspection can then be used as an input for a maintenance program, which will facilitate timely levee maintenance.

Maintenance operations to be undertaken include repair of batter slumps, revegetation, mowing, and removal of trees, filling of burrow holes and depressions and crest maintenance. Particular monitoring and maintenance of the surface protection system immediately following construction is particularly important, at a time when a thick vegetative mattress has not fully established. Replanting and other associated maintenance will likely be required following the initial wet season. Crest maintenance is recommended to maintain design levee height and to prevent development of ruts and potholes, which avoids water ponding and potential development of pipes.

Grazing of vegetation on the levees or diversions is not recommended as this will impact on the coverage of vegetation.

It is recommended that during exposure of the works to a flood event (and particularly during first exposure), the Principal arrange for the following monitoring inspections to be conducted by appropriately qualified personnel:

1. Daily inspections of town side foundations and batters to detect potential failure mechanisms (for example seepage, boiling, piping and heaving)
2. Inspection of downstream culvert inlets/ outlets to detect potential failure mechanisms (scouring, seepage, boiling, piping and heaving)

It is recommended that relevant details are recorded and photographed for use in the development of remediation and/ or maintenance plans.

Following receding of the flood event, a detailed inspection and condition assessment is recommended to be undertaken by appropriately qualified personnel.

Remediation of scoured areas will be required to be undertaken by the Principal, particularly if flooding occurs prior to full establishment of vegetation.

1.2 TURF MAINTENANCE

The Contractor shall maintain all grassed areas for the whole of the Contract Period and the Defects Liability Period.

Such maintenance shall include:

- Irrigation
- Mowing to encourage a spreading habit of growth. Generally grass shall be kept at a height of less than 150 mm
- Such practices or work as are necessary to eliminate pests, disease or weed infestations
- Fertilising

Levee grasses should be inspected for healthy growth, and treated for any deficiency in topsoil or chemical imbalance. (This assumes that sufficiently regular watering for enhancing growth has been maintained).

All water used for watering of seed as appropriate shall be obtained from approved sources and be free of chemicals or compounds toxic to plant growth.

2 GENERAL TESTING REQUIREMENTS

2.1 GENERAL

1) All materials, equipment, installation and workmanship included in the works of this Contract, shall be tested and inspected to prove compliance with the Contract requirements. An approved alternative to testing to the specification and relevant codes will be the furnishing of a certificate of compliance with the specification or code.

2) Tests and inspections, unless otherwise specified or accepted shall be in accordance with the following order of precedence:

   a) This specification
   b) Relevant TMR standard
   c) Relevant Australian Standards
   d) If no AS standards are applicable, then those of the British Standards Institution shall be used).

3) The Contractor shall at all times give to the Principals Representative a minimum of one day's prior notice of all tests and inspections.

4) Specific test requirements for the various items of work and equipment are covered in the relevant sections of this Specification and design drawings.

5) At all times when tests are in progress the Contractor shall have at least one suitably qualified and NATA or equivalent approved representative present.

6) All test results shall be suitably signed by a suitably qualified and NATA or equivalent approved representative, and submitted to the Principals Representative within 5 days of the completion of the testing.

2.2 EQUIPMENT FOR TESTING

1) The Contractor shall carry out all tests nominated in the Specification and the design drawings and all labour, materials, temporary works and equipment necessary for the tests shall be provided by and at the expense of the Contractor. It will also be the Contractor's responsibility to make any necessary temporary connections in order properly to carry out all specified testing procedures.

2) NATA or other approved authority shall certify measuring and metering equipment. The Contractor at his expense shall provide all electrical power, compressed air or chemicals required for testing purposes.

PART F: ENVIRONMENTAL MANAGEMENT

1 GENERAL

The Contractor shall develop and implement a Project Environmental Management Plan (PEMP) which shall comply with the Environmental Management Systems Guidelines as outlined in the Preliminaries and the following sections of this Specification. It is noted that this may include development of a Review of Environmental Factors (REF) for the project site to ensure all relevant legislative and other requirements are identified by the construction team.

1.1 IMPLEMENTATION

The Principals Representative is responsible for:

- Ensuring that the Contractor's PEMP meets the requirements of the Contract Documents.
- Auditing the Contractor's implementation of the PEMP and for issuing corrective action requests to the Construction Contractor as appropriate.

The Construction Contractor is responsible for preparation of a PEMP, which states the Contractor's policy and methods of implementation for:

- Compliance with all relevant local, state and Commonwealth environmental legislation, guidelines, permits and licences and industry codes of practice.
- Design of temporary environmental measures to mitigate any unfavourable environmental impacts.
- Construction, operation, maintenance and monitoring of all environmental measures during construction and the relevant defects liability period.
- Reporting and correcting non-conformances during construction and the relevant defects liability period.
- Correcting matters raised by the Principals Representative on corrective action requests.

The PEMP must be submitted by the Contractor and approved by the Principals Representative at least seven (7) days prior to the commencement of construction works.

The Principals Representative will be responsible for periodic monitoring and auditing, reporting the results and issuing Corrective Action Requests (CAR).

CAR will specify the non-conformance and require the person/organisation responsible to state the corrective action being taken and its time of completion and, in addition will require a statement of preventive actions to ensure that similar non-conformances do not occur.

1.2 REPORTING

An Environmental Management File (EMF) is to be maintained by the Construction Contractor and should contain all documentation pertaining to environmental management of the project. The EMF should take the form of a traditional correspondence file and/or are readily retrievable, upgradeable and suitably protected computer file. The Construction Contractor shall undertake weekly inspections of the construction area to identify non-conformance with construction phase actions. A report providing details of these inspections is to be maintained on the EMF.

The Contractor shall prepare a monthly report including a description of monitoring activities, non-conformance notices and corrective action notices (both completed and pending). A monthly report shall be made available to Principals Representative for review and comment.

During construction, the Construction Contractor's Environmental Representative will make daily visual inspections of the site and any discharges from the site.

The Construction Contractor and any Subcontractors shall report any non-conformance with the PEMP to the Principals Representative. Reporting shall be done immediately after the non-conformance has occurred.

The Construction Contractor is responsible for carrying out preventative action and corrective action resulting from a non-conformance.

1.3 ABORIGINAL ISSUE MONITORING

The Contractor shall develop the Project Environmental Management Plan (PEMP) and detail the provisions and requirements for Aboriginal Project monitoring during construction within this document.

The provision of all works necessary for monitoring for Aboriginal significance at the site is the responsibility of the Contractor.

1.4 TRAINING, AWARENESS, COMPETENCE

All activities on the project which have a potential to cause environmental harm will be identified and personnel competent to carry them out without causing environmental harm will be selected or, alternatively, others will be given specific training and assessed for competency.

All staff will be trained and assessed in environmental responsibilities.

It will also be emphasized that compliance with the PEMP does not remove the responsibility of compliance with the law.

1.5 SAMPLING, ANALYSIS, MEASUREMENTS

The Manuals published by the QLD Environment Protection Authority will be utilised where they apply.

Laboratories will be selected for their certification by NATA or other accrediting body. Samples will be taken and measurements made by persons with the necessary training and competence.

Control and calibration of measuring equipment will be as set out in the equipment manuals, the EPA manuals or Australian Standards as appropriate. Records of calibrations will be kept.

1.6 STANDARDS, LEGISLATION, GUIDELINES

Compliance with the PEMP shall be made a condition of acceptance of the contract to work on the site by any Contractor or Subcontractor.

The Construction Contractor will plan and execute the construction to prevent or minimise environmental harm and in accordance with best practice environmental management as required by the relevant Queensland Legislation.

The following minimum standards apply to monitoring and auditing of performance. Subject to development of the CEMP by the contractor, additional standards may be required to be adopted.

Table 16.1 - List of Statutory Regulations

Item	Regulation
Water	Australian Water Quality Guidelines for Fresh and Marine Waters – ANZECC. Approved Methods for the Sampling and Analysis of Water Pollutants in QLD
Soils	ANZECC/NHMRC – Guidelines for the Assessment and Management of Contaminated Sites.
Air	AS3580 Methods of Sampling and Analysis of Ambient Air.
Noise and Vibration	QLD EPA Noise Manual AS1055.1 and AS1055.2 Acoustics - Description and Management of Environmental Noise. AS2436 Guide to Noise Control on Construction, Maintenance and Demolition Sites. AS2659.1 Guide to the Use of Sound Measuring Equipment. AS2659 Sound Level Meters.
Flora and Fauna	Commonwealth Environment Protection and Biodiversity Conservation Act 1999 Nature Conservation Regulation 2006
Cultural Heritage	Aboriginal Cultural Heritage Act 2003
Contaminated Land	Contaminated Land Management Act 1997 Contaminated Land Management Regulations 1998
Dangerous Goods	Dangerous Goods Act 1975 Dangerous Goods (General) Regulation 1999 Environmentally Hazardous Chemicals Act 1985 Environmentally Hazardous Chemicals Regulation 1994 AS1216 Classification, Hazard Identification and Information Systems for Dangerous Goods. AS1678 Emergency Procedure Guides - Transport AS1940 Storage and Handling of Flammable and Combustible Liquids. AS2508 Safe Storage and Handling Information Cards for Hazardous Materials. AS2809 Road Tank Vehicles for Dangerous Goods. AS2931 Selection and Use of Emergency Procedure Guides for Transport of Dangerous Goods.

Item	Regulation
Soil Erosion and Sediment Control	BCC guidelines for erosion and sedimentation control `Urban Erosion Sediment Control' (Department of Conservation and Land Management, 1992). Soil Erosion and Sediment Control – Engineering Guidelines for Construction Sites - Institution of Engineers 1996. Best Practice erosion and Sediment Control (IECA) guidelines 2008

1.7 INTERPRETATION

- Principal means the Maranoa Regional Council
- Principals Representative means the person authorized by the Principal, to act with the full authority of the Principal. For the purposes of this Specification, the Principals Representative is Ross Drabble of Maranoa Regional Council.
- Defects Liability Period means the period during which the Construction Contractor is responsible for making good defects in a part or the whole of any works. The Defects Liability Period shall also include routine maintenance items.
- The contractor means 'Ostwald Brothers'
- Routine Maintenance comprises:
    - Cleaning signs.
    - Litter collection.
    - Repair of Collateral Road Damage.
    - Repair Eroded Areas.
    - Maintenance of revegetated areas (i.e. watering, weed control etc.)
    - Maintenance of temporary fencing
    - Maintenance of environmental mitigation devices
- Project Environmental Management Plan (PEMP) means a detailed program of works and measures documented and carried out by the Construction Contractor in accordance with the relevant provisions of the Contract and relevant government and legislative requirements.

1.8 PEMP ELEMENTS

The following elements are considered the minimum requirements for the PEMP.

1.8.1 Erosion Control, Stormwater & River Water Quality Management & Monitoring

The Contractor shall determine the control measures appropriate to the site of the works. Prior to the commencement of the project works, the Contractor shall prepare an Erosion and Sediment Control Plan in consultation with the Maranoa Regional Council and the Department of Environment and Resource Management for the project.

Management measures shall incorporate the following items:

- Local stormwater runoff from the undisturbed area upstream of the site should be diverted away from the construction site and discharged to the existing open drain via erosion stabilised locations.

- Filtering devices, silt and sediment traps and other devices shall be utilised to prevent sediment, turbidity and other pollutants which result from the works being discharged into the Balonne River and Bungil Creek.
- Minimise the alteration of the existing drainage patterns in undisturbed areas.
- Drainage from construction sites shall be passed through sediment traps in the stormwater drainage. Examples of sediment traps include hay bales, geo-textile fabric filter fences and silt traps. Construction of temporary sediment fences and catch drains to be undertaken in accordance with standard guidelines.
- The extent of disturbance shall be the minimum required for construction activity or that provided in the permit, whichever is the lesser. This can be achieved by construction planning and undertaking the works in stages followed by prompt revegetation and rehabilitation of completed levee sections and the disturbed areas under the old levee sections.
- Identify and delineate no-go or limited access areas.
- Revegetation of completed earth levees, borrow areas and all other disturbed areas should be undertaken immediately after completion of construction.
- The completed earth levees shall be vegetated with a hardy, erosion resistant grass as specified. The vegetation of the batters will include techniques appropriate to earth embankments.
- Topsoil stockpiles shall be located on flat ground at least 5 metres away from areas subject to run-off and away from established flowpaths (eg. drains, gutters, etc.). The height of the stockpiles shall not exceed 2 metres, unless stockpiles are suitably protected from wind erosion. The Contractor shall protect temporary topsoil spoil stockpiles with diversion drains, silt fences and straw bales to prevent sediment loss.
- The Contractor shall be required to clean any machinery which has operated or travelled through an area where declared plants are present in accordance with the guidelines under the Land Protection Act 2002 and to collect this wash down water to allow silt and seeds to settle. The silt and seeds will be buried under at least 1 metre cover. Any declared plants, which emerge in the settling basin, will be destroyed.
- Tracking of sediment from the construction site via construction equipment onto the road shall be minimised. The Contractor shall be required to clean any machinery in a designated washdown area to prevent tracking of sediment off site.
- Washout of concrete trucks and cleaning of equipment and/or vehicles used during construction shall not be undertaken in locations that permit flow of untreated wastewater directly to the open drainage system.
- Stormwater from the construction site shall be collected and treated via sediment control structures prior to discharge off site.
- The design of any works by the Contractor shall minimise obstruction to normal and flood flows in the creeks and shall provide for protection against scour by floods.
- Stores of oils, paints, fuel, etc. will be contained in accordance with AS1940 so that no contaminants pollute land or waterways.
- At completion of construction the area shall be cleared of potentially polluting materials.
- Inspections of the construction area and periodic observations of work practices shall be undertaken daily to identify any potential problems.
- A Water Quality Monitoring Program shall be undertaken throughout construction that ensures that any water discharged into Bungil Creek or the existing drainage system during the construction phase is of equal or better quality than that flowing in the river at the time. Sampling of local stormwater during and immediately after the event should be undertaken before it discharges from the site into Bungil Creek.

1.8.2 Traffic and Air Quality

The Contractor is responsible for ensuring that construction traffic and activities result in minimum impact on air quality.

The Contractor shall utilise best management practices and polices to minimise dust from construction including:

- Comply with the relevant Queensland Act.
- The contractor shall ensure that dust in the atmosphere complies with Occupational Health and Safety requirements.
- Maintain a water truck on site to wet down working areas and haul routes as required.
- Access roads and earthworks, including spoil heaps and stockpiles of sand, shall be watered or covered as required to minimise dust emissions. The use of waste oil for dust suppression will be strictly prohibited.
- Ensure that all vehicles and equipment are fitted with appropriate exhaust control measures and are adequately maintained in line with manufacturer's requirements.
- Enforce the covering of trucks transporting earth and fill materials where dust could be generated.
- Sealed public roads where trucks leave the construction site are to be checked daily for mud/dust and cleaned as necessary.
- Where practical, a stable surface will be provided for main haul routes in the construction area and maintained to minimise dust. When necessary, the Contractor shall water these surfaces on Sundays and public holidays as required by weather conditions.
- Appropriate speed limits over unsurfaced roads shall be established and enforced.
- Burning of any waste arising from construction activities is prohibited.

1.8.3 Noise and Vibration Management

The contractors shall ensure that noise and vibration on the site are within acceptable limits as set out in the relevant QLD legislation and guidelines.

The contractor shall utilize best practices and policies to minimize noise from construction including:

- All construction plant is to be fitted with current best practice noise control and attenuation devices and maintained and operated to ensure that noise emissions are minimized.
- Permission is to be obtained from the Principals Representative for any work outside the standard hours and the conditions in the permit will be observed.
- Blasting is not expected to be required at the site.
- Noise and vibration levels are to be measured by the Construction Contractor, as required by the Principals Representative.
- Occupational Health and Safety requirements for noise and vibration are to be met and appropriate Codes of Practice followed.
- Ensure vehicles and construction equipment is maintained within service guidelines to minimise noise emissions from malfunctioning equipment.

1.8.4 Flora and Fauna Management

The Contractor shall ensure that construction activities are carried out in a manner that minimises the impact on flora and fauna.

The Contractor shall undertake activities including:

- Implementation of the revegetation principles as described in the Specification.
- Minimise area disturbed by construction activity and use temporary fencing to delineate construction areas from protected areas. The extent of disturbance will be the minimum required for the construction activity or that prescribed in the permit whichever is the lesser.
- Contractor shall advise the Principals Representative of any areas the Contractor proposes to clear and to mark the boundaries of clearing.
- Minimising the destruction of flora and interference with fauna.
- Declared plants and exotic flora and fauna shall not be introduced to the site and any that are accidentally introduced will be destroyed, using approved non residual herbicides applied by a licensed operator. Use herbicides as necessary (ie Round -Up) as necessary to control weed growth on site.
- Protected species of plants shall not be removed or interfered with, without the approval of the Department of National Parks, Recreation, Sport and Racing.
- The Specification will require the Contractor to advise the Principals Representative of any areas the Contractor proposes to clear and to mark the boundaries of clearing.
- The Contractor will be required to clean any machinery which has operated or travelled through an area where declared plants are present in accordance with the guidelines under the Land Protection Act and to collect this wash down water to allow silt and seeds to settle.
- The Construction Contractor will be required to prevent injury to, or death of, any native fauna on the construction site and to transport any injured fauna to an animal hospital or refuge.

1.8.5 Dangerous Goods and Waste Management

- Any on site washrooms and toilets shall be provided with waste disposal.
- Waste oil to be collected in drums and transported off site for recycling where possible.
- Petroleum products to be stored, handled, separated and signed as required by the AS1940 Storage and Handling of Flammable and Combustible Liquids.
- Refuelling shall be carried out over contained area to prevent contamination of land from spillage.
- Waste oils shall be collected and transported to recycle depots or designated disposal sites. Major maintenance and repairs shall be carried out offsite.
- Dangerous goods shall be stored and handled on bunded impervious floors and separated and signed as required by the appropriate Australian Standards.
- The Contractor shall prepare an Emergency Response Plan and train employees in the use of equipment, chemicals, and protective clothing and the application of the Emergency Response Plan.
- Any spills of dangerous goods shall be rendered harmless and collected for treatment and disposal at a designated site. This includes cleaning materials, absorbents and contaminated soils.

1.8.6 Road Transport and Sourcing of Materials

- The Construction Contractor shall provide a Traffic Management Strategy and comply with the Traffic Management Plan in the project Specification.
- When suitable alternatives are available, the soil materials and manufactured goods causing minimum adverse environmental effects shall be assessed and used in construction.
- Permission shall be obtained from the relevant Traffic Authority and Council for transportation of any loads exceeding dimension and weight limits and the Construction Contractor complies with the conditions of the permits.

- The Contractor shall coordinate transport to ensure minimum damage to public and other access roads along the haulage routes.
- The Contractor shall utilise materials sourced locally wherever possible to limit the use of public roads for long distance hauling of bulk construction materials.
- The Contractor shall ensure that the transportation of dangerous goods is in accordance with the regulations and the relevant codes and standards published by Standards Australia.
- The Contractor shall ensure that a regular program of street cleaning within the main road transport routes and associated works areas is undertaken.
- Washout of concrete trucks and cleaning of equipment and/or vehicles used during the road construction shall not be undertaken in locations that permit flow of untreated wastewater directly to the open drainage system.

1.8.7 Restoration and Rehabilitation of Disturbed Areas

- The Contractor shall restore all disturbed areas that result from construction activities. The disturbed areas shall be restored and returned to similar configurations and vegetation conditions to those that existed prior to the commencement of construction.
- The Contractor shall remove all structures used in the construction work that are not a permanent feature from the site together with all wastes.
- The Contractor shall repair all damage to existing roads, drainage and other infrastructure, as may have occurred during the construction work.
- Local drainage systems shall be constructed as per the Drawings and disturbed areas outside the works shall be reinstated to minimise erosion and to avoid changes in the overland flow patterns.
- The Contractor is responsible for rehabilitation maintenance until this responsibility is taken over, by prior arrangement with the Principal, or after the specified Defects Liability Period has expired.

1.8.8 Aboriginal And Historical Archaeology And Monitoring

i Contractors Requirements

The contractor shall identify all requirements relating to Aboriginal and Historical Archaeology and Monitoring and implement all measures required to satisfy the relevant Authorities.

APPENDIX A – SPECIFICATION TABLES

Appendix A Specification Tables	
Table No	Details
Table A1	Material Classification Table
Table A2	Placement and Compaction requirements for Earthworks
Table A3	Testing and Acceptance of Earthworks Materials
Table A4	Acceptable tolerances for Earthworks Levels and Position
Table A5	Testing and acceptance criteria for Placement and Compaction of Earthworks
Table A6	Schedule of Hold Points

Table A1: Material Classification Table

MATERIAL CLASSIFICATION TABLE								
Classification	**TYPE A Topsoil**		**TYPE B General Fill**		**TYPE C Structural fill**		**TYPE D Rip rap**	
Particle Size Grading Requirements (% passing by mass)	Sieve Size (mm)	Criteria (1)	Sieve Size (mm)	Criteria (1)	Sieve Size (mm)	Criteria (1)	Sieve Size (mm)	Criteria (1)
		N/A	75 0.075	100 20%	25 0.075	100 20%	150mm min dimension 500mm maximum dimension	
Min Plasticity Index	N/A		10 (2)		10 (2)		N/A	
Min/ Max Liquid Limit	N/A		20/65 (2)		20/65 (2)		N/A	
Emerson Class Number (ECN)	N/A		-		>3		N/A	
Acceptable material classification	N/A		SC, CL, CI, CH		SC, CL, CI, CH		N/A	
Other							Min UCS=10 MPa Max wet dry strength variation = 20%	

(1) Criteria = % passing nominated sieve by mass

(2) Refer to table below for acceptable range of values as shown on Atterberg plot

Table A2: Placement and compaction requirements for earthworks

TEST	TEST METHOD	ACCEPTANCE CRITERIA			
		TYPE A TOPSOIL	TYPE B GENERAL FILL	TYPE C STRUCTURAL FILL	TYPE D RIP RAP
Maximum Compacted Layer thickness (mm)	Inspection	N/A	300	300	(3)
Moisture Content	AS 1289.2.1.1 AS 1289.2.1.4	N/A	OMC(1)+-2%	OMC(1)+-2%	
Compaction	AS 1289.5.1.1 AS 1289.5.8.1	N/A	Min 98% (Standard)	Min 98% (Standard)	

1. As determined by AS1289.5.1.1 and AS1289.5.4.1
2. Proposed maximum lift to be submitted to DSGR for review and approval, depending upon type of machinery proposed for use
3. Layer thickness a function of max particle dimension (to be determined on site)

Table A3a: Testing and acceptance requirements for earthworks materials

CLAUSE REF	FILL TYPE	PROPERTY	TEST PROCEDURE	MIN TEST FREQUENCY	ACCEPTANCE LIMITS
Clause 3	**TYPE A** TOPSOIL	To Be Advised			Refer to Table A1 for all Acceptance limits for Properties noted in this Table
	TYPE B EARTH FILL	Particle Size Distribution	AS 1289.3.6.1	Min 1 test per 1000m3. Min 1 test per lot. (1)	
		Plasticity Index	AS1289.3.1.2 AS1289.3.2.1 AS1289.3.3.1	Min 1 test per 1000m3. Min 1 test per lot. (1)	
	TYPE C STRUCTURAL FILL	Particle Size Distribution	AS 1289.3.6.1	Min 1 test per 1000m3. Min 1 test per lot. (1)	
		Plasticity Index	AS1289.3.1.2 AS1289.3.2.1 AS1289.3.3.1	Min 1 test per 1000m3. Min 1 test per lot. (1)	
		Emerson Class Number	AS 1289.3.8.1	Min 1 test per 1000m3. Min 1 test per lot. (1)	
	TYPE D RIP RAP	Particle Size Distribution	AS 1289.3.6.1	1 test per material (quarried material)	
		Min Is50	TO BE DISCUSSED	1 test per material (quarried material)	
		Wet dry Strength variation	Q205C	1 test per material (quarried material)	

1. Lot size in layered fill placement can be greater than the volume listed above provided the number of tests per volume is achieved and subject to the entire fill from the lot being placed in a single day and being placed in a single layer.

Table A3b: Testing and acceptance requirements for ground surface treatments of foundations.

CLAUSE REF	FOUNDATION AREA	FOUNDATION MATERIAL	PROPERTY	TEST PROCEDURE	MIN TEST FREQUENCY	ACCEPTANCE LIMITS	PROCEDURE
Cl 3.8, 4.2 4.3, 5.0 & 6.0	**Foundation Floor**	Clay	Moisture content	Proof Roll	Single sufficient pass of trench width	No visible deformation or springing	Following approval scarify surface to >50mm depth and moisture condition prior to placement of fill material
		Sand	Moisture content	Proof Roll	Single sufficient pass of trench width	No visible deformation or springing	Following approval scarify surface to >50mm depth and moisture condition prior to placement of fill material

Table A4: Summary: Acceptable Tolerances for Earthworks Levels and Positions

EARTHWORKS LEVELS AND POSITIONS- ACCEPTABLE TOLERANCES	
POSITION	**ACCEPTABLE TOLERANCE**
Foundation surface prior to filling	-100mm/ +0mm
Levee finished surface	-0 mm / +100 mm
All earthworks for roads and around culverts/ structures	As per TMR specifications

Table A5: Acceptance Criteria for Earthworks Placement and Compaction

CLAUSE REF	FILL TYPE	PROPERTY	TEST PROCEDURE	MIN TEST AND REPORTING FREQUENCY	ACCEPTANCE LIMITS
	TYPE A TOPSOIL				
	TYPE B GENERAL FILL	Maximum Dry Density	Refer Table A2	Min 1 test per 400m3. (1)	
		Field Density		Min 1 test per 400m3. (1)	
		Moisture content		Min 1 test per 400m3. (1)	
		Layer thickness	Measurement (2)		
	TYPE C STRUCTURAL FILL	Maximum Dry Density	Refer Table A2	Min 1 test per 400m3. (1)	
		Field Density		Min 1 test per 400m3. (1)	
		Moisture content		Min 1 test per 400m3. (1)	
		Layer thickness	Measurement (2)		
		Emerson Class	Refer Table A2	Min 1 test per 400m3. (1)	
	TYPE D RIP RAP	To be determined			

(1) Lot size in layered fill placement can be greater than the volume listed above provided the number of tests per volume is achieved and subject to the entire fill from the lot being placed in a single day and being placed in a single layer.

(2) Measurement with respect to items with level tolerance in accordance with Table A4. Contractor Quality Team shall sign off conformance of individual layer thicknesses.

Table A6: Schedule of Hold Points – Part B: Engineering Specification for Levee Earthworks Structures and Drainage

CLAUSE REF	HOLD POINT		
	PROCESS HELD	SUBMISSION DETAILS	RELEASE DETAILS
Clause 1.3	Mixing of materials	Notification to the DSGR 5 working days before commencement of treating material.	Approval or rejection by DSR/DSGR
Clause 1.5	Alternative material to be used to specification	Submittal to the DSR/DSGR details of an alternative to rock rip rap	Approval or rejection by DSR/DSGR
Clause 2.10	Examining of material in borrow area	Notification to DSGR that excavation is proposed at a new Borrow Location, site investigation to be undertaken by DSGR.	Approval or rejection by DSGR.
Clause 3.1	Inspection of foundation	Notification to DSGR of new excavation	Inspection of foundation by DSGR prior to initial filling. Witness of proof rolling.
Clause 3.1	Groundwater and/or Seepage found	Notification to DSGR if groundwater and/or seepage is observed in foundation	Inspection by DSGR
Clause 3.2 and 3.4	Presentation of levee and culvert foundation	Notification to DSGR that excavation to foundation level has been attained.	Inspection of foundation by DSGR prior to initial filling. Witness of Proof rolling. Selection of treatment (if required) and direction of removal of unsuitable material and/or further action as required. If unsuitable is removed, DSGR shall inspect stripped foundation prior to further filling operations.
Clause 3.3	Replacement of each lot of unsuitable material	Notification to DSGR that unsuitable material has been removed as directed.	Inspection by DSGR Further removal of unsuitable may by directed prior to authorising release of Hold Point.

CLAUSE REF	HOLD POINT		
	PROCESS HELD	SUBMISSION DETAILS	RELEASE DETAILS
Clause 4.1	Delivery of imported material	Submittal to the DSGR details of imported fill and reason for use on the project.	Approval or rejection by DSGR
Clause 5.0	Material conformance	Submittal to DSGR of conformity of each lot of Material placed, with relevant test and survey reports	Approval or rejection of placed material as ongoing responsibility of Contactor Quality Team followed by submission of results to DSGR
Clause 5.0	Testing and acceptance of Earthworks	Submittal of all quality/ verification records and tests. Submittal to be issued as packages (per design lot). Submittal to include description of origin/ location of lot.	Approval or rejection by Principal

Table A7: Schedule of Hold Points – Part C: Engineering Specification for Concrete and Structures

CLAUSE REF	HOLD POINT		
	PROCESS HELD	SUBMISSION DETAILS	RELEASE DETAILS
1.1	Selection of appropriate concrete for cast in situ structures	Submittal to DSR details of concrete mix proportions and, details of materials and their sources	Approval or rejection
1.7	Inspection of reinforcement for cast in situ structures	Notification to DSR that reinforcing requires inspection prior to concreting	Inspection by DSR of formwork and reinforcement

APPENDIX C – GEOTECHNICAL FACTUAL REPORT

ROMA FLOOD MITIGATION PROJECT

Geotechnical Investigation Factual Report

June 2014

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1 INTRODUCTION

1.1 Background

The Roma township is located in the Bungil Creek floodplain and has an extensive history of flooding, with a number of major flood events in the recent years resulting in significant damage to private property, public infrastructure and utilities. Three significant large flood events have occurred between March 2010 and February 2012, with the February 2012 flood being the largest flood event ever recorded in Roma and resulting in significant damage to over 500 premises.

SMEC Australia Pty Ltd. (SMEC) has been commissioned by Ostwald Brothers Pty Ltd (OB) to prepare the detailed design of the Stage 1 Roma Flood Levee, for Maranoa Regional Council (MRC).

SMEC has carried out a geotechnical investigation to provide ground information for the detailed design of the proposed earthworks and structures and for potential nearby borrow areas to identify suitable materials for the levee earthworks.

For the purpose of design works and field investigation, the levee alignment has been divided in four separable sections (i.e. Section A to Section D). This report revision presents the factual data collected for Section A to Section D and available information for the borrow areas undertaken to this date.

1.2 Report Scope and Structure

The scope of works covered in this report includes:

- A summary of the regional geology of the site;
- Details and results of the field investigation for Section A to Section D;
- Investigated potential borrow areas;
- Pavement test pits;
- Compiling of all test pit logs and boreholes logs;
- Compiling of all laboratory test results.

Explanatory notes and commonly used abbreviations specific to geotechnical logs of boreholes and excavations are presented in Appendix A.

An overall plan showing the locations of geotechnical investigations and borrow pits is presented in Appendix B.

2 FIELD INVESTIGATIONS

2.1 Objectives

Test locations for this investigation were chosen to allow a geotechnical assessment of the ground conditions below proposed earthworks, structures, and in borrow areas. Final locations were also dependent on site access restrictions regarding property boundaries and land ownership.

The objectives of the investigation were:

- Identification of key potential geotechnical risks to the project;
- Characterisation of subsurface conditions;
- Provision of foundation parameters for detailed design of the proposed earthworks and structures;
- Identification and assessment of the suitability of materials to be excavated along the proposed alignment and potential borrow areas for possible use in levee construction;
- Identification of design constraints and potential issues relating to dispersive soils and erodibility;
- Provision of permeability/seepage soil parameters of foundation materials beneath and within the proposed levee structures.

2.2 Previous Investigations

Previous ground information has been provided in GHD Report - Roma Flood Mitigation Project – Geotechnical Factual Report, dated March 2013.

This report includes the findings of 13 boreholes (BH1 to BH13) drilled to approximately 5.5m depth. These boreholes are generally located between residential Roma and Bungil Creek, however, not specifically along the currently proposed levee alignment.

2.3 Investigation Activities

The investigation aimed to examine the subsurface ground conditions beneath the levee foundations. It should be noted at this point that the shape and levee type changed at several points during the investigation. The final shape of the levee is a 1:4 earth bund with a three (3m) wide crest from the start to finish however due to community preferences the scope changed in certain areas to allow for possible alternative alignments and alternative structures.

The investigation scope, with test locations presented in Appendix B and summarised in Table 1, generally comprised of:

- Test pits to a depth of three metres at approximately 200m centres (TP3 to TP32) and Dynamic Cone Penetrometer tests (DCP1 to DCP110) at approximately 50m centres along the proposed levee alignment footprint (including a DCP test adjacent to each test pit);
- 4 boreholes (BH14 to BH17) drilled to depths of between 9 and 12 metres and installation of standpipe piezometers to provide deeper ground information along the levee alignment;
- 3 further boreholes (BH21 to BH23) drilled to a depth of approximately 10m along one section of the levee alignment where a vertical wall structure was proposed in lieu of the earth bund structure over a length of approximately 100m. Boreholes were located at 50m spacing along the proposed structure.
- Installation of standpipe piezometers in each of the 4 levee alignment boreholes (BH14 to BH17) and in one at the concrete wall boreholes at BH22;

- 5 in-situ falling head and/or rising head permeability tests in each of the standpipe piezometers;
- 9 test pits to a depth of 6m at proposed borrow areas within the present Roma landfill site;
- Additional test pits to a depth of 3m at proposed borrow areas adjacent to the levee alignment on private properties.

The bulk of the fieldwork was carried out over ten days from the 24th of September to 3rd of October 2013 under the supervision of experienced geotechnical professionals from SMEC. The investigations were carried out in general accordance with SMEC environmental, health and safety management procedures and AS1726-1993 "Geotechnical Site Investigations".

Due to access constraints at the time of investigation, access was not possible from CH00 to CH1350 adjacent the Roma airport site and through properties adjacent to the Carnarvon Highway. Additionally, various alignment test pits were relocated due to property access constraints.

The works carried out during this period comprised:

- 106 test pits excavated both along the proposed levee alignment and at potential borrow areas:
  - 23 test pits (TP03-TP06, TP8-TP17, TP19, TP20, TP22-TP28) along the proposed levee alignment;
  - 15 test pits (TPB1-TPB9, TPB66-TPB69 and TPB74-TPB75) throughout the proposed landfill borrow areas and;
  - 32 test pits (TPB10-TPB16, TPB29-TPB41 and TPB58-TPB69) at the locations of proposed borrow areas along the levee alignment;
  - 14 test pits at Barron Borrow Area (TPB17-TPB28 and TPB54-TPB55);
  - 3 test pits at Racecourse Horse Pool (TPB42-TPB44);
  - 9 test pits at Potential Borrow Area at Peak's property (TPB45-TPB53);
  - 4 test pits at the Proposed western diversion channel (TPB70-TPB73) and;
  - 6 pavement test pits at proposed tie in points of the road crossings over the levee.
- 10 boreholes drilled to approximately 10m depth at the selected locations along proposed levee alignment:
  - 4 alignment boreholes where there was an absence of existing deeper ground information from the previous investigation (GHD March 2013);
  - 3 boreholes at 50m chainages at the location of one of the proposed wall sections south of McPhie Street at approximate CH2900 to CH3000 and;
  - 3 boreholes at 50m chainages at the location of one of the proposed walls at approximate CH750 to CH850.
- 97 Dynamic Cone Penetrometer tests (DCP) were carried out from CH1350 to CH5150 by South Queensland Soils, Roma;
- Installation of standpipe piezometers in six boreholes and;
- In situ permeability testing carried out in the six standpipe piezometers.

Test pit and borehole locations are summarised in Table 1.

Table 1 – Test Pit and Borehole Locations

Test Pit /DCP	Location	Chainage (Approx.)	Easting (m)	Northing (m)	RL (m) AHD
Test Pits – Levee Alignment					
TP03/DCP01	Alignment Section D	00	677064.8	7063662.4	304.2
TP04/DCP05	Alignment Section D	200	677171.5	7063350.4	302.7
TP05/DCP09	Alignment Section D	400	677220.55	7063350.1	302.5
TP06/DCP13	Alignment Section D	600	677409.5	7063286.0	302.6
TP08/DCP20	Alignment Section D	1000	677725.1	7063278.6	302.50
TP09/DCP25	Alignment Section D	1200	677796.3	7063175.1	303.82
TP10/DCP29	Alignment Section D	1400	677879.3	7062988	302.32
TP11/DCP33	Alignment Section C	1600	678076.6	7062915	301.05
TP12/DCP33	Alignment Section C	1800	678268.2	7062884	301.47
TP13	Alignment Section C	2100	678563.4	7062930.9	301.2
TP14	Alignment Section C	2280	678742.6	7062959.5	301.4
TP15/DCP49	Alignment Section C	2400	678861.5	7062956	301.27
TP16/DCP53	Alignment Section B/C	2600	679049.6	7062890	300.39
TP17/DCP57	Alignment Section B	2800	679101.6	7062709	300.92
TP19	Alignment Section B	3180	679083.2	7062342.1	300.0
TP20/DCP69	Alignment Section B	3400	679132.7	7062128	299.89
TP22/DCP77	Alignment Section A	3800	679218	7061737	299.88
TP23/DCP81	Alignment Section A	4000	679270.7	7061545	299.04
TP24/DCP85	Alignment Section A	4200	679241.1	7061348	299.05
TP25/DCP89	Alignment Section A	4400	679192.7	7061154	297.45
TP26/DCP93	Alignment Section A	4600	679136.1	7060962	297.49
TP27/DCP97	Alignment Section A	4800	679109.6	7060765	297.28

Test Pit /DCP	Location	Chainage (Approx.)	Easting (m)	Northing (m)	RL (m) AHD
TP28/DCP101	Alignment Section A	5000	679153.3	7060573	297.12
TP29/DCP105	Alignment Section D	940	677652.1	7063324	301.155
TP30/DCP106	Alignment Section D	980	677660.29	7063278	303.002
TP31/DCP107	Alignment Section D	1020	677666.82	7063239	303.53
TP32/DCP109	Alignment Section D	1060	677695.82	7063207	303.49
Test Pits – Proposed Landfill Borrow Areas					
TPB01	Landfill – North Side	-	679427.8	7062423	300.23
TPB02	Landfill – North Side	-	679897.1	7062392	313.20
TPB03	Landfill – North Side	-	680286.9	7062332	318.61
TPB04	Landfill – North Side	-	679659.9	7062295	299.44
TPB05	Landfill – North Side	-	680056.4	7062234	313.86
TPB06	Landfill – Northwest Corner	-	679739.1	7062195	302.40
TPB07	Landfill – Northeast Corner	-	680240.8	7062095	312.44
TPB08	Landfill – Northwest Corner	-	679823.5	7062074	305.71
TPB09	Landfill – Southwest Corner	-	679840.5	7061655	301.81
Test Pits – Alignment Borrow Areas					
TPB10	Alignment Section C	1630	678031.1	7062797.3	300.60
TPB11	Alignment Section C	1500	678060.4	7062993.2	301.20
TPB12	Alignment Section C	1500	677950.6	7062930.9	301.30
TPB13	Alignment Section A	4600	679251.7	7060870.0	297.80
TPB14	Alignment Section A	4350	679259.9	7061191.0	297.90
TPB15	Alignment Section B	3500	679417.5	7062078.0	299.60

Test Pit /DCP	Location	Chainage (Approx.)	Easting (m)	Northing (m)	RL (m) AHD
TPB16	Alignment Section B	2050	678560.8	7063094.1	301.7
Test Pits - Proposed Borrow Area ID 5 (Barron Borrow) – Cluster of TP approx. Ch 2600					
TPB17	East of Section B	2600	679700.6	7062784.2	302.5
TPB18	East of Section B	2600	679698.3	7062762.7	302.1
TPB19	East of Section B	2600	679696.8	7062735.5	301.9
TPB20	East of Section B	2600	679734.9	7062785.5	302.6
TPB21	East of Section B	2600	679735.4	7062760.8	302.6
TPB22	East of Section B	2600	679728.8	7062726	302.6
TPB23	East of Section B	2600	679767.7	7062789.9	303.3
TPB24	East of Section B	2600	679768.1	7062751.4	303.2
TPB25	East of Section B	2600	679771.7	7062714.6	303.6
TPB26	East of Section B	2600	679798.2	7062789.9	304.1
TPB27	East of Section B	2600	679811.8	7062756.5	303.6
TPB28	East of Section B	2600	679819.1	7062730.7	303.7
Test Pits - Proposed Borrow Area – Various Locations					
TPB29	West of Section C	1530	679819.1	7062730.7	303.7
TPB30	West of Section C	1530	677940.0	7062760.7	300.9
TPB31	West of Section C	1530	677934.0	7062789.3	300.9
TPB33	West of Section D	1410	677967.6	7062790.2	299.5
TPB34	East of Section C	1505	677895.5	7062940.2	301.9
TPB36	East of Section C	1525	678052.1	7063041.4	301.2
TPB37	East of Section C	1525	678070.2	7063016.1	301.2
TPB38	East of Section B	2275	678911.988	7063046.991	301.333
TPB39	East of Section B	2275	678897.169	7063121.187	301.489
TPB40	East of Section B	2275	678902.121	7063096.366	301.499
TPB41	East of Section B	2275	678906.986	7063072.247	301.397
Test Pits - Proposed Borrow Area – Racecourse Borrow					
TPB42	East of Section B	3675	678092.404	7062356.942	303.080
TPB43	East of Section B	3675	678131.573	7062359.779	302.999
TPB44	East of Section B	3675	678170.32	7062362	302.824
Test Pits - Proposed Borrow Area – Peaks Property					
TPB45	NE of Section B	2600	679283.399	7062806.446	299.838

Test Pit /DCP	Location	Chainage (Approx.)	Easting (m)	Northing (m)	RL (m) AHD
TPB46	NE of Section B	2600	679196.899	7062801.784	299.971
TPB47	NE of Section B	2600	679171.985	7062926.63	300.372
TPB48	NE of Section B	2600	679221.757	7062935.324	300.559
TPB49	NE of Section B	2600	679307.623	7062925.097	300.782
TPB50	NE of Section B	2600	679309.279	7062844.696	300.342
TPB51	NE of Section B	2600	679313.119	7063062.371	300.921
TPB52	NE of Section B	2600	679268.267	7063070.392	300.991
TPB53	NE of Section B	2600	679181.816	7063069.064	300.758
Test Pits – Proposed Extension at Baron's Borrow					
TPB54	East of TPB27	2700	679891.042	7062766.769	304.989
TPB55	East of TPB27	2700	679964.332	7062771.437	305.753
Test Pits - Proposed Dam Extension at Campbells Property					
TPB56	Western Side	Not Applicable	678569.264	7061469.252	298.517
TPB57	Eastern Side	Not Applicable	678641.666	7061486.153	298.765
Test Pits - Proposed Dam Extension Lavelle's Property					
TPB58	North of Bassett Lane	3600	678917.392	7061849.195	298.797
TPB59	North of Bassett Lane	3600	678917.468	7061887.564	298.78
TPB60	North of Bassett Lane	3600	678959.925	7061893.249	298.944
TPB61	North of Bassett Lane	3600	678970.062	7061831.483	299.039
Test Pits – Proposed Borrow Area Hulbert's Property					
TPB62	East of Section B	3300	679235.975	7062244.498	299.269
TPB63	East of Section B	3300	679314.094	7062260.951	299.452
TPB64	East of Section B	3300	679184.522	7062229.417	300.269
Test Pit – Proposed Borrow Area Heilbron's Property					
TPB65	East of Section B	3200	679231.746	7062310.146	300.554
Test Pits – Proposed Borrow Area Landfill SW Cnr - Extension of TPB9 Site					

Test Pit /DCP	Location	Chainage (Approx.)	Easting (m)	Northing (m)	RL (m) AHD
TPB66	East of Bungil Creek	3900	679841.289	7061714.238	302.427
TPB67	East of Bungil Creek	3900	679896.057	7061718.663	303.157
TPB68	East of Bungil Creek	3900	679885.762	7061686.003	302.712
TPB69	East of Bungil Creek	3900	679877.674	7061648.173	301.614
Test Pits – Proposed Borrow Area at Western Diversion					
TPB70	South of Bowen Street	-	679252.688	7059313.809	295.972
TPB71	South of Bowen St	-	679283.227	7059258.564	295.799
TPB72	South of Bowen St	-	679260.679	7059216.999	296.914
TPB73	South of Bowen St	-	679261.146	7059185.803	296.529
Borrow Pit Landfill NW End					
TPB74	East of Bungil Creek	3100	679810.652	7062123.589	305.628
TPB75	East of Bungil Creek	3100	679817.657	7062179.472	306.867
Pavement Test Pits					
TPX01	Carnarvon Hwy – Western Shoulder	650	677483.897	7063387.895	302.769
TPX02	Carnarvon Hwy – Eastern Shoulder	650	677557.02	7063047.447	303.242
TPX04	McPhie St Crossing (Eastern End)	2840	679176.353	7062624.455	301.109
TPX06	Miscamble St Crossing – Eastern Side	4750	679179.382	7060810.796	297.863
TPX08	Miscamble St Crossing – Eastern End	4750	679275.378	7060809.143	298.195
TPX09	Miscamble St Crossing – Western End	4750	679040.312	7060807.014	297.833
Boreholes - Levee Alignment					
BH14*	Alignment Section C	1450	677931	7062952	301.49

Test Pit /DCP	Location	Chainage (Approx.)	Easting (m)	Northing (m)	RL (m) AHD
BH15*	Alignment Section C	2150	678537.8	7062896	301.15
BH16*	Alignment Section B	3500	679125.9	7062017	299.78
BH17*	Alignment Section A	4200	679210.8	7061371	299.00
BH18*	Alignment Section D - Concrete Wall	750	677526.818	7063351.668	302.420
BH19	Section D - Concrete Wall	810	677560.166	7063357.903	301.476
BH20	Section D - Concrete Wall	850	677590.388	7063360.726	301.207
BH21	Section B - Concrete Wall	2910	679097.4	7062596	300.66
BH22*	Section B - Concrete Wall	2950	679105.6	7062557	300.48
BH23	Section B - Concrete Wall	3000	679112	7062507	300.43

*Standpipe piezometer installed and falling head, in situ permeability test carried out on 3rd October 2013.

Notes: TP18 was replaced with BH23 (wall borehole).

TP21 not excavated due to property access constraints at time of investigation.

3 SITE DESCRIPTION AND GEOLOGY

3.1 General

Roma is located in the Maranoa Shire within southern Queensland. The majority of the town is located on the flood plain to the western side of the Bungil Creek. At this location the creek flows in a general direction North to South with several meanders, especially to the southern side of Roma.

Aerial photograph interpretation suggests that the creek has been migrating towards the east over time. These changes have left several abandoned channels; the most evident abandoned channel is located south of the Warrego Highway. These abandoned channels may become preferential flow paths when the Bungil Creek overflows.

Additionally, smaller gullies have been observed to run within the township of Roma and towards the Bungil creek. These gullies run seasonally, generally in south-easterly direction.

Cretaceous age deeply weathered rocks outcrops at both sides of the Bungil creek alluvial plains, in the Hospital Hill, towards the west and along the eastern margin of the Bungil creek. The landforms produced by these rocks are generally gentle rolling slopes interrupted by creeks and gullies.

3.2 Regional Geology

The flood levee is proposed to be located within the Quaternary alluvium of the Bungil creek floodplains. The Quaternary alluvium comprises clay, silt and sands that have been transported by the creek. These suggest that lateral and vertical variability is expected.

Underlying the quaternary sediments, rocks from Duncaster Member of the Wallumbilla Formation are present. These rocks generally comprise deeply weathered carbonaceous age mudstone, siltstone and some glauconitic and calcareous shelly fossils of Cretaceous age.

North of Roma and further upstream, the Bungil Creek flows through rocks from the Bungil Formation. The Bungil Formation mainly comprises Glauconitic, labile to Quartzose, siltstone and mudstone of Lower Cretaceous age. Bungil Formation (Ky): is part of the Blythesdale Group and underlies the Doncaster Member. Figure 1 is an extract from the geological map of the project area.

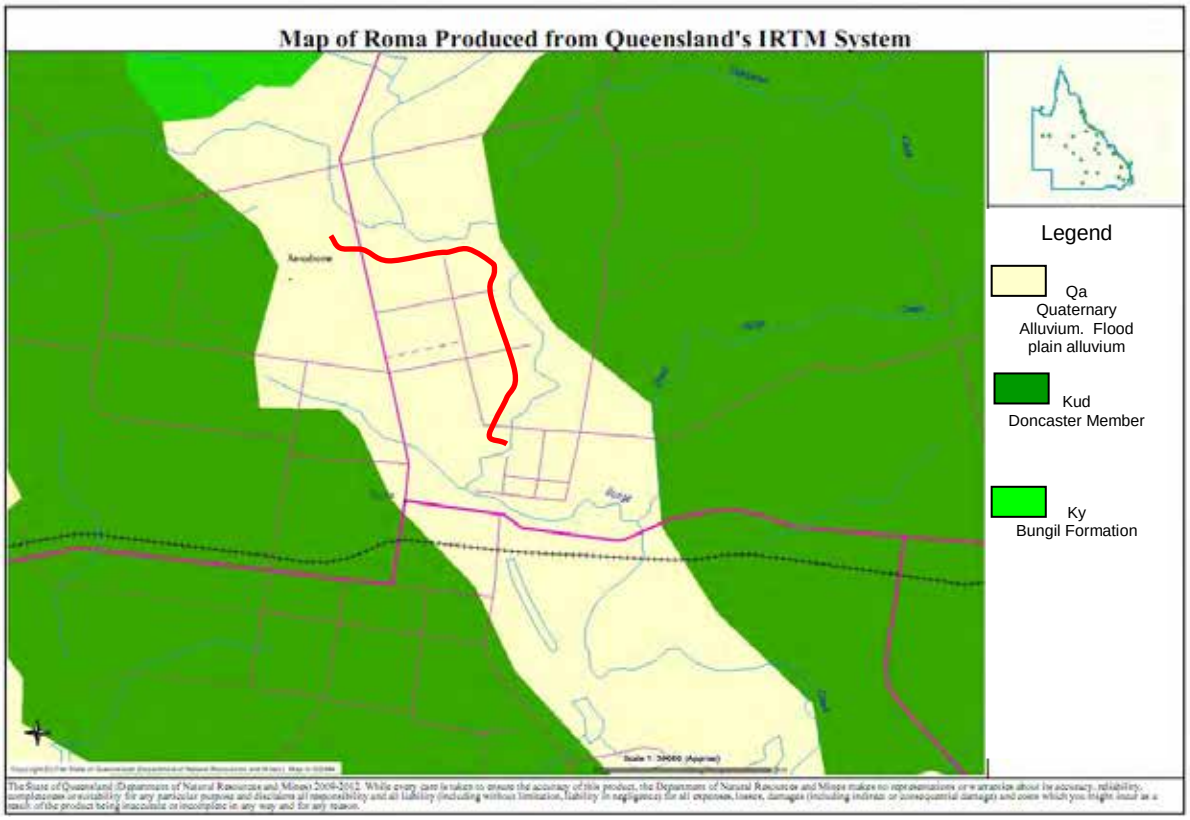


Figure 1 – Geological Map of Roma, QLD area

3.3 Groundwater

Groundwater was not observed within any of the test pits excavated to approximately three metres depth along the alignment area and to a maximum depth of six metres in the potential landfill borrow areas.

Ground water was encountered in BH14, BH17, BH 18, BH21, BH22 and BH23 during drilling. Standing water levels were measured in the standpipe piezometers installed in BH14, BH15, BH16, BH17, and BH21 prior to carrying out the falling head permeability tests on 3rd October 2013. Table 2 below summarises ground water levels encountered during drilling and standing water level measured before in-situ permeability testing.

Table 2 – Summary of Groundwater Levels

BH	Estimated water level encountered during drilling (mBGL)	Date	Standing water level measured in piezometer (mBGL)	Date
BH14	7.45	02/10/13	7.93	03/10/13
BH15	Not observed	02/10/13	6.52	03/10/13
BH16	4.20	30/09/13	4.48	03/10/13
BH 17	5.70	30/09/13	6.09	03/10/13
BH18	8.9	6/11/13	8.9	8/11/13

BH	Estimated water level encountered during drilling (mBGL)	Date	Standing water level measured in piezometer (mBGL)	Date
BH19	Not observed	7/11/13	-	-
BH20	Not observed	7/11/13	-	-
BH21	7.10	01/10/13	Not measured	-
BH22	7.25	01/10/13	5.90	03/10/13
BH23	7.00	01/10/13	Not measured	-
BH07*	4.90	06/02/13	Not measured	-
BH10*	4.50	05/02/13	Not measured	-
BH13*	4.00	14/02/13	Not measured	-

* Reported in previous investigation undertaken by GHD, March 2013.

4 SUBSURFACE CONDITIONS

The exploratory test pit and borehole logs provide a record of the subsurface conditions encountered during the investigation and are presented in Appendix C. Photographs showing the stratigraphy layers in the test pits and the pit arisings are provided in Appendix D. Photographs of samples retrieved from SPTs during drilling boreholes are also included in Appendix D.

5 IN-SITU TESTING

5.1 DCP Testing

In-situ testing consisted of Dynamic Cone Penetration (DCP) tests carried out along the proposed levee alignment at 50m intervals from CH1350 to CH5150. DCP tests were carried out by South Queensland Soils. Results are presented in Appendix E.

5.2 SPT Testing

Standard Penetration Tests (SPT) were carried out during the drilling of each of the boreholes. Retrieved SPT samples were logged and photographed by experienced geotechnical personnel. SPT results are presented on the boreholes logs in Appendix C along with photographs in Appendix D.

5.3 Falling/Rising Head Permeability Testing

Falling Head and/or Raising Head Permeability tests were carried out in four of the levee alignment boreholes, (i.e. BH14, BH15, BH16 and BH17) and in one of the three concrete wall boreholes (BH22).

Details of the standpipe piezometers installed in the five boreholes are included in Appendix C.

Results of the permeability tests carried out are summarised in Table 3, below:

The Rising head tests were carried out for the soil around the standing ground water table while the Falling Head test was carried out for the soil profile immediately above the ground water table. Assuming isotropic permeability in horizontal and vertical direction, (i.e. $k_v=k_h$) analysis of the field results has produced a coefficient of permeability ranging from $5.81x10^{-6}$ to $3.58 x10^{-7}$ m/s.

Table 3 – Summary of in-situ Permeability Testing

BH	Test conducted	Date	Material type	Material response zone	Permeability, k (m/s)
BH14	Rising head	03/10/13	Gravelly SAND	8.09-8.5	$3.18x10^{-6}$
	Falling Head	03/10/13	Sandy CLAY/ Gravelly SAND	6.82-8.5	$4.12x10^{-6}$ (*)
BH15	Falling Head	03/10/13	SAND	4.71-6.8	$2.33x10^{-6}$
BH16	Rising head	03/10/13	XW Mudstone (weathered to Silty CLAY)	4.84-5.00	$3.58x10^{-7}$
	Falling Head	03/10/13	Clayey SAND/SAND/ XW Mudstone (weathered to Silty CLAY)	1.65-5.00	$1.57x10^{-6}$ (*)
BH 17	Falling Head	03/10/13	Clayey SAND/Silty SAND	4.76-7.0	$3.72x10^{-6}$ (*)
BH22	Rising head	03/10/13	Clayey SAND	6.6-8.2	$5.81x10^{-6}$
	Falling Head	03/10/13	Clayey SAND/Silty SAND	1.2-8.2	$1.32x10^{-6}$ (*)

*) Denotes average permeability

6 LABORATORY TESTING

6.1 General

A suite of laboratory testing was undertaken on soil samples recovered during the field investigation. Testing was carried out by NATA accredited laboratories located in Roma, Chinchilla, Toowoomba and Brisbane.

Laboratory testing comprised:

- 295 x Field Moisture Content;
- 313 x Particle Size Distribution;
- 53x Hydrometer;
- 294 x Atterberg Limits;
- 235 x Linear Shrinkage;
- 175 x Emerson Class Dispersion;
- 40 x Shrink Swell Index;
- 96 x Standard Compaction;
- 1 x Maximum/Minimum Density;
- 73 x Falling Head Permeability and
- 10 CBR (10 day soak)
- 3 Organic Content testing

The results of the testing is summarised in Table 4. Test certificates are provided in Appendix E.

Table 4 – Results of Laboratory Testing Summarised

Location ID	Depth	Material Type	Atterberg Limits				Sieve Analysis % Passing							Moisture Content	Emerson Class Number	Maximum Dry Density or Max/Min	Optimum Moisture Content	Shrink Swell Index	Falling Head Permeability	CBR (10days soak)	Organic Content
	(m)		LL %	PL %	PI %	LS %	9.5 (mm)	4.75 (mm)	2.36 (mm)	0.6 (mm)	0.425 (mm)	0.075 (mm)	0.002 (mm)	(%)		(t/m3)	(%)	(%)	k (m/s)	(%)	
Levee Alignment Foundation Section A																					
TP22	0.3-0.5	Silty SAND	-	-	-	-	100	100	100	97	94	23	9.3	3.0	-	1.88	11.0	-	1.00E-08	-	
	0.7-1.0	Clayey SAND	29	20	9	4.5	100	100	100	99	96	33	20.7	7.9	-	1.82	12.0	-	2.00E-08	-	
	2.5-2.7	Clayey SAND	-	-	-	-	86	84	80	61	54	21	-	-	-	-	-	-	-	-	
	2.8-3.0	Sandy CLAY	-	-	-	-	93	91	87	72	64	28	-	16.5	-	-	-	-	-	-	
TP23	0.3-0.6	Clayey SAND	23	13	10	5.5	100	100	100	100	98	44	15.3	5.5	3	1.87	11.5	-	1.00E-10	-	
	0.7-0.9	Silty SAND	19	NP	NP	1.5	100	100	100	99	97	33	12.1	3.6	3	1.91	10.5	-	1.00E-09	-	
	0.9-1.2	Silty SAND	-	-	-	-	100	100	100	99	96	28	8.8	-	-	1.86	10.5	-	4.00E-10	-	
	1.4-1.6	Clayey SAND	31	19	12	6.5	100	100	100	100	98	44	25.3	8.8	2	1.80	14.0	-	2.00E-12	-	
	2.0-2.3	Silty SAND	-	-	-	-	100	100	100	100	97	33	-	-	-	-	-	-	-	-	
BH17	3.0-3.45	Clayey SAND	22	13	9	4	100	100	100	100	99	30	-	-	-	-	-	-	-	-	
	5.5-5.95	Clayey SAND	27	18	9	6.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	7.0-7.45	Silty SAND	28	19	9	4	100	99	97	69	55	18	-								
TP24	0.4-0.6	Silty SAND	-	-	-	-	100	100	100	100	99	39	16.4	5.5	3	1.87	11.5	-	3.00E-10	-	
	1.1-1.3	Silty SAND	-	-	-	-	100	100	100	100	99	33	14.3	5.2	-	1.87	12.5	-	3.00E-12	-	
	2.3-2.6	Silty SAND	-	-	-	-	100	100	100	100	99	32	-	-	-	-	-	-	-	-	
TP25	0.2-0.4	Silty CLAY	30	15	15	7.5	100	100	100	100	100	70	23.6	7.2	3	1.68	14.5	1.2	3.00E-08	-	
	1.5-1.7	Sandy CLAY	29	11	18	8.5	100	100	100	99	98	53	22	10.3	2	1.80	12.5	-	5.00E-12	-	
	1.8-2.0	Sandy CLAY	-	-	-	-	100	100	100	98	97	49	-	-	-	-	-	-	-	-	
	2.4-2.7	Sandy SILT	-	-	-	-	100	100	100	99	98	48	-	-	-	-	-	-	-	-	
	2.7-3.0	Silty SAND	-	-	-	-	100	100	100	100	98	42	24.1	11.8	-	1.79	13.0	-	5.00E-11	-	
TP26	1.5-1.8	Silty CLAY	39	16	23	12.5	100	100	100	99	98	72	-	11.9	1	1.69	15.5	2.1	6.00E-10	-	
TP27	0.4-0.6	Silty CLAY	42	17	25	12.5	100	100	100	99	99	80	33.7	12.2	2	1.69	14.5	2.4	2.00E-11	-	
TP28	1.5-1.7	Sandy CLAY	34	15	19	10	100	100	100	100	99	63	24.8	11.1	-	1.74	14.5	-	2.00E-11	-	
	2.0-2.3	Silty CLAY	-	-	-	-	100	100	100	100	100	68	22.8	13.3	2	1.75	14.5	-	3.00E-09	-	
	3.2-3.4	Silty SAND	-	-	-	-	100	100	100	100	100	43	-	12.1	-	-	-	-	-	-	
Levee Alignment Foundation Section B																					
TP17	0.4-0.6	Sandy CLAY	40	15	25	11.0	100	100	100	99	98	47	-	12.5	3	1.70	13.0	1.4	2.00E-09	-	
	0.8-1.0	Silty CLAY	37	13	24	11.5							-	10.7	4	1.77	14.0	1.4	6.00E-10	-	
	1.4-1.6	Sandy CLAY	30	14	16	8.0	100	100	100	99	99	59	-	8.4	-	-	-	-	-	-	
	2.2-2.4	Silty SAND	25	NP	NP	4.5	100	100	100	100	100	31	16.6	6.3	-	-	-	-	-	-	
TP18*															-	-	-	-	-	-	
BH22	5.5-5.95	Clayey SAND	28	18	10	6	100	99	97	73	55	17	-	-	-	-	-	-	-	-	
	7.0-7.45	Clayey SAND	34	21	13	6.5	100	100	99	94	90	42	-	-	-	-	-	-	-	-	
BH23	7.0-7.45	Silty SAND	25	20	5	3.0	100	100	100	97	90	27	-	-	-	-	-	-	-	-	
TP19	0.3-0.6	Silty SAND	-	-			100	100	100	98	94	14	-	2.3	-	1.81	11.0	-	4.00E-06	-	
	1.5-1.8	Silty SAND	-	-			100	100	100	98	94	12	-	1.7	-	1.73	13.0	-	5.00E-06	-	
	2.3-2.8	Silty SAND	-	-			100	100	100	98	94	12	-	1.7	-	1.73	13.5	-	5.00E-06	-	
TP20	0.4-0.6	Silty SAND	-	-			100	100	100	99	93	23	-	2.4	-	-	-	-	-	-	
	1.4-1.6	Silty SAND	22	NP	NP	0.0	100	100	100	99	95	22	-	4.5	5	1.88	12.5	-	2.00E-06	-	
	2.8-3.0	Silty SAND	-	-	-	-	100	100	100	96	86	23	-	-	-	-	-	-	-	-	
BH16	1.0-1.45	Silty SAND	20	11	9	4	100	100	100	100	98	38	-	-	-	-	-	-	-	-	
	2.0-2.45	Silty SAND	23	NP	NP	0.0	100	100	100	100	99	26	-	-	-	-	-	-	-	-	
	3.0-3.45	Clayey SAND	18	5	13	3	100	100	100	99	96	27	-	-	-	-	-	-	-	-	

Location ID	Depth	Material Type	Atterberg Limits				Sieve Analysis % Passing							Moisture Content	Emerson Class Number	Maximum Dry Density or Max/Min	Optimum Moisture Content	Shrink Swell Index	Falling Head Permeability	CBR (10days soak)	Organic Content
	(m)		LL %	PL %	PI %	LS %	9.5 (mm)	4.75 (mm)	2.36 (mm)	0.6 (mm)	0.425 (mm)	0.075 (mm)	0.002 (mm)	(%)		(t/m3)	(%)	(%)	k (m/s)	(%)	
	4.0-4.25	Clayey SAND	54	28	26	13	100	99	99	93	86	40	-				-				
TP21*																					
Levee Alignment Foundation Section C																					
TP10	0.3-0.6	Silty CLAY											-	10.8	2	1.65	17	-	4.00E-10	-	
	0.7-1.0	Silty CLAY	43	19	24	14.0							-	11.6	4	1.73	16	-	4.00E-10	-	
	2.2-2.5	Sandy CLAY	34	16	18	9.0	100	100	100	99	99	52	-	8	-	-	-	-		-	
	2.7-3.0	Clayey SAND	29	21	8	5.5	100	100	100	100	99	39	-	9	-	-	-	-		-	
BH14	2.0-2.45	Sandy Clay	27	17	10	6.0	100	100	100	100	99	51	-	-	-	-	-	-		-	
	4.0-5.93	Sandy Clay	39	19	20	5.5	100	100	97	94	94	54	-	-	-	-	-	-		-	
	8.5-8.95	Gravelly SAND	-	-	-	-	98	93	86	32	16	2	-	-	-	-	-	-		-	
TP11	0.2-0.4	Silty CLAY	-	-	-	-	100	100	100	100	99	72	37.6	8.6	3	1.7	15	1.7	5.00E-11	-	
	0.8-1.0	Silty CLAY	30	18	12	11.5	-	-	-	-	-	-	-	8.6	-	-	-	-		-	
	1.2-1.5	Silty CLAY	31	16	15	9.0	-	-	-	-	-	-	-	8	-	1.79	13	-	4.00E-09	-	
	2.0-2.3	Silty CLAY	45	19	26	13.0	-	-	-	-	-	-	-	13.7	-	1.66	16	-	5.00E-09	-	
TP12	0.1-0.3	Silty SAND					100	100	100	100	99	41	-	2.3	-	-	-	-	-	-	
	0.3-0.6	Silty CLAY	42	15	27	12.0	-	-	-	-	-	-	-	10.7	3	1.67	18	-	6.00E-10	-	
	1.0-1.3	Silty CLAY	46	15	31	15.5	-	-	-	-	-	-	-	12.9	-	-	-	-		-	
	2.6-2.8	Clayey SAND	25	17	8	3.5	100	100	100	100	99	34	16.1	5.8	-	1.85	13.5	-	2.00E-09	-	
	2.9-3.2	Silty SAND					100	100	100	97	94	33	-		-		-	-		-	
TP13	0.4-0.6	Silty CLAY	28	14	14	9.0	-	-	-	-	-	-		9.9	2	1.72	15	2.0	1.00E-10	-	
	0.9-1.1	Silty CLAY	40	17	23	13.5	-	-	-	-	-	-		9.8	-		-	-		-	
	1.3-1.5	Sandy CLAY	31	14	17	9.0	100	100	100	99	99	61	26.6	7.9	-	1.79	12	-	3.00E-09	-	
TP14	0.3-0.5	Silty SAND	14	NP	NP	2.0	100	100	100	100	99	44	16.8	4.6	-	1.88	11	0.5	1.00E-07	-	
	1.2-1.5	Sandy CLAY	35	17	18	11.0								8.8	-	1.74	14	-	6.00E-10	-	
	2.3-2.6	Clayey SAND	24	20	4	5.5	100	100	100	100	98	37	18.8	7.2	-	-	-	-		-	
TP15	0.3-0.5		40	16	24	12.5	-	-	-	-	-	-	-		-	-	-	-		-	
	1.4-1.6	Silty CLAY					-	-	-	-	-	-	-	13.7	3	1.70	17	-	2.00E-10	-	
	1.7-1.9	Silty CLAY	29	14	15	11.5	-	-	-	-	-	-	-	8.2	-			-		-	
	2.2-2.4	Clayey SAND	28	16	12	6.0	100	100	100	100	98	37	18.8	6.9	-	1.86	12.5	-	6.00E-08	-	
TP16	0.2-0.4	Sandy CLAY	31	13	18	12.0	100	100	100	100	99	60	16.8	5.4	3	1.76	14	1.9	5.00E-08	-	
	1.3-1.5	Silty CLAY	37	14	23	11.0								10.8	-	1.71	14.5	-	7.00E-10	-	
																				-	
Levee Alignment Foundation Section D																					
TP03	0.2-0.4	Sandy CLAY	45	15	30	16	100	100	100	96	94	71	47	12.3	2	1.64	17.0	2.5	1.00E-10	-	
	0.4-0.8	Sandy CLAY	53	14	39	18	100	100	99	96	96	80	-	15.4	2	-	-	-	-	-	
	1.3-1.6	Sandy CLAY	39	13	26	13.5	100	100	100	99	98	62	-	12.8	-	-	-	-	-	-	
	2.5-2.7	Sandy CLAY					100	100	100	99	98	79	-	17.9	-	-	-	-	-	-	
TP04	0.4-0.8	Sandy CLAY	55	15	40	18.0	100	100	100	97	96	76	63	15.7	3	1.60	20.5	3.6	1.00E-11	-	
	1.0-1.3	Silty CLAY	71	23	48	16.0	100	100	99	95	95	90	-	20.7	-	-	-	-	-	-	
TP05	0.4-0.6	Silty CLAY	56	15	41	17.5	100	100	100	99	98	85	-	15.3	-	1.58	21.0	-	-	-	
	0.8-1.0	Silty CLAY	56	15	41	19.0	100	100	100	99	98	84	-	16.2	-	-	-	-	-	-	
	1.2-1.5	Silty CLAY	65	18	47	19.0	100	100	100	96	96	91	65	20.8	-	-	-	-	1.00E-10	-	
	1.7-2.0	Silty CLAY	65	15	50	17.0	100	100	99	99	98	96	-	21.1	-	-	-	-	-	-	
	2.9-3.1	Sandy CLAY	30	11	19	8.5	100	100	100	100	100	92	-	-	-	-	-	-	-	-	
TP06	0.3-0.5	Sandy CLAY	44	12	32	16.5	100	100	99	98	98	78	-	13.2	2	1.65	16.5	-	-	-	
	0.9-1.2	Sandy CLAY	37	11	26	13.0	100	100	99	98	98	68	-	11.7	-	-	-	-	-	-	

Location ID	Depth	Material Type	Atterberg Limits				Sieve Analysis % Passing							Moisture Content	Emerson Class Number	Maximum Dry Density or Max/Min	Optimum Moisture Content	Shrink Swell Index	Falling Head Permeability	CBR (10days soak)	Organic Content
	(m)		LL %	PL %	PI %	LS %	9.5 (mm)	4.75 (mm)	2.36 (mm)	0.6 (mm)	0.425 (mm)	0.075 (mm)	0.002 (mm)	(%)		(t/m3)	(%)	(%)	k (m/s)	(%)	
	1.8-2.0	Sandy CLAY	28	10	18	8.0	99	99	99	99	97	52	-	8.5	-	-	-	-	-	-	
	2.7-3.0	Silty SAND					100	100	100	99	96	31	-	4.5	-	-	-	-	-		-
BH18	1.0-1.45	Sandy CLAY	49	17	32	15	100	100	100	98	97	66	-	-	-	-	-	-	-	-	-
	2.0-2.45	Clayey SAND	27	13	13	5	100	100	100	97	92	32	-	-	-	-	-	-	-	-	-
	3.0-3.45	Sandy CLAY	34	13	22	9.5	100	100	100	98	96	58	-	-	-	-	-	-	-	-	-
	4.1-4.45	Clayey SAND	29	15	14	6	100	100	100	99	96	44	-	-	-	-	-	-	-	-	-
BH19	1.0-1.45	Sandy CLAY	42	17	25	12.5	100	100	100	92	85	52	-	-	-	-	-	-	-	-	-
	2.0-2.45	Sandy CLAY	33	16	17	9	100	100	100	99	97	55	-	-	-	-	-	-	-	-	-
	3.0-3.45	Silty SAND	23	16	7	1.5	100	100	100	94	86	22	-	-	-	-	-	-	-	-	-
	4.1-4.45	Silty SAND	-	-	-	-	99	96	91	52	41	21	-	-	-	-	-	-	-	-	-
	5.5-5.95	Silty SAND	-	-	-	-	96	94	90	55	34	9	-	-	-	-	-	-	-	-	-
BH20	1.0-1.45	Sandy CLAY	-	-	-	-	100	100	100	99	98	59	-	-	-	-	-	-	-	-	-
	2.0-2.45	Sandy CLAY	28	13	15	8	100	100	100	97	96	52	-	-	-	-	-	-	-	-	-
	4.0-4.44	Clayey SAND	-	-	-	-	93	90	83	55	48	33	-	-	-	-	-	-	-	-	-
TP08	0.3-0.6	Sandy CLAY	41	12	29	14.0	100	100	100	99	98	64	40	8.7	1	1.71	14.5	-	2.00E-10	-	-
	1.2-1.5	Sandy CLAY	37	11	26	12.0	100	100	100	100	99	67	-	10.4	1	-	-	-	-	-	-
	2.0-2.3	Clayey SAND	24	14	10	6.5	100	100	100	99	99	44	-	8.4	-	-	-	-	-	-	-
TP09	0.2-0.4	Silty SAND	20	18	2	0.5	100	100	100	99	97	18	-	1.6	3	1.77	11.0	-	-	-	-
	0.4-0.7	Clayey SAND	22	12	10	5.0	100	100	100	99	97	47	35	7.4	-	1.82	13.0	-	5.00E-10	-	-
	0.7-1.0	Clayey SAND	24	14	10	6.0	100	100	100	100	98	32	21	7.6	-	1.81	14.0	-	1.00E-09	-	-
	1.5-1.8	Sandy CLAY	29	11	18	9.5	100	100	100	100	99	80	-	12.8	-	-	-	-	-	-	-
TP29	0.3-0.5	Sandy CLAY	43	15	28	15.0	100	100	100	99	97	58	-	14.4	2	-	-	-	-	-	-
	0.5-0.8	Sandy CLAY	41	13	28	13.5	100	100	100	99	98	62	-	11.9	2	-	-	-	-	-	-
	2.5-2.7	Silty SAND	26	15	11	6.0	100	100	100	93	85	34	-	6.0	-	-	-	-	-	-	-
TP30	0.5-0.8	Sandy CLAY	41	13	28	14.0	100	100	100	99	98	64	-	10.6	2	-	-	-	-	-	-
	0.8-1.0	Sandy CLAY	44	14	30	15.0	100	100	100	99	98	66	-	13.6	2	-	-	-	-	-	-
	2.7-2.9	Silty SAND	21	16	5	2.0	100	100	100	100	99	28	-	4.8	-	-	-	-	-	-	-
TP31	2.0-2.3	Sandy CLAY	35	14	21	11.5	100	100	100	99	97	76	-	12.8	-	-	-	-	-	-	-
TP32	0.3-0.5	Clayey SAND	32	10	22	10.5	100	100	99	97	95	48	-	9.6	2	-	-	-	-	-	-
	0.7-1.0	Clayey SAND	33	11	22	10.0	100	99	98	97	95	42	-	9.5	2	-	-	-	-	-	-
	1.8-2.1	Clayey SAND	27	12	15	7.0	100	100	99	98	96	37	-	9.2	-	-	-	-	-	-	-
Proposed Land Fill Borrow Areas																					
TPB1	0.6-0.9	Silty SAND	-	-	-	-	100	100	100	100	99	30	-	4.9	-	-	-	-	-	-	-
	1.3-1.6	SAND	-	-	-	-	100	100	100	100	100	15	-	3.2	-	-	-	-	-	-	-
TPB2	0.7-1.0	Silty CLAY	56	18	38	19.0	100	100	98	96	95	80	-	13.7	3	-	-	-	-	-	-
	1.3-1.6	Silty CLAY	61	23	38	18.5	100	100	100	99	98	93	-	19.5	2	-	-	-	-	-	-
TPB3	0.3-0.6	Silty CLAY	65	22	43	21.0	100	100	90	87	86	78	57	16.8	4	-	-	-	-	-	-
	0.8-1.0	Silty CLAY	68	22	46	18.5	100	95	83	79	77	69	59	18.0	3	1.58	21.5	-	1.00E-10	-	-
	2.7-3.0	Siltstone/Mudstone – Silty CLAY	60	21	39	17.0	99	99	99	98	97	95	-	19.8	2	-	-	-	-	-	-
TPB4	0.6-0.9	Silty CLAY	62	18	44	18.0	100	100	98	94	92	82	55	20.4	3	1.55	24.0	3.1	4.00E-10	-	-
	1.9-2.2	Clayey GRAVEL	78	25	53	22.5	91	63	41	41	41	40	29	25.0	2	1.51	23.0	-	2.00E-10	-	-
	2.7-3.0	Silty SAND	-	-	-	-	100	100	100	100	99	48	-	14.1	-	-	-	-	-	-	-
TPB5	0.6-0.9	Silty CLAY	65	22	43	17.5	100	99	98	95	95	88	-	17.8	2	1.57	23.0	-	1.00E-10	-	-
TPB6	0.4-0.8	Silty CLAY	51	19	32	14.0	99	98	97	95	93	71	-	18.9	2	1.56	20.5	-	3.00E-10	-	-
	0.9-1.2	Mudstone	60	24	36	15.5	100	100	100	100	99	88	-	25.6	2	1.47	26.5	-	5.00E-10	-	-

Location ID	Depth	Material Type	Atterberg Limits				Sieve Analysis % Passing							Moisture Content	Emerson Class Number	Maximum Dry Density or Max/Min	Optimum Moisture Content	Shrink Swell Index	Falling Head Permeability	CBR (10days soak)	Organic Content
	(m)		LL %	PL %	PI %	LS %	9.5 (mm)	4.75 (mm)	2.36 (mm)	0.6 (mm)	0.425 (mm)	0.075 (mm)	0.002 (mm)	(%)		(t/m3)	(%)	(%)	k (m/s)	(%)	
		– Silty CLAY																			
TPB7	0.3-0.6	Silty CLAY	58	19	39	19.0	99	86	64	64	64	62	41	16.2	4	1.61	18.5	4.1	1.00E-10	-	-
	1.8-2.1	Clayey Gravel	60	22	38	18.0	98	68	51	48	46	41	22	18.8	2	1.49	22.0	-	7.00E-09	-	-
TPB8	0.5-0.8	Clayey Gravel	47	16	31	16.0	94	77	60	57	55	37	31	13.7	4	1.76	16.5	-	1.00E-10	-	-
	0.8-1.1	Sandy CLAY	46	14	32	15.5	100	99	98	94	91	57	-	12.9	2	-	-	-	-	-	-
	1.4-1.7	Clayey SAND	35	14	21	8.0	91	82	70	66	63	30	22	10.7	3	1.72	14.5	-	6.00E-11	-	-
	2.2-2.5	Siltstone/Mudstone - GRAVEL	45	17	28	13.0	53	29	10	10	10	7	-	17.3	2	-	-	-	-	-	-
TPB9	0.7-1.0	Silty CLAY	54	18	36	17.5	100	100	99	93	92	74	-	15.5	2	1.73	17.0	-	2.00E-10	-	-
	1.2-1.5	Silty CLAY	62	22	40	16.0	100	100	99	98	97	85	-	18.6	2	-	-	-	-	-	-
	2.5-3.0	Clayey GRAVEL	50	13	37	15.5	86	58	37	37	37	36	18	16.8	2	1.65	20.0	-	1.00E-10	-	-
	3.0-3.2	Gravelly CLAY	41	15	26	11.5	99	90	67	67	66	46	32	18.7	2	-	-	-	-	-	-
	4.3-5.0	Silty SAND	-	-	-	-	99	97	95	83	76	9	-	7.8	-	-	-	-	-	-	-
	5.0-5.5	Silty SAND	-	-	-	-	78	71	64	39	31	11	-	9.5	-	-	-	-	-	-	-
Proposed Levee Alignment Borrow Areas																					
TPB10	0.3-0.6	Silty CLAY	46	16	30	13.5	100	100	100	99	99	83	45.6	12.5	2	1.67	16	-	1.00E-10	-	-
	1.9-2.2	Silty CLAY	56	15	41	13.0	100	100	100	100	99	87	-	20.0	2	-	-	-		-	-
	2.6-2.9	Sandy CLAY	28	15	13	10.5	100	100	100	99	98	70	36.5	12.6	1	1.74	15	-	9.00E-10	-	-
TPB11	0.3-0.6	Silty CLAY					100	100	100	99	99	72	43.6	10	4	-	-	-	-	-	-
	1.3-1.6	Sandy CLAY	26	14	12	8.5	100	100	99	98	97	53	24.1	8.3	2	-	-	-	-	-	-
TPB12	0.2-0.4	Silty CLAY	49	15	34	14.5	100	100	100	99	98	70	39.8	14.4	3	1.64	17.5	2.3	2.00E-10	-	-
	0.4-0.7	Silty CLAY	72	19	53	16.0							45.1	14.3	4	1.72	15.5		2.00E-10	-	-
	2.7-3.0	Sandy CLAY	32	14	18	9.0	100	100	100	100	99	60	30.0	10.5	2	1.77	13.5		3.00E-09	-	-
TPB13	0.6-1.0	Silty CLAY	36	14	22	13.5	100	100	100	99	98	58	-	11	3	1.65	16.5	2.4	-	-	-
	1.2-1.5	Silty CLAY	33	16	17	8.5	100	100	100	99	99	80	31	12.7	4	1.64	15.5	-	4.00E-10	-	-
	2.4-2.6	Sandy CLAY	27	16	11	7.0	100	100	100	100	100	55	19.7	7	3	1.81	12.5	-	9.00E-09	-	-
	3.0-3.3	Silty SAND					100	100	100	100	99	52	-	8.4	-	-	-	-	-	-	-
TPB14	0.3-0.6	Sandy SILT	25	16	9	5.5	100	100	100	100	100	58	18.7	4.6	3	1.79	12.5	0.8	2.00E-08	-	-
	0.6-0.9	Silty CLAY	31	14	17	4.5	100	100	100	100	99	53	22.7	6.2	3	1.75	12.0	1.0	2.00E-04	-	-
	1.2-1.5	Sandy CLAY	34	15	19	9.5	100	100	100	100	99	59	31.2	9.6	3	1.75	13	1.5	3.00E-10	-	-
	2.0-2.3	Sandy SILT	30	17	13	5.5	100	100	100	100	99	49	24.8	8.6	3	1.79	14.5	1.5	9.00E-11	-	-
	2.8-3.0	Silty SAND					100	100	100	100	99	29	-	6.7	-	-	-	-	-	-	-
TPB15	0.4-0.7	Silty CLAY	36	16	20	7.5	100	100	100	100	100	73	24	8	5	1.68	13.5	1.0	3.00E-09	-	-
	0.7-1.1	Silty SAND	22	NP	NP	0.0	100	100	100	100	99	39	-	4.9	3	1.85	12.5	-	6.00E-10	-	-
	1.3-1.7	Sandy CLAY	28	14	14	8.0	100	100	100	99	98	65	-	8.7	3	1.77	14.0	-	5.00E-10	-	-
TPB16	0.3-0.6	Sandy Silty CLAY	24	12	12	6.5	100	100	100	100	100	58	22	7.5	3	1.72	14.0	0.8	-	-	-
	0.7-1.0	Sandy CLAY	29	11	18	8.5	100	100	100	100	100	67	-	10.2	-	1.63	19.5	-	-	-	-
	1.2-1.5	Sandy CLAY	27	11	16	7.5	100	100	100	100	100	55	-	9.2	-	1.71	12.5	-	-	-	-
	2.0-2.3	Silty SAND					100	100	100	100	99	29	-	5.1	-	-	-	-	-	-	-
	2.7-3.0	Silty SAND					100	100	100	99	99	31	-	5.7	-	-	-	-	-	-	-
Proposed Borrow ID 5 (Barron Borrow)																					
TPB17	0.4-0.8	Silty CLAY	63	24	39	16.5	100	100	99	92	88	56	-	16	6	1.52	19.0	-	-	-	-
	0.8-1.1	XW Mudstone/ - Clayey SAND	38	20	18	13.0	100	97	95	78	69	33	-	15.6	4	1.55	22.8	-	5.00E-10	-	-
	1.3-1.6	XW Sandstone/	45	15	30	11.0	100	99	94	68	59	24	-	14.3	-	-	-	-	-	-	-

Location ID	Depth	Material Type	Atterberg Limits				Sieve Analysis % Passing							Moisture Content	Emerson Class Number	Maximum Dry Density or Max/Min	Optimum Moisture Content	Shrink Swell Index	Falling Head Permeability	CBR (10days soak)	Organic Content
	(m)		LL %	PL %	PI %	LS %	9.5 (mm)	4.75 (mm)	2.36 (mm)	0.6 (mm)	0.425 (mm)	0.075 (mm)	0.002 (mm)	(%)		(t/m3)	(%)	(%)	k (m/s)	(%)	
		- Clayey SAND																			
	2.1-2.3	XW Sandstone/ - Clayey SAND	34	17	17	7.0	100	98	87	62	53	17	-	14.9	-	-	-	-	-	-	-
TPB18	0.3-0.7												-		-	-	-	-	-	-	-
	0.9-1.1	Silty CLAY	35	16	19	11.5	100	100	100	98	96	78	-	13.6	5	1.62	18.9	1.7	-	-	-
	2.3-2.6	Sandy CLAY	39	16	23	13.0	100	100	99	90	85	53	-	12.7	2	1.73	16.7	1.6	-	-	-
TPB19	0.3-0.6	Clayey SAND	23	12	11	9.5	100	100	99	94	90	46	-	6.5	3			-	-	-	-
	0.8-1.1	Clayey SAND	28	14	14	4.5	82	73	66	49	42	11	-	5.5	5			-	-	-	-
	1.2-1.5	Mudstone/ - Clayey SAND	36	19	17	10.5	99	97	90	63	53	23	-	16.5	4	1.73	17.9	-	4.00E-08	-	-
	2.0-2.3	Mudstone/ - Clayey SAND	44	20	24	11.0	100	100	99	77	70	37	-	14.6	-	1.67	19.6	-	1.00E-08	-	
TPB20	0.3-0.5	Clayey SAND	27	14	13	6.5	100	99	98	92	88	43	-	13.7	-	-	-	-	-		
TPB21	0.9-1.3	Clayey SAND	24	12	12	7.5	100	100	98	69	57	27	-	4.5	-	-	-	-	-	-	
	1.3-1.7	Sandy CLAY	36	13	23	10.0	100	100	99	92	88	51	-	9.5	5	1.83	13.3	1.5	-	-	
	2.2-2.5	Sandy CLAY	38	14	24	10.5	100	100	99	94	91	52	-	12.3	-	1.84	12.4	2.6	-	-	
TPB22	0.4-0.7	Clayey SAND	25	9	16	6.0	100	100	98	90	85	40	-	5.9	-	-	-	-	-	-	
	0.7-1.0	Sandy CLAY	41	16	25	12.0	100	100	99	94	91	61	-	9.3	5	-	-	-	-	-	
TPB24	1.7-2.0	Clayey SAND	29	11	18	8.0	99	96	92	82	76	37	-	10.2	-	-	-	-	-	-	
	2.2-2.5	Clayey SAND	31	13	18	7.5	71	65	57	36	30	11	-	5.1	-	-	-	-	-	-	
TPB25	0.6-1.0	Sandy CLAY	43	18	25	12.5	97	97	96	92	89	62	-	11.1	5	1.75	16.4	2.0	-	-	
	1.9-2.2	Sandy CLAY	41	14	27	12.0	100	100	98	92	89	58	-	9.7	4	-	-		-	-	
	2.2-2.5	Sandy CLAY	36	13	23	11.5	100	100	97	91	88	54	-	11.4	-	-	-		-	-	
TPB26	0.3-0.6	Silty CLAY	66	21	45	18.5	100	100	100	97	96	88	-	14.6	-	1.52	23.0	4.4	-	-	
	0.9-1.2	Mudstone/ - Silty CLAY	62	27	35	17.5	100	100	99	96	95	84	-	17.8	6	1.54	23.8	-	2.00E-09	-	
TPB27	0.5-0.8	Sandy CLAY	40	17	23	11.5	100	100	98	86	84	50	-	9.3	-	1.78	15.4	2.4	-	-	
	1.5-2.0	Clayey SAND	35	14	21	11.0	100	100	99	95	91	48	-	10.0	-	1.81	11.9	-	-	-	
	2.4-2.7	Siltstone/Mudstone - Clayey SAND	41	15	26	9.5	87	79	63	52	45	17	-	20.0	-	1.74	17.3	-	2.00E-08	-	
TPB28	0.6-1.0	Sandy CLAY	51	18	33	16.5	100	100	98	92	89	69	-	14.0	-	-	-	-	-	-	
	1.7-2.0	Silty CLAY	62	17	45	19.5	100	100	100	97	95	81	-	20.8	-	-	-	-	-	-	
Borrow ID 8 – McNamara Dam 1																					
TPB31	0.7-1.0	Silty CLAY	58	18	40	20	100	100	100	100	100	91	-	24.9	3	1.64	18.5	-	-	-	-
	1.7-2.0	Sandy CLAY	38	11	27	14	100	100	100	100	99	66	-	14.6	3	-	-	-	-	-	-
	3.0-3.3	Sandy CLAY	38	12	26	13.5	100	100	99	97	94	66	39	13.4	3	1.69	16.0	-	1.00E-10	-	-
Borrow B12 – McNamara Previously Proposed Dam																					
TPB33	0.3-0.6	Sandy CLAY	38	13	25	14	100	100	100	99	98	65	-	6.4	3	1.67	14.0	-	-	-	
	1.0-1.3	Sandy CLAY	26	11	15	7.5	100	100	100	99	98	45	-	6.4	2	1.83	11.5	-	-		
Borrow ID 7 (TPB34, TPB36 & TPB37) – McNamara Dam 1																					
TPB34	0.4-0.6	Silty CLAY	59	16	43	18.5	100	100	100	99	99	85	-	12.4	-	1.62	19.5	-	-	-	
	0.6-0.9	Sandy CLAY	30	12	18	9.5	100	100	100	99	98	60	-	9.2	-	1.79	14.0				
	2.0-2.4	Sandy CLAY	30	11	19	10	100	100	100	99	98	62	-	8.8	-	1.75	15.0				
	3.0-3.4	Sandy CLAY	29	11	18	9.5	98	98	98	98	97	62	-	11.0	-	1.75	14.5				
TPB36	0.2-0.4	Silty CLAY	45	16	29	16.5	100	100	100	100	99	76	-	10.7	2	1.62	12.5	2.6			

Location ID	Depth	Material Type	Atterberg Limits				Sieve Analysis % Passing							Moisture Content	Emerson Class Number	Maximum Dry Density or Max/Min	Optimum Moisture Content	Shrink Swell Index	Falling Head Permeability	CBR (10days soak)	Organic Content
	(m)		LL %	PL %	PI %	LS %	9.5 (mm)	4.75 (mm)	2.36 (mm)	0.6 (mm)	0.425 (mm)	0.075 (mm)	0.002 (mm)	(%)		(t/m3)	(%)	(%)	k (m/s)	(%)	
	0.4-0.6	Sandy CLAY	40	12	28	14	100	99	98	97	96	67	-	10.7	2	1.73	16.5				
	1.0-1.3	Sandy CLAY	27	12	15	7.5	100	100	100	99	98	52	-	7.7	2	-	-				
	2.2-2.4	Sandy CLAY	36	13	23	12.5	100	99	99	98	97	69	-	11.5	2	1.71	16.5				
	3.6-3.9	Sandy CLAY	30	13	17	9.0	100	99	99	98	98	74	-	10.6	2	1.76	15.5				
TPB37	0.3-0.5	Silty CLAY	50	14	36	17.5	100	100	100	100	99	82	-	11.2	-	1.65	17.0	3.3			
	0.6-0.8	Sandy CLAY	28	11	17	9.0	100	100	100	99	99	57	-	7.5	-	1.80	13.0				
	1.6-1.9	Sandy CLAY	31	11	20	11.0	100	100	100	99	97	66	-	10.6	-	1.65	14.0				
	2.7-3.0	Sandy CLAY	35	11	24	13.0	100	100	99	98	97	74	-	9.8	-	1.75	11.5				
	3.5-3.7	Sandy CLAY	34	13	21	12	100	100	100	99	98	71	-	10.3	-	1.73	13.5				
33 McPhie Street Borrow Area																					
TPB38	1.3-1.5	Sandy CLAY	29	10	19	11.0	100	100	100	99	99	64	-	12.1	2		-	-	-	-	
	2.0-2.3	Sandy CLAY	24	14	10	6.0	100	100	100	100	100	52	-	11.3	2		-	-	-	-	
	4.0-4.3	Silty SAND	24	16	8	5.0	100	100	99	99	98	44	-	11.3	2		-	-	-	-	
TPB39	1.2-1.5	Silty SAND	21	12	9	4.0	100	100	100	99	97	49	-	13.5	2		-	-	-	-	
	2.2-2.5	Clayey SAND	27	11	16	8.0	100	100	100	99	98	44	-	7.9	2		-	-	-	-	
TPB40	1.3-1.6	Clayey SAND	21	11	10	5	100	100	100	99	98	42	-	6.7	2		-	-	-	-	
	2.0-2.5	Sandy CLAY	21	12	9	5.5	100	100	100	100	99	57	-	9.6	2		-	-	-	-	
TPB41	1.3-1.5	Silty SAND	16	13	3	1.0	100	100	100	99	97	38	-	3.8	3		-	-	-	-	
	2.0-2.3	Sandy CLAY	31	12	19	10.5	100	100	100	100	99	66	-	11.4	2						
Race Course Borrow Areas																					
TPB42	0.7-1.0	Sandy CLAY	30	11	19	8.5	100	100	100	99	97	54	-	11.7	2						
	1.2-1.5	Sandy CLAY	30	11	19	8.0	100	100	100	100	99	57	-	10.2	2						
	1.8-2.1	Silty SAND	23	19	4	2.0	100	100	100	100	99	37	-	11.2	3						
	2.5-2.8	Sandy CLAY	33	12	21	9.0	100	100	100	100	100	-	-	16.6	2						
TPB43	0.7-1.0	Sandy CLAY	31	11	20	8.0	99	97	97	96	94	56	-	9.5	1						
	1.5-1.8	Silty CLAY	42	13	29	15.0	100	100	100	99	99	82	-	15.0	2						
	2.5-2.8	Silty CLAY	43	15	28	15.5	100	100	100	99	98	78	-	14.5	2						
TPB44	0.3-0.5	Clayey SAND	28	11	17	8.0	100	100	100	99	96	44	-								
	1.2-1.5	Sandy CLAY	32	12	20	10.0	100	100	100	99	99	59	-	10.0	2						
	2.4-2.7	Sandy CLAY	34	14	20	10.5	100	100	100	100	99	62	-	10.4	2						
Borrow Pit Peaks Property																					
TPB45	0.5-1.0	Sandy CLAY	40	14	26	13.0	100	100	100	99	99	81	-	9.6	3			1.8			Pass
	2.2-2.5	Sandy CLAY	36	12	24	10.5	100	100	100	100	100	71	-	16.3	3						
	2.8-3.2	Sandy CLAY	34	13	21	10.5	100	100	100	100	99	66	-	16.7	1						
TPB46	0.3-0.7	Sandy CLAY	26	11	15	8.0	100	100	100	99	99	65	-	5.1	3						
	0.8-1.2	Sandy CLAY	30	12	18	9.0	100	100	100	100	99	58	-	8.1	2						
	1.4-1.8	Clayey SAND	29	12	17	7.5	100	100	100	100	99	47	-	-	2						
TPB47	0.5-0.8	Silty CLAY	29	12	17	9.0	100	100	100	100	99	71	-	7.8	3						
	1.8-2.2	Clayey SAND	28	12	16	8.0	100	100	100	99	97	40	-	-	3						
	2.4-2.7	Clayey SAND	29	11	18	8.0	100	100	100	99	99	49	-	8.3	3						
TPB48	0.5-0.8	Sandy CLAY	23	17	6	3.5	100	100	100	100	100	55	-	5.0	3						
	1.3-1.7	Sandy CLAY	30	12	18	10	100	100	100	100	99	58	-	6.6	2						
	1.9-2.3	Clayey SAND	26	11	15	7.0	100	100	100	100	99	38	-	6.3	2						
TPB49	0.3-0.6	Sandy CLAY	31	12	19	9.0	100	100	100	100	100	77	-	6.8	3						
	0.7-1.0	Clayey SAND	26	15	11	6.5	100	100	100	100	100	49	-	6.5	2						

Location ID	Depth	Material Type	Atterberg Limits				Sieve Analysis % Passing							Moisture Content	Emerson Class Number	Maximum Dry Density or Max/Min	Optimum Moisture Content	Shrink Swell Index	Falling Head Permeability	CBR (10days soak)	Organic Content
	(m)		LL %	PL %	PI %	LS %	9.5 (mm)	4.75 (mm)	2.36 (mm)	0.6 (mm)	0.425 (mm)	0.075 (mm)	0.002 (mm)	(%)		(t/m3)	(%)	(%)	k (m/s)	(%)	
	2.4-2.6	Silty SAND	25	16	9	6.0	100	100	100	100	99	36	-	6.2	2						
TPB50	0.7-1.0	Sandy CLAY	24	12	12	7.0	100	100	100	100	100	55	-	5.4	2						
	1.2-1.6	Sandy CLAY	32	13	19	10.5	100	100	100	99	99	70	-	8.9	2			1.0			Pass
	2.0-2.4	Sandy CLAY	32	12	20	11.0	100	100	100	99	99	69	-	8.6	2						
	2.4-2.8	Sandy CLAY	27	12	15	7.0	100	100	100	100	99	53	-	7.1	3						
TPB51	1.3-1.6	Clayey SAND	26	12	14	6.5	100	100	100	100	98	39	-	12.2	3			2.0			Pass
	2.6-3.0	Sandy CLAY	41	14	27	12.0	100	100	100	100	100	68	-	7.6	3						
TPB52	0.9-1.2	Sandy CLAY	25	11	14	7.0	100	100	100	100	99	66	-	6.1	2						
	2.1-2.4	Clayey SAND	25	14	11	6.5	100	100	100	99	97	36	-	7.4	3						
TPB53	1.3-1.7	Sandy CLAY	33	13	20	11.0	100	100	100	100	99	55	-	10.4	3						
	2.4-2.8	Sandy CLAY	30	12	18	8.5	100	100	100	100	100	52	-	8.4	3						
Proposed Dam Extension Campbell's Property																					
TPB56	0.5-0.7	Sandy CLAY	36	10	26	12.5	100	100	100	99	97	61	-	9.9	3			1.5			
	0.7-1.0	Clayey SAND	32	11	21	9.5	100	100	100	99	97	47	-	7.6	2						
	1.0-1.3	Clayey SAND	28	11	17	8.0	100	100	100	99	95	38	-	6.0	3						
	2.5-2.7	Sandy CLAY	32	10	22	9.5	100	100	100	99	98	55	-	9.4	3						
TPB57	0.4-0.6	Clayey SAND	24	11	13	7.0	100	100	100	98	93	37	-	6.3	3						
	0.7-1.0	Clayey SAND	37	12	25	12.0	100	100	100	98	92	44	-	8.6	3						
Proposed Dam Extension Lavelle's Property																					
TPB58	0.5-0.8	Sandy CLAY	51	12	39	15.0	100	97	97	96	96	82	-	19.8	2						
	0.9-1.2	Sandy CLAY	33	12	21	12.0	100	100	100	97	95	61	-	9.0	3						
	2.8-3.1	Sandy CLAY	35	10	25	12.0	100	100	99	97	95	66	-	9.2	2						
	4.5-4.8	Sandy CLAY	52	15	37	17.0	100	100	100	99	99	81	-	22.5	3						
TPB59	0.2-0.3	Sandy CLAY	28	12	16	9.0	99	99	99	98	97	75	-	8.9	2			1.0			
	0.4-0.7	Sandy CLAY	40	11	29	14.0	100	100	100	99	99	79	-	12.6	3						
	1.0-1.3	Silty CLAY	45	13	32	16.0	100	100	99	98	98	79		13.6	2						
	1.7-2.0	Sandy CLAY	37	13	24	11.0	100	99	99	99	98	58	-	12.2	2						
	2.1-2.4	Sandy CLAY	33	12	21	10.0	100	99	99	99	99	56	-	10.9	2						
TPB60	0.2-0.4	Sandy CLAY	21	13	8	4.5	100	100	100	99	97	60	-	4.0	3						
	0.5-0.8	Sandy CLAY	35	11	24	13.0	100	100	100	99	98	67	-	9.5	2						
	0.9-1.2	Sandy CLAY	35	10	25	9.5	100	100	100	99	99	54	-	7.2	3						
	1.7-2.0	Sandy CLAY	37	12	25	12.0	100	98	97	96	96	67	-	10.0	3						
TPB61	0.4-0.7	Sandy CLAY	28	11	17	9.5	100	100	100	99	97	59	-	6.9	2						
	0.9-1.2	Sandy CLAY	33	12	21	10.0	100	100	100	98	97	55	-	7.0	1						
	2.0-2.3	Sandy CLAY	39	12	27	12.5	100	100	100	99	98	73	-	9.1	2						
Borrow Pit Hulbert's Property																					
TPB62	0.5-0.8	Clayey SAND	27	12	15	7.0	100	100	100	100	98	34	-	5.1	3						
TPB64	0.6-0.9	Sandy CLAY	36	12	24	12.0	100	100	100	100	99	64	-	10.4	3						
	1.2-1.5	Sandy CLAY	32	11	21	9.0	100	100	100	99	99	54	-	8.5	3						
Borrow Pit Western Diversion																					
TPB70	0.4-0.6	Silty CLAY	40	11	29	12.0	100	100	100	100	99	87	-	9.3	-	-	-	1.9	-	-	-
	0.7-1.0	Silty CLAY	68	19	49	19.0	100	100	100	100	99	81	-	9.4	-	-	-	1.7	-	-	-

Location ID	Depth	Material Type	Atterberg Limits				Sieve Analysis % Passing							Moisture Content	Emerson Class Number	Maximum Dry Density or Max/Min	Optimum Moisture Content	Shrink Swell Index	Falling Head Permeability	CBR (10days soak)	Organic Content
	(m)		LL %	PL %	PI %	LS %	9.5 (mm)	4.75 (mm)	2.36 (mm)	0.6 (mm)	0.425 (mm)	0.075 (mm)	0.002 (mm)	(%)		(t/m3)	(%)	(%)	k (m/s)	(%)	
	2.2-2.4	Sandy CLAY	42	11	31	12.5	100	100	100	99	99	72	-	13.6	-	-	-	-	-	-	-
TPB72	1.2-1.5	Sandy CLAY	40	13	27	13.5	100	100	100	99	99	73	-	13.9	3	-	-	2.4	-	-	-
	1.4-1.8	Sandy CLAY	40	13	27	14.0	100	100	98	96	96	60	-	13.3	3	-	-	-	-	-	-
	2.4-2.8	Sandy CLAY	33	11	22	9.0	100	100	100	99	99	56	-	13.1	3	-	-	-	-	-	-
TPB73	0.5-1.0	Sandy CLAY	42	13	29	18.0	100	100	99	99	98	77	-	13.3	6	-	-	2.1	-	-	-
	1.8-2.2	Sandy CLAY	44	17	27	14.0	100	100	100	100	99	80	-	16.6	3	-	-	2.1	-	-	-
Pavement Test Pits																					
TPX1	0.22-0.3	Gravelly SAND	31	22	9	4	80	70	66	62	60	35	-	10.4	-			-			-
	0.3-0.45	Silty CLAY	42	13	29	15	98	96	96	95	95	69	-	5.1	3	1.69	17.3	-	6.00E-11	2.5	-
	0.45-0.6	Sandy CLAY	37	12	25	13.5	100	100	100	99	97	56	-	11.8	3	1.72	16.3	-	1.00E-11	2.5	-
	0.6-0.9	Sandy CLAY	38	11	27	13.5	100	100	100	99	97	61	-	7.7	3	1.73	17.1	-	-	2.5	-
TPX2	0.03-0.2	Sandy GRAVEL	16	10	6	3.5	63	45	32	23	20	8	-	3.3	-			-	-		-
	0.33-0.55	Silty CLAY	30	11	19	10.0	100	100	99	98	97	50	-	2.8	-	1.79	15.1	-	-	4.5	-
	0.55-0.8	Silty SAND	17	12	5	3.0	100	100	99	98	97	46	-	4.1	-	1.75	14.0	-	-	3	-
TPX4	0.015-0.22	Sandy GRAVEL	25	18	7	4.5	81	60	43	32	30	16	-	6.0	-		-	-	-		-
	0.22-0.5	Silty SAND	17	14	3	1.5	100	100	100	99	97	32	-	1.0	-	1.91	-	-	-	9	-
TPX6	0.03-0.18	Sandy GRAVEL	20	16	4	2.0	74	59	44	35	33	11	-	4.1	-	-	-	-	-		-
	0.18-0.4	Gravelly Silt	22	17	5	3.5	85	75	64	55	51	21	-	5.2	-	-	-	-	-		-
	0.4-0.5	Clayey SAND	22	10	12	5.0	94	90	85	66	59	24	-	6.0	-	-	-	-	-		-
	0.5-0.8	Silty CLAY	39	14	25	13.5	100	100	100	99	99	87	-	6.2	-	1.64	-	-	-	1.5	-
TPX8	0.03-0.2	Sandy GRAVEL	28	24	4	1.5	37	22	14	7	7	2	-	1.4	-	-	-	-	-		-
	0.2-0.3	Clayey SAND	30	12	18	8.5	93	87	74	72	72	39	-	11.0	-	-	-	-	-		-
	0.3-0.6	Sandy CLAY	32	11	21	9.5	98	97	96	92	91	52	-	3.7	-	1.80		-	-	4	-
TPX9	0.015-0.18	Sandy GRAVEL	28	14	14	7.5	69	54	42	24	22	12	-	8.0	-	-	-	-	-		-
	0.18-0.5	Silty CLAY	41	13	28	15.0	100	100	100	99	99	81	-	13.2	-	1.69	-	-	-	1.0	-
	0.7-0.9	Silty CLAY	37	11	26	14.0	100	100	99	98	98	76	-	10.9	-	-	-	-	-	1.5	-

APPENDIX A EXPLANATORY NOTES

GEOTECHNICAL LOG OF BOREHOLE AND EXCAVATION

(These notes explain the terms and abbreviations used on the log sheets)

GENERAL

Information obtained from drilling investigations is recorded on log sheets. The "*Geotechnical Log of Borehole*" presents data from drilling operations where a core barrel has not been used to recover material and information is based on a combination of regular sampling and in-situ testing. The "*Geotechnical Log of Excavation*" presents data obtained on the subsurface profile from observations of excavations, either natural or man made.

The heading of the log sheets contains information on client and project identification, hole or pit identification, location and elevation. Details of the drilling contractor, equipment, drilling or excavation dates, and of the personnel responsible for the preparation of log, are given at the bottom of the sheet. The main section of the log contains information on drilling or excavation methods and conditions, material substance description, details of in-situ tests and additional observations, presented as a series of columns plotted with reference to length in metres below the ground surface.

As far as is practicable the data contained on the log sheets is factual. Some interpretation is inevitable in the assessment of conditions between samples and of the origin of the materials. Material description and classification is generally based on AS1726-1993 Geotechnical Site Investigations.

DRILLING OR EXCAVATION METHOD

B	Rubber tyred backhoe
H	Hand Excavation
EE	Existing excavation
EX	Excavator
HA	Hand auger
AS	Auger screwing
AV	Auger drilling with V-bit
ATC	Auger drilling with TC bit
WR	Washbore drilling with roller bit
WD	Washbore drilling with drag or blade
RC	Reverse circulation
RAB	Rotary Air Blast (Percussion)

SUPPORT

The measures used to support the hole or excavation during logging and the extent of those measures are described in the support column

WATER

- ▼ Groundwater level with date.
- ▸ Drilling fluid loss at level marked.
- ◂ Groundwater inflow at the level marked.

CLASSIFICATION SYMBOL

Standard symbol in accordance with the Unified Soil Classification System.

MATERIAL DESCRIPTION

Term	Grain Size (mm)
Boulders	>200
Cobbles	60 - 200
Gravel	2 - 60
Sand	0.06 - 2
Silt	0.002 - 0.06
Clay	<0.002

DESCRIPTIVE TERMS FOR MATERIAL PROPORTIONS

Coarse Grained Soils		Fine Grained Soils	
% Fines	**Term**	**% Coarse**	**Term**
≤ 5	trace	≤ 15	trace
> 5 ≤ 12	with some	> 15 ≤ 30	with some
> 12	Prefix silty / clayey	> 30	Prefix sandy / gravelly

MOISTURE

D Dry
M Moist - no free water on remoulding
W Wet - free water on remoulding

DENSITY

(Non-cohesive soil only)

Symbol	Term	SPT N Value	Density Index
VL	very loose	0 - 4	< 15%
L	loose	4 - 10	15 - 35%
MD	medium dense	10 - 30	35 - 65%
D	dense	30 - 50	65 - 85%
VD	very dense	>50	> 85%

CONSISTENCY

(Cohesive soil only)

Symbol	Term	Cone Resistance	Undrained Shear Strength
VS	very soft	0-180 kPa	< 25 kPa
S	soft	180-375 kPa	25 – 50 kPa
F	firm	375-750 kPa	50 – 100 kPa
St	stiff	750-1500 kPa	100 – 200 kPa

Symbol	Term	Cone Resistance	Undrained Shear Strength
VSt	very stiff	1500-3000 kPa	200 – 400 kPa
H	hard	>3000 kPa	> 400 kPa
Fr	friable	n/a	

SAMPLE

Sections sampled bounded by lines across column

DS Disturbed sample
BS Bulk disturbed sample
S Standard penetration test sample
U50 Undisturbed sample (50 mm diameter)
U75 Undisturbed sample (75 mm diameter)

TEST TYPE

S Standard penetration test
V Vane shear
PP Pocket penetrometer
P Pressuremeter
W Permeability
MC Field moisture content
LL Liquid limit
PL Plastic limit
PI Plasticity index
LS Linear shrinkage
UC Unconfined compression

OTHER OBSERVATIONS

Information on the structure of the material and an assessment of the inferred origin of the material.

RESIDUAL SOIL: Soil essentially in-situ and derived from weathering and degradation of the underlying bedrock

ALLUVIUM: Soil transported by river or stream processes and deposited remote from the parent material.

COLLUVIUM: Soil transported down slope by a process of creep and/or landslide activity.

BEDROCK: In-situ rock (excludes transported boulders or boulders underlain by soil)

TALUS: Rock fragments deposited from rock fall landslides

FILL: Material placed by human activities

APPENDIX B SITE LOCATION PLANS

Please refer to appendix A of the main design report for the relevant drawings.

APPENDIX C TEST PIT, BOREHOLE AND DCP LOGS

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP01

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION :
SURFACE ELEVATION :
EQUIPMENT TYPE : CAT CRS2225
METHOD : Backhoe
DATE EXCAVATED : 17/5/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0		CH	0.10m Silty CLAY: Very stiff, high plasticity, dark grey, dry to slightly moist, grass, rootlets and organic matter to 0.15m		VSt		ALLUVIUM
			0.20m B				becoming hard, trace of rootlets to 0.4m				0.20: HP In-situ >600 kPa
				0.5							
			0.80m			CH		D	H		
				1.0							
			1.40m				1.40m				
			B	1.5		CI	Sandy CLAY: Very stiff, medium plasticity, light brown, slightly brown in parts, fine grained sands, some medium grains, high silt content, grading sandy silt in parts, dry to moist				
							1.60m gradually shading light brown only	D - M	VSt		1.60: HP In-situ =350 kPa
			1.80m			CI					
			1.90m				1.90m				
			B	2.0		SC	Clayey SAND: Dense, fine to medium grained, light brown, varying low plasticity fines, grading silty sand in parts	D - M	D		
			2.20m				2.20m				
						SP	SAND: Dense, fine to medium grained, light brown, varying trace to some fines content, some clayey/silty sand lenses/bands, easier digging				
			2.50m					D - M	D		
			B	2.5			2.70m becoming slightly more moist				
			3.00m			SP					
				3.0			3.10m				
							EXCAVATION TP01 TERMINATED AT 3.10 m No ground water encountered. Test pit backfilled on completion. Test pit located in Borrow Area 1 as proposed as possible site at tender stage, May 2013.				
				3.5							
				4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

SMEC

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP03

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 677064.850, N: 7063662.440 (55 MGA94)
SURFACE ELEVATION : 304.184 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 29/10/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0 / 304.0		CI	Silty CLAY: very stiff to hard, medium plasticity, dark brown to grey, trace of fine grained sand, grass and rootlets to 0.2m, becoming hard below 0.1m	D	VSt to H		ALLUVIUM
				0.30m		CI	light brown to brown, trace of fine grained sand in parts with some white powdery calcide nodules >15mm diameter				
				0.40m			higher moisture content				
				0.5 / 303.5		CI					0.60: PP > 500 kPa
				0.80m			Sandy CLAY: hard, low to medium plasticity, light brown and light grey brown mottled, some fine to medium grained sand				
				1.0		CI					
				1.20m			becoming partly fissured, some dark grey to black mottling and staining/ veneer along fissured surfaces	D to M	H		
				1.5 / 303.0		CL					1.50: PP > 500 kPa
				1.80m			grey to light brown, mottled occasionally grey to black mottles and staining, higher silt content				
				2.0 / 302.5		CI					
				2.5 / 302.0							
				2.70m			EXCAVATION TP03 TERMINATED AT 2.70 m No ground water encountered. Test pit backfilled on completion.				
				3.0 / 301.5							
				3.5 / 301.0							
				4.0 / 300.5							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

SMEC

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP04

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 677170.185, N: 7063555.370 (55 MGA94)
SURFACE ELEVATION : 302.540 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 29/10/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				302.5 0.0		CI	Silty CLAY: very stiff, medium plasticity, dark grey brown , traces to some fine grained sand in parts, grass and rootlets to 0.2m, becoming hard below 0.1m	D	VSt		ALLUVIUM
				0.40m			becoming light brown to brown, traces of fine to medium grained sand in parts				
				302.0 0.5		CI					
				0.80m			becoming light brown to slight light grey brown, some white powdery calcide nodules >15mm diameter	D to M			
				301.5 1.0		CI					
				1.50m			slightly higher moisture content, becoming moist in parts		H		
				301.0 1.5		CI					
				2.00m			light grey brown to light brown, some dark grey to black staining/ veneer along fissures, occasional glass like fine gravel sized angular crystalline inclusions, occasional white powdery nodules to 20mm diameter, blocky, higher moisture content in parts	M			
				300.5 2.0		CI					
				2.60m			occasional rock like structure in parts				
				300.0 2.5		CI					
				3.10m			EXCAVATION TP04 TERMINATED AT 3.10 m No ground water encountered. Test pit backfilled on completion.				
				299.5 3.0							
				299.0 3.5							
				4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

SMEC

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP05

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 677206.229, N: 7063350.609 (55 MGA94)
SURFACE ELEVATION : 302.450 (AHD)

EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator

DATE EXCAVATED : 27/10/13
LOGGED BY : CM
CHECKED BY : JSM

EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				302.0	0.0		CI	Silty CLAY: very stiff, medium plasticity, dark grey brown, traces of fine grained sand, grass and rootlets to 0.15m				ALLUVIUM
					0.40m							0.30: PP > 500 kPa
				301.5	0.5		CI-CH	becoming medium to high plasticity, shading dark grey to brown, traces of fine grained sand in parts, high moisture content				
					0.80m							0.70: PP > 500 kPa
				301.0	1.0		CI-CH	light brown, occasonal white powdery calcide nodules >15mm diameter, occasional glass like fine gravel sized crystals inclusions				
					1.20m							1.20: Easy digging
				300.5	1.5		CI-CH	shading light brown, light grey, brown and orange brown, motteled, fissured, blackened, some dark grey to black staining/ veneer along fissured surfaces, moist.				1.40: PP > 500 kPa
				300.0	2.0							
					2.50m							
					2.5		CI-CH	some fine grained sand content				
					2.70m							
							SM	Silty SAND: dense to very dense, fine grained, yellow brown/ light brown, some clay fines in parts				
					2.90m							
				299.5	3.0		CL	Sandy CLAY: hard, low plasticity, yellow brown and light grey brown, fine grained sand with high silt content, some clayey sand in pockets				2.90: Slower digging
					3.10m							
								EXCAVATION TP05 TERMINATED AT 3.10 m No ground water encountered. Test pit backfilled on completion.				
				299.0	3.5							
				298.5	4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP06

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 677412.959, N: 7063284.916 (55 MGA94)
SURFACE ELEVATION : 302.500 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 27/10/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION (Soil Type, Colour, Plasticity or Particle Characteristic; Secondary and Minor Components)	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
302.5 / 0.0		CI	Silty CLAY: very stiff, medium plasticity, dark grey brown, traces of fine grained sand, grass and rootlets to 0.15m	D	VSt to H		ALLUVIUM
		CI	0.20m — decreasing sand content				
302.0 / 0.5		CH	0.30m — becoming medium to high plasticity, light brown to brown, some white powdery calcide nodules >10mm diameter, traces of fine grained sand in parts				0.40: PP > 500 kPa
		CI	0.80m — Sandy CLAY: hard, medium plasticity, yellow and brown, fine grained sand				1.00: PP > 500 kPa
301.5 / 1.0							
301.0 / 1.5		CI	1.50m — increasing fine sand and silt content, lower moisture content	D to M	H		
		CI	1.80m — Sandy CLAY: very stiff, fine to medium grained sand, yellowy brown/ light grey brown, varying clay fines content				
300.5 / 2.0		CI					
300.0 / 2.5		SM	2.50m — Silty SAND decreasing silt and clay fines content, shading lighter yellow brown/ grey brown, lower moisture content		D to VD		
299.5 / 3.0			3.00m — EXCAVATION TP06 TERMINATED AT 3.00 m No ground water encountered. Test pit backfilled on completion.				
299.0 / 3.5							
298.5 / 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP08

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 677725.098, N: 7063278.566 (55 MGA94)
SURFACE ELEVATION : 302.494 (AHD)

EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator

DATE EXCAVATED : 6/11/13
LOGGED BY : CM
CHECKED BY : JSM

EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0			Silty CLAY: very stiff to hard, medium plasticity, grey brown/ slight dark grey brown, traces of fine to medium grained sand, grass and rootlets to 0.15m	D	VSt to H		ALLUVIUM
				0.20m		CI	becoming hard, shading lighter and less greyish brown				
				0.30m		CI	brown to slightly greyish brown, some white powdery calcide nodules >20mm diameter				
				302.0 0.5		CI					
				301.5 1.0		CI			H		
				1.20m			light brown to brown/ slight grey brown, some dark grey to black mottling and staining without white calcite nodules	D to M			
				301.0 1.5		CI					
				2.00m			Clayey SAND: dense to very dense, fine to medium grained sand, yellow/ orange brown, low plasticity fines, high silt content, varying fines content possibly grading clayey sand/ sandy clay in parts		VD to D		
				300.5 2.0		SC					
				300.0 2.5							
				2.60m			SAND: dense, fine to medium grained sand, light grown grey to white, trace of fines		D		
				3.00m		SM					
				299.5 3.0			EXCAVATION TP08 TERMINATED AT 3.00 m No ground water encountered. Test pit backfilled on completion.				
				299.0 3.5							
				298.5 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
- 10 Oct., 73 Water Level on Date shown
- water inflow
- water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP09

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 677796.270, N: 7063175.149 (55 MGA94)
SURFACE ELEVATION : 303.821 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 5/11/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0 / 303.5		SM	Silty SAND: medium density to dense, light brown to brown, traces of fine to medium grained sand, grass and rootlets to 0.15m, occasional tree roots to 60mm diameter	D	MD to D		ALLUVIUM
				0.30m		SM	some clay fines content				
				0.40m / 0.5		SC	Clayey SAND: dense, fine to medium grained sand, light brown grey with some orange brown in parts, some silt content low to medium plasticity fines		D		
				0.70m / 303.0		SC	becoming very dense, light brown to slightly light grey brown, increase in clay content tending clayey sand/ sandy clay in parts		VD		
				1.00m / 1.0		SC	increasing clay content with depth				
				1.30m / 302.5		CI	Sandy CLAY: hard, medium plasticity, light brown and slight orange and grey brown in parts, fine grained sand fissured in parts, black staining/ veneer along fissures	D to M	H		
				1.5 / 302.0 / 2.0							
				2.20m		CI	light brown/ grey brown, less fissuring, decrease in fine sand content, increase in plasticity, higher moisture content				
				301.5 / 2.5 / 301.0 / 3.0							
				3.00m			EXCAVATION TP09 TERMINATED AT 3.00 m No ground water encountered. Test pit backfilled on completion.				
				300.5 / 3.5 / 300.0 / 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP10

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 677879.331, N: 7062988.084 (55 MGA94)
SURFACE ELEVATION : 302.324 (AHD)

EQUIPMENT TYPE : CAT Excavator 3T
METHOD : Excavator

DATE EXCAVATED : 2/10/13
LOGGED BY : CM
CHECKED BY : JSM

EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0			Silty CLAY: hard, high plasticity, dark grey brown, less than trace of fine grained sand, grass rootlets to 0.25	D			ALLUVIUM
			0.30m B 0.60m	302.0 0.5		CH	0.30m shading brown to dark brown, slightly darker grey brown, trace to no fine grained sand, occasional fissuring				
			0.70m B 1.00m	301.5 1.0		CH	0.70m shading light brown, some white powdery calcite nodules, < 15mm diameter to 1.8m depth	D - M	H		
						CH	1.20m shading light brown/yellow brown, increasing moisture content, trace of fine grained sand				
			2.20m B 2.50m	301.0 1.5 300.5 2.0 300.0 2.5		CH CI	2.20m Sandy CLAY: hard, medium plasticity, yellow brown, fine grained sand	D - M	H		
			2.70m B 3.00m	299.5 3.0		SC	2.70m Clayey SAND: very dense, fine grained, yellow brown, high clay fines content, grading clayey sand/sandy clay in parts. 3.00m	D - M	VD		
				299.0 3.5 298.5 4.0			EXCAVATION TP10 TERMINATED AT 3.00 m No ground water encountered. Test pit backfilled on completion.				

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
- 10 Oct., 73 Water Level on Date shown
- water inflow
- water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP11

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 678076.589, N: 7062915.051 (55 MGA94)
SURFACE ELEVATION : 301.050 (AHD)

EQUIPMENT TYPE : CAT Excavator 3T
METHOD : Excavator

DATE EXCAVATED : 1/10/13
LOGGED BY : CM
CHECKED BY : JSM

EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
			0.20m B 0.40m	301.0 / 0.0		CH	Silty CLAY: hard, high plasticity, slightly dark grey brown, less than trace of fine grained sand, grass rootlets to 0.15, occasional tree roots to 15mm thick	D			ALLUVIUM
			0.50m B 0.70m	300.5 / 0.5		CI-CH	becoming medium to high plasticity, light brown to brown, with white powdery calcite nodules <20mm diameter				
			0.80m B 1.00m	300.0 / 1.0		CI-CH	light brown, trace of fine grained sand, occasional, white powdery calcite nodules <10mm diameter				
			1.20m B 1.50m	299.5 / 1.5		CI-CH	light brown, slight yellow brown, trace of fine grained sand	D - M	H		
			2.00m B 2.30m	299.0 / 2.0		CH	becoming high plasticity, grey brown, some white powdery calcite nodules <20mm diameter and occasional shiny, coarse sand sized crystals				2.00: slow digging, change to 0.3m bucket
				298.5 / 2.5		CH	becoming moist	M			
				298.0 / 3.0		CH	becoming light brown, slight yellow brown, higher silt content, trace of fine grained sand				
				297.5 / 3.5			EXCAVATION TP11 TERMINATED AT 3.30 m No ground water encountered. Test pit backfilled on completion.				
				4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP12

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 678268.228, N: 7062884.459 (55 MGA94)
SURFACE ELEVATION : 301.462 (AHD)
EQUIPMENT TYPE : CAT Excavator 3T
METHOD : Excavator
DATE EXCAVATED : 1/10/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
			0.10m B		0.0		SM	Silty SAND: medium dense to dense, fine grained, light brown to brown, some clay fines, grass and rootlets to 0.2m	D	D - VD MD - D		ALLUVIUM
			0.30m B		0.20m		SM	higher clay fines content				
			0.60m B	301.0	0.30m 0.5		CI-CH	Silty CLAY: hard, medium to high plasticity, light brown to brown, occasional white powdery calcite nodules				
			1.00m B	300.5	1.00m 1.0		CI-CH	light brown, slight yellow brown, trace of fine grained sand, less frequent smaller white powdery calcite nodules.				
			1.30m		1.40m		CI-CH	light brown slight grey brown, increasing moisture content	D - M	H		
				300.0	1.5							
				299.5	2.0		CI	becoming medium plasticity, yellow brown, some fine sand content, variable, grading sandy clay in parts, increasing silt content				
			2.60m B	299.0	2.5 2.60m		SC	Clayey SAND: very dense, fine grained, some medium grains, yellow brown, some silt fines grading sandy clay in parts	D - M	VD		
			2.80m 2.90m D	298.5	2.90m 3.0		SM	Silty SAND: very dense, fine to medium grained, yellow brown, some clay fines	D - M	VD		
			3.20m		3.20m			EXCAVATION TP12 TERMINATED AT 3.20 m No ground water encountered. Test pit backfilled on completion.				
				298.0	3.5							
				297.5	4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
- 10 Oct., 73 Water Level on Date shown
- water inflow
- water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP13

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 678562.752, N: 7062933.563 (55 MGA94)
SURFACE ELEVATION : 301.237 (AHD)

EQUIPMENT TYPE : CAT Excavator 3T
METHOD : Excavator

DATE EXCAVATED : 1/10/13
LOGGED BY : CM
CHECKED BY : JSM

EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				301.0 0.0			Sandy CLAY: hard, low plasticity, brown, fine grained sand, some medium grains, grass and rootlets to 0.15m	D / D - M	H		ALLUVIUM
			0.40m B 0.60m	0.5			0.40m Silty CLAY: hard, high plasticity, slightly dark grey brown, less than trace of fine grained sand	D - M	H		
			0.90m B 1.10m	300.5 1.0			0.80m light brown to brown, occasional tree roots, white powdery calcite nodules <10mm diameter				0.80: slow digging, change to 300mm bucket
			1.30m B 1.50m	300.0 1.5			1.20m Sandy CLAY: hard, medium plasticity, light brown, fine grained sand	D - M	H		
				299.5 2.0			1.60m grading higher silt content, increasing moisture content 2.00m increasing sand content, grading fine to medium grained				2.00: very slow digging
				299.0 2.5			2.30m grading sandy clay/clayey sand in parts 2.50m EXCAVATION TP13 TERMINATED AT 2.50 m No ground water encountered. Test pit backfilled on completion.				
				298.5 3.0							
				298.0 3.5							
				297.5 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP14

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 678742.627, N: 7062959.463 (55 MGA94)
SURFACE ELEVATION : 301.400 (AHD)
EQUIPMENT TYPE : CAT Excavator 3T
METHOD : Excavator
DATE EXCAVATED : 1/10/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0			Sandy CLAY: hard, low plasticity, light brown to brown, fine grained sand, grading clayey sand in parts, some silt content, grass and rootlets to 0.3m				ALLUVIUM
			0.30m B 0.50m	301.0 0.5		CL SC	0.30m Silty SAND: dense to very dense, grey brown, light brown/yellow brown, some silt fines, dry 0.60m	D	H D - VD		
						CL	Sandy CLAY: hard, low plasticity, light brown to brown, fine grained sand, grading clayey sand in parts, some silt content, grass and rootlets to 0.3m 0.90m				
				300.5 1.0		CI	varying sand content, grading silty clay some fine grained sand in parts				
			1.20m B 1.50m			CI	1.20m becoming medium plasticity, orange brown, higher fine grained sand content, higher moisture content	D - M	H		1.20: slow digging, change to 300mm bucket
				300.0 1.5			1.80m				
						SC	shading light brown/yellow brown, occasional white powdery calcite nodules 2.20m				1.80: easier digging
			2.30m B 2.60m	299.5 2.0		SC	Clayey SAND: dense to very dense, fine grained, light brown/yellow brown, some silt fines	D - M	D - VD		
				299.0 2.5			2.70m slightly higher silt content				
				298.5 3.0			3.00m EXCAVATION TP14 TERMINATED AT 3.00 m No ground water encountered. Test pit backfilled on completion.				
				298.0 3.5							
				297.5 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

SMEC

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP15

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 678861.513, N: 7062955.674 (55 MGA94)
SURFACE ELEVATION : 301.265 (AHD)
EQUIPMENT TYPE : CAT Excavator 3T
METHOD : Excavator
DATE EXCAVATED : 30/9/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0			Sandy CLAY: hard, low to medium plasticity, brown, fine grained sand, some medium grains, grass and rootlets to 0.3m, occasional tree roots to 10mm thick to 0.8m	D	H		ALLUVIUM
			0.30m B 0.50m	301.0 0.5		CL-CI		D - M	VSt - H		
							0.60m decreasing sand content				
				300.5		CL-CI	0.80m Silty CLAY: hard, low to medium plasticity, brown, trace to some fine grained sand				
				1.0							
				300.0		CL-CI	1.30m becoming medium plasticity, light grey brown and orange brown, mottled, trace of fine grained sand, slightly higher moisture content	D - M	H		
			1.40m B 1.60m	1.5		CI					
			1.70m B 1.90m	299.5		CI	1.70m shading orange brown, slightly higher moisture content, slow digging, change to 0.3m bucket				
				2.0		CL	2.00m Sandy CLAY: hard, low plasticity yellow/light brown, fine grained sand	D - M	H		
			2.20m B 2.40m	299.0 2.5		SC	2.20m Clayey SAND: dense to very dense, fine grained, some medium grains, light brown/yellow brown	M	VD		
							2.60m Silty CLAY: hard, low to medium plasticity, light brown/yellow brown, some fine grained sand, high silt content				
			2.80m B 3.00m	298.5 3.0		CL-CI		D - M	H		
							3.10m EXCAVATION TP15 TERMINATED AT 3.10 m No ground water encountered. Test pit backfilled on completion.				
				298.0 3.5							
				297.5 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP16

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679049.636, N: 7062889.809 (55 MGA94)
SURFACE ELEVATION : 300.386 (AHD)
EQUIPMENT TYPE : CAT Excavator 3T
METHOD : Excavator
DATE EXCAVATED : 30/9/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION (Soil Type, Colour, Plasticity or Particle Characteristic, Secondary and Minor Components)	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP (5 10 15 20)	STRUCTURE & Other Observations
			0.20m B 0.40m	300.0 0.0		CI	Sandy CLAY: very stiff, medium plasticity, brown, fine grained sand, grass and rootlets to 0.2m, occasional tree roots to 10mm thick to 0.4m	D	VSt		ALLUVIUM
				0.5		CI	0.50m decreasing sand content				
				299.5 1.0		CI	0.70m Silty CLAY: hard, medium plasticity, brown, trace to some fine grained sand				
			1.30m B 1.50m	299.0 1.5		CH	1.30m becoming high plasticity, dark grey brown, trace to no fine grained sand in parts	D - M	H		1.30: slow digging, change to 300mm bucket
			1.60m B 1.80m			CI-CH	1.60m becoming medium to high plasticity, light brown, no sand content, slightly higher moisture content				
			1.90m B 2.10m	298.5 2.0		CI-CH	1.90m shading light grey brown				
						CI-CH	2.20m higher silt content, shading light grey brown slight yellow brown, trace of fine grained sand				2.20: very slow digging
				298.0 2.5		CI-CH	2.40m increasing sand content 2.50m				
						CL	Sandy CLAY: hard, low plasticity, light grey brown/yellow brown, fine to medium grained sand, high silt content, grading toward sandy silt 2.70m				
				297.5 3.0			EXCAVATION TP16 TERMINATED AT 2.70 m No ground water encountered. Test pit backfilled on completion.				
				297.0 3.5							
				296.5 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP17

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679101.596, N: 7062708.730 (55 MGA94)
SURFACE ELEVATION : 300.920 (AHD)
EQUIPMENT TYPE : CAT Excavator 3T
METHOD : Excavator
DATE EXCAVATED : 30/9/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
			0.40m B 0.60m	300.5 / 0.5		CI	Sandy CLAY: hard, medium plasticity, light brown to brown, fine grained sand, some medium grains, grass and rootlets to 0.3m	D			ALLUVIUM
			0.80m B 1.00m	300.0 / 1.0		CI	0.70m becoming light brown, some white powdery calcite nodules, <20mm diameter	D - M	H		
			1.40m B 1.60m	299.5 / 1.5		CI	1.40m becoming low to medium plasticity, shading light brown/yellow brown, fine grained sand, some medium grains, occasional white powdery calcite nodules, <10mm diameter, some silt content				1.20: slow digging, change to 300mm wide bucket
				299.0 / 2.0		CI	2.00m increasing sand content, without white nodules				
			2.20m B 2.40m	298.5 / 2.5		CI	2.20m Silty SAND: dense, higher silt content, grading clayey sand in parts, higher moisture content	D - M	H		
						CL-CI	2.60m slightly higher moisture content				
				298.0 / 3.0			3.00m EXCAVATION TP17 TERMINATED AT 3.00 m No ground water encountered. Test pit backfilled on completion.				
				297.5 / 3.5							
				297.0 / 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP19

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679083.168, N: 7062342.102 (55 MGA94)
SURFACE ELEVATION : 300.014 (AHD)
EQUIPMENT TYPE : CAT Excavator 3T
METHOD : Excavator
DATE EXCAVATED : 2/10/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

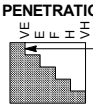
VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				300.0 / 0.0		SM	Silty SAND: medium dense to dense, fine to medium grained, light brown to brown, grass and rootlets to 0.25m, trace of clay fines	D	MD - D		ALLUVIUM
			0.30m B 0.60m	299.5 / 0.5		SM	0.30m becoming dense, light brown, less clay fines content, slightly moist	D - M			
			1.50m B 1.80m	299.0 / 1.0 298.5 / 1.5		SP	1.50m becoming light brown slight yellow/orange brown		D		
			2.30m B 2.80m	298.0 / 2.0 297.5 / 2.5		SP	2.30m shading light grey brown/yellow brown, less fines content	D - M			
				297.0 / 3.0		SP	3.00m higher moisture content, slightly higher fines content				
				296.5 / 3.5 4.0			3.30m EXCAVATION TP19 TERMINATED AT 3.30 m No ground water encountered. Test pit backfilled on completion.				

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION



WATER

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP20

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679132.694, N: 7062127.988 (55 MGA94)
SURFACE ELEVATION : 299.873 (AHD)
EQUIPMENT TYPE : CAT Excavator 3T
METHOD : Excavator
DATE EXCAVATED : 30/9/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0			Silty SAND: dense to very dense, fine to medium grained, light brown to brown, grass and rootlets to 0.2m	D	D - VD		ALLUVIUM
			0.40m B 0.60m	299.5 0.5		SM					
							some clay fines, shading light brown to orange brown	D - M	VD		
				299.0 1.0		SM	0.90m Silty SAND: very dense, fine to medium grained, orange brown, varying clay content grading clayey sand/sandy clay in parts				
			1.40m B 1.60m	298.5 1.5		SC		D - M	VD		
				298.0 2.0		SC	1.80m decreasing clay content, some silt fines, high moisture content, shading yellow/orange brown				
						SM	2.20m becoming dense to very dense, fine to medium grained, yellow brown, some clay fines	D - M	D - VD		
				297.5 2.5		SM	2.40m grading fine to coarse grained				
						SM	2.60m becoming moist	M			
			2.80m B 3.00m	297.0 3.0		SM	3.00m				
							EXCAVATION TP20 TERMINATED AT 3.00 m No ground water encountered. Test pit backfilled on completion.				
				296.5 3.5							
				296.0 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP22

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679218.008, N: 7061737.183 (55 MGA94)
SURFACE ELEVATION : 299.875 (AHD)
EQUIPMENT TYPE : CAT Excavator 3T
METHOD : Excavator
DATE EXCAVATED : 30/9/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0			Silty SAND: dense, fine to medium grained, light brown, grass and rootlets to 0.3m	D	D		ALLUVIUM
			0.30m B 0.50m	299.5 0.5		SM	0.50m	D - M			
						SM	some clay fines 0.70m		MD - D		
			0.70m B 1.00m	299.0 1.0		SC	Clayey SAND: medium dense to dense, fine to medium grained, orange brown, grading low plasticity sandy clay in parts, some light brown fine to medium grained silty sand pockets 0.90m		MD - D		
						SC	becoming very dense		VD		
				298.5 1.5		SC	1.50m shading yellow/orange brown	D - M			
				298.0 2.0		SC					
						SC	2.20m occasional light grey brown silty clay pockets/lenses, <100mm thick, slight increase in plasticity				
			2.50m B 2.70m	297.5 2.5		SC	2.50m becoming fine to coarse grained, yellow/orange brown, trace of fine to coarse, rounded to subrounded gravels and occasional cobbles to 50mm	M			
			2.80m B 3.00m	297.0 3.0		SC	2.80m shading light brown, grey brown and brown grey, slightly lower plasticity, fine to coarse grained sand, trace of fine to coarse rounded to subrounded gravels 3.00m				
						SC	increasing moisture content with depth				
				296.5 3.5			3.30m EXCAVATION TP22 TERMINATED AT 3.30 m No ground water encountered. Test pit backfilled on completion. DCP 77 carried out adjacent test pit.				
				296.0 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
- 10 Oct., 73 Water Level on Date shown
- water inflow
- water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP23

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679270.704, N: 7061544.963 (55 MGA94)
SURFACE ELEVATION : 299.038 (AHD)
EQUIPMENT TYPE : CAT Excavator 3T
METHOD : Excavator
DATE EXCAVATED : 29/9/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				299.0 / 0.0			Clayey SAND: very dense, fine graned sand, brown, grass and rootlets to 0.3m, grading low plasticity sandy clay in parts	D	VD		ALLUVIUM
			0.30m B 0.60m			SC		D - M	D - VD		
				298.5 / 0.5			0.60m				
			0.70m B 0.90m			SC	Silty SAND: dense to very dense, fine grained, light brown, trace of clay fines	D	D - VD		
							0.90m shading light grey brown/cream, trace of clay fines				
			B 1.20m	298.0 / 1.0		SM					
			1.40m B 1.60m			SC	1.30m Clayey SAND: dense to very dense, fine grained, light grey brown, some yellow/orange brown mottling, low to medium plasticity fines	M	D - VD		
				297.5 / 1.5			1.80m				1.70: slow digging, change to 300mm wide bucket
			2.00m B 2.30m			SM	Silty SAND: very dense, fine grained, some medium grains, yellow/orange brown, high silt content, some clay fines	M	VD		
				297.0 / 2.0							
							2.50m grading fine to medium grained, high silt content, varying clay fines content				
				296.5 / 2.5		SM					
				296.0 / 3.0			3.10m EXCAVATION TP23 TERMINATED AT 3.10 m No ground water encountered. Test pit backfilled on completion. DCP 81 carried out adjacent test pit.				
				295.5 / 3.5							
				4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

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EXCAVATION - GEOLOGICAL LOG

PIT NO : TP24

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679241.105, N: 7061347.858 (55 MGA94)
SURFACE ELEVATION : 299.052 (AHD)

EQUIPMENT TYPE : CAT Excavator 3T
METHOD : Excavator

DATE EXCAVATED : 29/9/13
LOGGED BY : CM
CHECKED BY : JSM

EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				299.0 / 0.0			Silty SAND: medium dense, fine grained, brown, some clay content, grass and rootlets to 0.2m, tree roots to 50mm thick to 0.4m,	D	MD		ALLUVIUM
			0.40m B			SM					
			0.60m	298.5 / 0.5			0.60m becoming dense, higher moisture content, shading light brown to brown		D		
						SM					
			1.10m B	298.0 / 1.0			1.10m becoming dense to very dense, fine grained, some medium grains, light brown, some clay fines	D - M			
			1.30m			SM					
				297.5 / 1.5			1.60m decreasing clay fines content, light brown/yellow brown		D - VD		
						SM					
				297.0 / 2.0			2.00m becoming dense, fine grained, shading yellow brown, trace of clay fines				
			2.30m B								
			2.60m	296.5 / 2.5							
						SM		M	D		
				296.0 / 3.0							
				295.5 / 3.5			3.50m EXCAVATION TP24 TERMINATED AT 3.50 m No ground water encountered. Test pit backfilled on completion. DCP 85 carried out adjacent test pit.				
				4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
- 10 Oct., 73 Water Level on Date shown
- water inflow
- water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP25

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679192.721, N: 7061153.992 (55 MGA94)
SURFACE ELEVATION : 297.447 (AHD)
EQUIPMENT TYPE : CAT Excavator 3T
METHOD : Excavator
DATE EXCAVATED : 29/9/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0			Silty CLAY: very stiff to hard, low to medium plasticity, dark brown grey, traces to no fine grained sand in parts, grass and rootlets to 0.15	D	VSt - H		ALLUVIUM
			0.20m B 0.40m	297.0 0.5		CL-CI	0.15m slight moisture				
						CL-CI	0.50m slight shading to dark grey brown				
						CL-CI	0.70m higher moisture content	D - M	H		
				296.5 1.0		CL-CI					1.10: slow digging, change to 300mm wide bucket
			1.50m B 1.70m	296.0 1.5		CL-CI	1.50m Sandy CLAY: hard, low to medium plasticity, grey brown, some yellow brown mottles, fine grained sand				1.50: easier digging
			1.80m B 2.00m			CL	1.80m becoming low plasticity, light brown grey and yellow brown, mottled, higher silt content	M	H		
			2.40m	295.5 2.0		CL	2.10m grading higher silt content, less sand content, grading toward silty clay				
			B 2.70m	295.0 2.5		ML	2.40m Sandy SILT: hard, low plasticity, yellow brown, fine grained sand, some clay fines	M	H		
			B 3.00m	294.5 3.0		SM	2.70m Silty SAND: dense, fine grained, some medium grains, yellow brown, traces of clay fines	M	D		
				294.0 3.5			3.40m EXCAVATION TP25 TERMINATED AT 3.40 m No ground water encountered. Test pit backfilled on completion. DCP 89 carried out adjacent test pit.				
				293.5 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP26

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679136.137, N: 7060962.135 (55 MGA94)
SURFACE ELEVATION : 297.483 (AHD)

EQUIPMENT TYPE : CAT Excavator 3T
METHOD : Excavator

DATE EXCAVATED : 29/9/13
LOGGED BY : CM
CHECKED BY : JSM

EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0			Silty CLAY: very stiff, high plasticity, dark brown grey, trace fine grained sand, grass and rootlets to 0.1m	D	VSt		ALLUVIUM
						CH					
				0.30m			becoming hard				
						CH					
			0.50m B	297.0 0.5			shading dark grey brown, slightly higher moisture content,			>>	
						CH				>>	
			0.80m	0.80m			trace of fine grained sand, slightly higher moisture content				
				296.5 1.0				D - M	H		1.00: slow digging, change to 300mm wide bucket
						CH					
			1.50m B	296.0 1.5							
			1.80m								
				2.00m			EXCAVATION TP26 TERMINATED AT 2.00 m No ground water encountered. Test pit backfilled on completion. DCP 93 carried out adjacent test pit.				
				295.5 2.0							
				295.0 2.5							
				294.5 3.0							
				294.0 3.5							
				293.5 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP27

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679109.563, N: 7060765.397 (55 MGA94)
SURFACE ELEVATION : 297.283 (AHD)
EQUIPMENT TYPE : CAT Excavator 3T
METHOD : Excavator
DATE EXCAVATED : 28/9/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0 297.0		CI	Silty CLAY: firm to stiff, medium plasticity, dark brown grey, grass and rootlets to 0.3m, trace of no fine grained sand in parts	D	F - St		ALLUVIUM
				0.30m			becoming very stiff		VSt		
			0.40m B 0.60m	0.5 296.5		CI	becoming hard, shading dark grey brown				
				1.00m			gradually grading slightly higher silt content, no sand content				
			1.40m B 1.60m	1.5 296.0		CI	slightly higher moisture content	D - M	H		
				2.00m			shading slightly toward dark brown, less greyish brown				
				2.5 295.5 295.0		CI					
				2.60m			EXCAVATION TP27 TERMINATED AT 2.60 m No ground water encountered. Test pit backfilled on completion. DCP 97 carried out adjacent test pit.				
				3.0 294.5 294.0							
				3.5 293.5							
				4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remoulded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

SMEC

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP28

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679153.302, N: 7060572.685 (55 MGA94)
SURFACE ELEVATION : 297.121 (AHD)
EQUIPMENT TYPE : CAT Excavator 3T
METHOD : Excavator
DATE EXCAVATED : 29/9/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				297.0 0.0			Silty CLAY: very stiff to hard, medium to high plasticity, dark brown grey, trace to no fine grained sand, grass and rootlets to 0.2m		VSt - H		ALLUVIUM
			0.30m B 0.50m			CI-CH	0.50m shading dark grey brown	D - M	H		
				296.5 0.5		CI-CH					
				296.0 1.0		CI-CH	1.00m trace of fine grained sand				
			1.50m B 1.70m	1.5		CI	1.50m Sandy CLAY: hard, medium plasticity, brown, fine grained sand, some silt content				
				295.5		CI-CH	1.70m becoming low to medium plasticity, light brown, increase in fine grained sand content, grading clayey sand in parts	D - M	H		
			2.00m B 2.30m	2.0 295.0		CL-CL	2.00m Silty CLAY: hard, low to medium plasticity, light brown with fine grained sand varying high silt content, grading clayey/sandy silt in parts	D - M	H		
				2.5 294.5		ML	2.50m Sandy SILT/Silty SAND: very stiff, low plasticity, light brown, fine grained sand with clay fines varying silt and clay fines in parts	D - M	VSt / D		
				3.0		SM	2.90m Silty SAND: dense, fine grained, light brown, trace of clay fines	D - M	D		
			3.20m B 3.40m	294.0		SM	3.20m grading toward fine to medium grained sand, less clay fines				
				3.5 293.5			3.40m EXCAVATION TP28 TERMINATED AT 3.40 m No ground water encountered. Test pit backfilled on completion.				
				4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
- 10 Oct., 73 Water Level on Date shown
- water inflow
- water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP29

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 677652.100, N: 7063324.000 (55 MGA94)
SURFACE ELEVATION : 301.155 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 2/5/14
LOGGED BY : CM
CHECKED BY :
EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0 / 301.0		SM	Silty SAND: dense, fine to medium grained, light brown to brown, slight grey brown, varying clay fines content, grass and rootlets to 0.15m	D	D		ALLUVIUM
			0.30m B			CI	Sandy CLAY: very stiff to hard, medium plasticity, brown, some light brown to orangey yellow brown, fine rootlets, fine to medium grained sand	D to M	VSt to H		
			0.50m B	0.5 / 300.5			becoming hard, low to medium plasticity, light brown/yellow brown, increase in fine to medium grained sand				
			0.80m			CL-CI					
				1.0 / 300.0			becoming light brown, mottled pale grey, light grey brown and yellow brown, increase in silt content.				
				1.5 / 299.5		CL-CI					
				2.0 / 299.0		CL-CI	shading light yellow bown and light grey brown/pale grey, mottled				
						SM	increase in sand content				
			2.50m B	2.5 / 298.5		SC	Clayey SAND: dense to very dense, fine to medium grained, light yellow brown, varying clay content, grading silty sand.				
			2.70m								
				3.0 / 298.0			EXCAVATION TP29 TERMINATED AT 2.90 m No ground water encountered. Test pit backfilled on completion.				

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

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EXCAVATION - GEOLOGICAL LOG

PIT NO : TP30

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 677660.290, N: 7063278.000 (55 MGA94)
SURFACE ELEVATION : 303.002 (AHD)

EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator

DATE EXCAVATED : 2/5/14
LOGGED BY : CM
CHECKED BY :

EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				303.0 / 0.0			Sandy CLAY: hard, medium plasticity, brown, fine to medium grained sand, grass and rootlets to 0.1m				ALLUVIUM
						CI	0.20m some white powdery calcite nodules less that 10mm diameter				
			0.50m B	302.5 / 0.5		CI					
			0.80m B				0.80m shading light brown, less fragmened white nodules, ocassional glass like crystalline nodules less than 5mm diameter				
			1.00m			CI	1.00m without nodules		H		
				302.0 / 1.0		CI					
				301.5 / 1.5				D to M			
						CI	1.70m increase in fine to medium grained sand content				
							1.90m Silty SAND: dense to very dense, fine to medium grey, yellow brown, varying clay fines content				
				301.0 / 2.0							
						SM					
				300.5 / 2.5					D to VD		
			2.70m B				2.70m shading lighter, less fines content				
			2.90m			SM					
							3.00m				
				300.0 / 3.0			EXCAVATION TP30 TERMINATED AT 3.00 m No ground water encountered. Test pit backfilled on completion.				

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

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EXCAVATION - GEOLOGICAL LOG

PIT NO : TP31

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 677666.820, N: 7063239.000 (55 MGA94)
SURFACE ELEVATION : 303.530 (AHD)

EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator

DATE EXCAVATED : 2/5/14
LOGGED BY : CM
CHECKED BY :

EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				303.5 / 0.0		CI	Sandy CLAY: very stiff to hard, medium plasticity, brown to dark brown, fine to medium grained sand, grass and rootlets to 0.1m	D to M	VSt to H		ALLUVIUM
							0.20m some white powdery calcite nodules less than 10mm diameter				
						CI	0.40m shading light brown to brown, frequent white powdery nodules less that 10mm diameter				
				303.0 / 0.5		CI	0.80m shading light brown, slightly yellow brown, without nodules, varying sand content grading silty clay with sand in parts				
				302.5 / 1.0		CI					
				302.0 / 1.5							
			2.00m B	301.5 / 2.0		CI	2.00m shading light brown with dark grey mottling and staining along fissures				
			2.30m			CI	2.30m shading light brown, increasing in sand content, grading clayey sand in parts				
				301.0 / 2.5		CI	2.70m				
						SM	Silty SAND: dense to very dense, fine to medium grained, light brown, varying sand content, grading clayey sand in parts		D to VD		
						SM	2.90m decreasing in fines content				
				300.5 / 3.0			3.00m EXCAVATION TP31 TERMINATED AT 3.00 m No ground water encountered. Test pit backfilled on completion.				

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
- 10 Oct., 73 Water Level on Date shown
- water inflow
- water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TP32

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 677695.820, N: 7063207.000 (55 MGA94)
SURFACE ELEVATION : 303.490 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 2/5/14
LOGGED BY : CM
CHECKED BY :
EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0		SC	Clayey SAND: very dense, brown, fine to medium grained sand, high to medium plasticity clay fines, grass and rootlets to 0.1m	D			ALLUVIUM
						SC	0.10m shading dark grey, brown				
						SC	0.20m some white powdery calcite nodules to 10mm diameter				
			0.30m B				0.30m shading slightly lighter				
			0.50m	303.0 0.5		SC					
			0.70m B				0.70m shading light brown/ grey, frequent white powdery calcite nodules, slight decrease in clay fines content.				
			1.00m	302.5 1.0		SC		D to M	VD		
				302.0 1.5			1.70m shading light grey brown, ocassional nodules,				
			1.80m B			SC					
				301.5 2.0			2.00m slight decrese in clay fines, increase in moisture content, shading light grey brown, pale grey and yellow brown, mottled.				
			2.10m			SC					
				301.0 2.5			2.90m EXCAVATION TP32 TERMINATED AT 2.90 m No ground water encountered. Test pit backfilled on completion.				
				300.5 3.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
- 10 Oct., 73 Water Level on Date shown
- water inflow
- water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB01

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679427.815, N: 7062423.427 (55 MGA94)
SURFACE ELEVATION : 300.227 (AHD)
EQUIPMENT TYPE : CAT Excavator 23T
METHOD : Excavator
DATE EXCAVATED : 26/9/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				300.0 / 0.0		CI	Sandy CLAY: very stiff, hard, medium plasticity, brown, slight grey brown, fine grained sand, grass fine rootlets to 0.2	D	VSt - H		ALLUVIUM
				0.25m		SM	Silty SAND: dense, fine to medium grained, brown				
				0.50m			becoming fine grained, some medium plasticity, grains, varying silt content				
			0.60m B 0.90m	0.5		SM					
			1.30m B 1.60m	299.0 / 1.0							
				1.30m			SAND: dense, fine to medium grained, light brown, slight light grey brown, trace of silt	D - M	D		
				1.5		SP					
				298.0 / 2.0							
				2.5							
				3.00m			shading light brown, less grey brown				
				3.0 / 297.0		SP					
				3.5							
				4.00m			slightly higher moisture content				
				4.0 / 296.0		SP					
				4.5							
				4.80m			EXCAVATION TPB01 TERMINATED AT 4.80 m No ground water encountered. Test pit backfilled on completion.				
				5.0 / 295.0							
				5.5							
				6.0 / 294.0							
				6.5							
				7.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB02

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679897.103, N: 7062391.824 (55 MGA94)
SURFACE ELEVATION : 313.198 (AHD)
EQUIPMENT TYPE : CAT Excavator 23T
METHOD : Excavator
DATE EXCAVATED : 26/9/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				313.0 / 0.0			Gravelly CLAY: very stiff to hard, medium plasticity, dark grey brown, fine to coarse, rounded to subangular gravels and cobbles to 100mm, some fine to coarse grained sand, grass and rootlets to 0.4m, occasional tree roots to 20mm thick to 0.5m.	D			ALLUVIUM
						CI	0.40m				
				0.5		CI	less gravels, grading silty clay, some sands and gravels, some white calcite nodules				
			0.70m B 1.00m				0.60m Silty CLAY: hard, medium to high plasticity, orange brown, less than trace of fine to coarse, rounded to subrounded gravels and cobbles to 40mm, some fissuring, blocky in parts	D - M	H		
			1.30m B 1.60m	312.0 / 1.0		CI-CH	1.30m yellow/orange brown and light grey/brown, higher silt content in parts, no sand or gravel content, some fine to course gravel sized extremely low to very low strength, extremely to highly weathered, siltstone/mudstone inclusions, some rock structure in parts,				RESIDUAL SOIL
			1.80m B 2.10m	1.5		CI-CH					
				2.0			2.10m XW SILTSTONE/MUDSTONE: extremely low to very low strength, extremely to highly weathered, yellow/orange brown and light grey brown, varying bands/laminations , friable, remoulds to gravelly silty clay.				WEATHERED ROCK
				311.0 / 2.5			2.40m very low strength, highly weathered in parts, shading yellow/orange brown, redbrown and light grey brown				
				3.0				D - M			
				310.0 / 3.5			3.70m becoming very low to low strength, highly to moderately weathered, less friable, slow digging				
				4.0							
				309.0 / 4.5			4.50m EXCAVATION TPB02 TERMINATED AT 4.50 m No ground water encountered. Test pit backfilled on completion. DCP 101 carried out adjacent test pit.				
				5.0							
				308.0 / 5.5							
				6.0							
				307.0 / 6.5							
				7.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB03

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 680286.923, N: 7062331.850 (55 MGA94)
SURFACE ELEVATION : 318.613 (AHD)
EQUIPMENT TYPE : CAT Excavator 23T
METHOD : Excavator
DATE EXCAVATED : 25/9/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
			0.30m	318.0 0.0		CI-CH	Silty CLAY: very stiff to hard, medium to high plasticity, dark grey brown, trace of fine to medium grained sand and fine to coarse rounded to subrounded gravels, grass and rootlets to 0.3m	D	VSt - H		ALLUVIUM
			B 0.60m	0.5		CI-CH	becoming hard 0.60m	D - M	H		
			0.80m			CI	becoming brown, slightly orange brown, trace of fine to coarse grained sand 0.80m				
			B 1.00m	1.0		CI-CH	shading orange brown, medium to high plasticity, trace of fine to coarse grained sands and fine to coarse, angular to subangular gravels, occasional white nodules and shiny coarse grained sand to fine gravel sized glass-like crystals				
				317.0 1.5			1.40m trace to no sands, gravels and white nodules	D - M	H		
			1.80m			CI-CH	1.80m				
			B 2.10m	2.0		CI-CH	shading yellow brown, higher silt content in parts, with fine to medium gravel sized, yellow brown and grey brown sandstone inclusions.				RESIDUAL SOIL
			2.70m	2.5		CI-CH	2.30m tending extremely low strength, extremely weathered siltstone/mudstone in parts, friable 2.70m				
			B 3.00m	316.0 3.0			XW SILTSTONE/MUDSTONE: extremely low strong, extreme to highly weathered yellow/light brown, orange brown and grey brown, blocky, friable, interbedded bands/laminations, remoulds to gravelly silty clay	D - M			WEATHERED ROCK
				3.5			3.50m becming very low strength in parts 3.70m				
				315.0 4.0			becoming very low strength, highly weathered, some orange/red brown laminations 4.30m				
				4.5			EXCAVATION TPB03 TERMINATED AT 4.30 m No ground water encountered. Test pit backfilled on completion.				
				314.0 5.0							
				5.5							
				313.0 6.0							
				6.5							
				312.0 7.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
- 10 Oct., 73 Water Level on Date shown
- water inflow
- water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB04

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679659.915, N: 7062294.933 (55 MGA94)
SURFACE ELEVATION : 299.444 (AHD)
EQUIPMENT TYPE : CAT Excavator 23T
METHOD : Excavator
DATE EXCAVATED : 26/9/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
			0.30m B	0.0 299.0 0.5			Silty CLAY: very stiff, hard, high plasticity, dark grey brown, trace of fine grained sand, grass and rootlets to 0.2, occasional tree roots to 20mm thick to 0.3m	D	VSt - H		ALLUVIUM
			0.60m B	0.20m			becoming hard, high plasticity, dark grey to black, less than trace of fine to medium grained sand and subrounded to angular gravels	D - M			0.30: HP In-situ >500 kPa
			0.90m B	0.60m		CI-CH	higher moisture contet	M			
				1.0 1.00m			becoming moist, trace to no sand and gravels		H		1.00: HP In-situ >500 kPa
			1.90m	298.0 1.5		CH		M			
			B 2.20m	1.90m 2.0		CH	Clayey GRAVEL: very dense, high plasticity clay fines, light brown to brown, slight grey brown, no sand content		VSt		2.00: HP In-situ =350 kPa
			2.70m B 3.00m	297.0 2.5 2.70m			Silty SAND: dense, fine grained, light brown, slight yellow brown, high silt content, grading sandy silt in parts, trace to some clay fines, moist	M	D		
				3.0 296.0 3.5		SM					
				4.0							
				4.50m 295.0 4.5			slightly less silt content in parts				
						SM					
				5.0			5.00m				
						SM	becoming moist to wet 5.20m	M - W			
				294.0 5.5			EXCAVATION TPB04 TERMINATED AT 5.20 m No ground water encountered. Test pit backfilled on completion. DCP 101 carried out adjacent test pit.				
				6.0							
				293.0 6.5							
				7.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
- 10 Oct., 73 Water Level on Date shown
- water inflow
- water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB05

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 680056.375, N: 7062233.911 (55 MGA94)
SURFACE ELEVATION : 313.861 (AHD)

EQUIPMENT TYPE : CAT Excavator 23T
METHOD : Excavator

DATE EXCAVATED : 26/9/13
LOGGED BY : CM
CHECKED BY : JSM

EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0		CI-CH	Silty CLAY: very stiff to hard, medium to high plasticity, dark grey brown, trace of fine to medium grain sand, fine to coarse rounded to subangular gravels and cobbles to 50mm, grass, rootlets and tree roots to 15mm thick, timber fragments to 20mm thick to 0.3m	D	VSt - H		ALLUVIUM
				0.30m		CI	becoming hard, medium plasticity, brown to dark brown,				
				0.50m			medium to high plasticity, brown slight light brown, less sand content and fewer gravels and cobbles, some white, powdery, calcite nodules with coarse grained sand to fine gravel sized shiny crystals				0.50: HP In-situ >500 kPa
			0.60m B 0.90m	0.5		CI-CH		D - M	H		0.80: HP In-situ >500 kPa
			1.00m B 1.30m	313.0 1.0			shading yellow and orange brown, higher silt content with light grey brown and orange brown, fine to medium gravel sized, extremely low to very low strength silstone and mudstone inclusions, some rock structure in parts				RESIDUAL SOIL 1.20: HP In-situ >500 kPa
				1.50m		CI-CH					
			1.70m B 2.00m	1.5			XW SILTSTONE/MUDSTONE: extremely low to very low strength, extremely to highly weathered, yellow/orange brown and light grey brown interbedded bands/laminations, laminated to very thinly bedded, friable, remoulds to gravity silty clay				WEATHERED ROCK
				312.0 2.0							
				2.5							
				2.80m			becoming very low strength, highly weathered, less yellow/orange brown, siltstone beds, predominantly light grey brown mudstone beds in parts, friable				
				311.0 3.0				D - M			
				3.5							
				310.0 4.0							
				4.00m			very low to low strength in parts, slower digging				
				4.50m							
				4.5			EXCAVATION TPB05 TERMINATED AT 4.50 m No ground water encountered. Test pit backfilled on completion.				
				309.0 5.0							
				5.5							
				308.0 6.0							
				6.5							
				307.0 7.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB06

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679739.057, N: 7062195.238 (55 MGA94)
SURFACE ELEVATION : 302.401 (AHD)
EQUIPMENT TYPE : CAT Excavator 23T
METHOD : Excavator
DATE EXCAVATED : 25/9/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 1.20 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0							ALLUVIUM
						CL-CI	Silty CLAY: stiff, low to medium plasticity, brown, some fine to medium grained sand, trace of fine to medium gravels, grass and rootlets to 0.2m	D	VSt		
				0.20m							
			0.40m B 0.80m	302.0 0.5		CI	hard, medium plasticity, dark brown grey, some fine to medium grain sand, some fine to coarse, rounded to subangular gravels and cobbles to 50mm, some white calcite nodules.		H		0.30: HP In-situ >500 kPa
				0.40m							RESIDUAL SOIL
						CI-CH	becoming medium to high plasticity, light brown, orange and red brown, grey brown	D - M	H		0.50: HP In-situ >500 kPa
				0.80m							
			0.90m B 1.20m	1.0			XW MUDSTONE: extremely low strength, orange and red brown, pale grey and grey brown, weathered to silty clay, high plasticity	D - M			WEATHERED ROCK
				1.30m							
				301.0 1.5			XW SANDSTONE: extremely low strength, extremely weathered, medium to coarse grained grained, light brown, slight yellow/orange brown, very low strength in parts, remoulds with trace of silt content	D - M			
				2.00m							
				2.0			becoming very low to low strength, fine to medium grained, pale grey and grey, high silt content, remoulds in parts to fine to medium grained silty sand				
				2.40m							
				300.0 2.5			HW MUDSTONE/SANDSTONE: very low to low strength, highly to moderately weathered, interbedded bands of grey to dark grey mudstone and fine to coarse grained, orange brown and light brown sandstone, <100mm thick	D - M			
				2.80m							
							EXCAVATION TPB06 TERMINATED AT 2.80 m No ground water encountered. Test pit backfilled on completion.				
				3.0							
				299.0 3.5							
				4.0							
				298.0 4.5							
				5.0							
				297.0 5.5							
				6.0							
				296.0 6.5							
				7.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB07

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 680240.829, N: 7062094.724 (55 MGA94)
SURFACE ELEVATION : 312.438 (AHD)
EQUIPMENT TYPE : CAT Excavator 23T
METHOD : Excavator
DATE EXCAVATED : 25/9/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 1.20 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
			0.30m B 0.60m	0.0 312.0 0.5		CI-CH	Silty CLAY: very stiff to hard, medium to high plasticity, dark grey brown, trace of fine to coarse grained sand and fine subangular gravels and cobbles to 80mm, grass and rootlets organic matter and tree roots to 10mm thick to 0.3m 0.30m becoming hard 0.60m	D	VSt - H H		ALLUVIUM
			0.80m B 1.10m	1.0		CI-CH	becoming orange brown and brown, trace of fine to coarse grained sand, some white, powdery, calcite nodules and white, coarse grained sand sized crystals. 0.80m shading orange brown, some light brown mottling, without sand content or orange nodules	D - M	H		RESIDUAL SOIL 1.00: HP In-situ >500 kPa
			1.80m B 2.10m	311.0 1.5		CI-CH	1.80m				
			2.50m B	2.0 310.0 2.5		GW	Clayey GRAVEL: very dense, well-graded, orange brown some light brown mottling 2.50m with extremely weathered siltstone/mudstone in parts, extremely low stregth		VD		2.00: HP In-situ >500 kPa
				3.0		CI-CH	3.00m		H		
			3.50m	309.0 3.5			XW SILTSTONE/MUDSTONE: extremely low strength, extremely weathered, yellow/light brown and grey brown, blocky, friable, interbedded bands/laminations, remoulds to gravelly silty clay 3.50m becoming low strength, highly weathered	D - M			WEATHERED ROCK
				4.0			4.20m becoming very low strength to low strength, orange and red brown, light grey brown and light brown 4.50m				
				308.0 4.5			EXCAVATION TPB07 TERMINATED AT 4.50 m No ground water encountered. Test pit backfilled on completion.				
				5.0 307.0 5.5							
				6.0 306.0 6.5							
				7.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB08

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679823.467, N: 7062073.694 (55 MGA94)
SURFACE ELEVATION : 305.710 (AHD)
EQUIPMENT TYPE : CAT Excavator 23T
METHOD : Excavator
DATE EXCAVATED : 25/9/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 1.20 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0							ALLUVIUM
						GW	Clayey GRAVEL: very dense, brown, fine to coarse, rounded to subangular, grass and rootlets to 0.3m, occasional timber fragments, friable, medium plasticity clay fines, trace of fine grained sand.	D			
				0.20m		GW	some white, powdery calcite nodules		D - H		0.30: HP In-situ >500 kPa
			0.50m B	0.5			0.50m				
			0.80m B	305.0		GW	becoming lighter brown, some fine to coarse grained sand, occasional white calcite nodules				
			1.10m	1.0			0.80m				
			1.40m			CI	Sandy CLAY: shading light brown, hard, orange brown and dark brown grey, some calcite nodules, low to mediun plasticity		H		1.00: HP In-situ >500 kPa
			1.70m B	304.0			1.10m becoming light grey brown, slight yellow brown, some mottling, fine to medium grained sand, high silt content, grading sandy silt in parts.		VD		
				1.5		SC					
			2.20m B	2.0			1.80m				RESIDUAL SOIL
			2.50m			CL-CI	Silty CLAY: hard, low to medium plasticity, yellow brown, trace of fine grained sand, light brown grey to white in parts, high silt content		H		2.00: HP In-situ >500 kPa
			3.00m B	303.0			2.20m				WEATHERED ROCK
			3.50m	2.5		CL-CI	XW SILTSTONE/MUDSTONE: extremely low to very low strength, extremely to highly weathered, yellow brown and pale grey, laminated, friable, weathered to gravel.	D - M			
				3.0			3.00m				
				302.0			XW MUDSTONE: extremely low to very low strength, extreme to highly weathered, light brown grey, orange/red brown and grey brown, friable				
				3.5							
				4.0			4.00m becoming very low strength, highly weathered, less friable				
				4.5			4.50m becoming very low to low strength, highly to moderately weathered in parts				
				301.0			4.80m				
				5.0			EXCAVATION TPB08 TERMINATED AT 4.80 m No ground water encountered. Test pit backfilled on completion.				
				5.5							
				300.0							
				6.0							
				6.5							
				299.0							
				7.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB09

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679840.540, N: 7061655.350 (55 MGA94)
SURFACE ELEVATION : 301.807 (AHD)

EQUIPMENT TYPE : CAT Excavator 23T
METHOD : Excavator

DATE EXCAVATED : 25/9/13
LOGGED BY : CM
CHECKED BY : JSM

EXCAVATION DIMENSIONS : 1.20 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0			Silty CLAY: very stiff to hard, medium plasticity, dark brown grey, trace of fine grained sand, grass and rootlets to 0.5m	D	VSt - H		ALLUVIUM
				0.5		CI	0.50m becoming hard, light brown to brown, trace of fine to medium grained sand, less than trace of fine gravel				0.30: HP In-situ >500 kPa
			0.70m B 1.00m	301.0 1.0		CI-CH	1.10m without sand or gravel content, shading light brown, slight orange brown, occasional white mottles with white calcite nodules, occassional shiny coarse sand sized crystals				0.80: HP In-situ >500 kPa
			1.20m B 1.50m	1.5		CI-CH			H		
				300.0 2.0		CI-CH	2.00m shading yellow brown, no sand content	D - M			
			2.50m B 3.00m	2.5		GW	2.50m Clayey GRAVEL: very dense, yellow brown and light brown grey, mottled, some fine grained sand.		VD		
			B 3.20m	299.0 3.0		SM	3.00m Gravelly CLAY: hard, medium to high plasticity, yellow brow grey		H		
				3.5		SM	3.50m Silty SAND: dense, fine to medium grained, light brown grey and yellow brown, trace of clay content in pockets, trace of fine to coarse gravels	D	D		
			4.30m B 4.60m	298.0 4.0		SM	4.30m shading yellow brown, moist				
			5.00m B 5.50m	4.5 297.0 5.0		SM	5.00m becoming fine to coarse grained, some fine to coarse, rounded to subangular gravels and cobbles to 120mm, trace of clay content in pockets, higher moisture content	M			
				5.5		SM	5.80m				
				296.0 6.0			6.00m occasional yellow/orange brown laminated fine to coarse gravel sized, very low strength siltstone inclusions, tending weathered siltstone in pockets				
				6.5			EXCAVATION TPB09 TERMINATED AT 6.00 m No ground water encountered. Test pit backfilled on completion.				
				295.0 7.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB10

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 678031.116, N: 7062797.333 (55 MGA94)
SURFACE ELEVATION : 300.586 (AHD)
EQUIPMENT TYPE : CAT Excavator 3T
METHOD : Excavator
DATE EXCAVATED : 1/10/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0 300.5		CH	Silty CLAY: very stiff to hard, high plasticity, dark grey brown, trace of fine grained sand, grass and rootlets to 0.2m	D	VSt - H		ALLUVIUM
				0.20m							
			0.30m B			CH	shading light grey brown, occasional white calcite nodules to 10mm				
				0.40m				D - M			
			0.60m	0.5 300.0		CH	less than trace of fine grained sand				0.50: HP In-situ >500 kPa
				0.70m							
							no sand content, without white calcite nodules				
				1.0 299.5		CH					1.00: HP In-situ >500 kPa
				1.50m							
				1.5 299.0			occasional fissuring, occasional dark grey to black veneer/staining along fissures	M	H		
			1.90m B			CH					
			2.20m	2.0 298.5							
				2.50m							
			2.60m B	2.5 298.0		CL-CI	Sandy CLAY: hard, low to medium plasticity, light brown/yellow brown, fine to medium grained sand, high silt content	M	H		
			2.90m	3.00m							
				3.0 297.5			EXCAVATION TPB10 TERMINATED AT 3.00 m No ground water encountered. Test pit backfilled on completion.				
				3.5 297.0							
				4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

SMEC

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB11

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 678060.447, N: 7062993.219 (55 MGA94)
SURFACE ELEVATION : 301.193 (AHD)

EQUIPMENT TYPE : CAT Excavator 3T
METHOD : Excavator

DATE EXCAVATED : 2/10/13
LOGGED BY : CM
CHECKED BY : JSM

EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0							ALLUVIUM
						CH	Silty CLAY: very stiff to hard, high plasticity, dark brown grey, trace of fine grained sand, grass and rootlets to 0.15m	D	VSt - H		
				0.15m		CH	becoming brown, slight grey brown				
			0.30m B	301.0 0.30m			becoming medium to high plasticity, light brown with white powdery calcite nodules to 20mm				
						CI-CH					
			0.60m	0.5 300.5 0.50m			trace to some fine grained sand in parts	D - M	H		
						CI-CH					
				1.0 1.00m			Sandy CLAY: hard, light to medium plasticity, yellow brown, fine grained sand, some silt content, occasional white powdery calcite nodules to 10mm, varying sand content tending towards sandy clay/clayey sand in parts, higher moistue content				
			1.30m B	300.0 1.30m		CL-CI	increasing silt content, shading yellow brown, slight light grey brown, less silt content				
			1.60m	1.5 299.5		CL-CI		D - M	H		
				2.0 2.20m			becoming medium plasticity, shading toward light grey brown, less sand content				
				299.0 2.40m		CL-CI	less sand content				
				2.5 2.60m		CL-CI	grading silty clay, some fine grained sand in parts				
				298.5 2.80m		CL-CI	Silty CLAY: hard, medium to high plasticity, light grey brown, slight yellow brown, some fine grained sand	D - M	H		
				3.0 3.20m		CI-CH					
				298.0			EXCAVATION TPB11 TERMINATED AT 3.20 m No ground water encountered. Test pit backfilled on completion.				
				3.5 297.5							
				4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB12

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 677950.583, N: 7062930.873 (55 MGA94)
SURFACE ELEVATION : 301.331 (AHD)
EQUIPMENT TYPE : CAT Excavator 3T
METHOD : Excavator
DATE EXCAVATED : 2/10/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0			Silty CLAY: very stiff to hard, high plasticity, brown grey, trace of fine grained sand, grass and rootlets to 0.15m	D	VSt - H		
			0.20m B **0.40m** B	301.0 0.5		CH	less than trace of fine grained sand becoming hard, high plasticity, brown trace of fine grained sand, some white powdery calcite nodules to 20mm diameter	D - M	H		
			0.70m	300.5		CH					
				1.0			shading light brown, slight yellow brown, higher moisture content, less frequent smaller white nodules to 10mm to 1.5m				
				300.0 1.5		CH					
				299.5 2.0			becoming medium to high plasticity, yellow brown, mottled orange brown, light grey brown, dark grey brown and pale grey, trace to some fine grained sand				
				299.0 2.5		CI-CH	some fine grained sand, increasing sand content				
			2.70m B			CI-CH	some pale grey, dark grey brown, light grey brown mottling, fine grained sand, some medium grains	D - M	H		
			3.00m	298.5 3.0		CI	EXCAVATION TPB12 TERMINATED AT 3.00 m No ground water encountered. Test pit backfilled on completion.				
				298.0 3.5							
				297.5 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB13

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679251.711, N: 7060870.038 (55 MGA94)
SURFACE ELEVATION : 297.778 (AHD)
EQUIPMENT TYPE : CAT Excavator 3T
METHOD : Excavator
DATE EXCAVATED : 2/10/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				297.5 / 0.0		CH	Silty CLAY: very stiff to hard, high plasticity, dark grey brown, grass and rootlets to 0.15m	D	VSt - H		ALLUVIUM
			0.60m B	0.5			0.60m				
			1.00m	297.0 / 1.0		CH	slightly higher moisture content				
			1.20m B				1.20m				
			1.50m	296.5 / 1.5		CH	grey brown, slight light brown	D - M	H		
							1.80m				
				296.0 / 2.0		CH	slightly higher silt content				
							2.10m				
			2.40m			CH	trace of fine grained sand, shading lighter brown, slight yellow brown				
			B 2.60m	295.5 / 2.5		CL-CI	2.40m Sandy CLAY: hard, low to medium plasticity, light brown and yellow brown, fine grained sand, some silt content				
							2.60m				
				295.0 / 3.0		CL-CI	higher fine grained sand content, grading clayey sand in parts	D - M	H		
			3.00m B				3.00m				
			3.30m			SM	Silty SAND: dense to very dense, fine grained, yellow brown, some clay fines content	D - M	D - VD		
				294.5 / 3.5			3.30m EXCAVATION TPB13 TERMINATED AT 3.30 m No ground water encountered. Test pit backfilled on completion.				
				294.0 / 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB14

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679259.915, N: 7061190.953 (55 MGA94)
SURFACE ELEVATION : 297.918 (AHD)
EQUIPMENT TYPE : CAT Excavator 3T
METHOD : Excavator
DATE EXCAVATED : 2/10/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
			0.30m B	297.5 0.5		ML	Sandy SILT: very stiff to hard, low to medium plasticity, dark grey brown, fine grained sand, some varying clay fines content 0.40m	D	VSt - H		ALLUVIUM
			0.60m B			ML	lower sand content, higher clay fines content 0.60m	D - M	H		
			0.90m B	297.0 1.0		CI	Silty CLAY: hard, medium plasticity, dark grey brown, some fine sand content, high silt content 1.20m	D - M	H		
			1.50m B	296.5 1.5		CI	Sandy CLAY: hard, medium plasticity, light brown fine grained sand 2.00m	D - M	H		
			2.30m B	296.0 2.0		ML	Sandy SILT: hard, low plasticity, yellow brown, fine grained sand, some medium grains 2.50m	D - M	H		
			2.80m B	295.5 2.5		SM	Silty SAND: dense to very dense, fine grain sand, medium grains, yellow brown 3.00m	D - M	D - VD		
			3.00m	295.0 3.0		SM	lower silt content, grading cleaner sand 3.30m				
				294.5 3.5			EXCAVATION TPB14 TERMINATED AT 3.30 m No ground water encountered. Test pit backfilled on completion.				
				294.0 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB15

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679417.496, N: 7062078.016 (55 MGA94)
SURFACE ELEVATION : 299.608 (AHD)
EQUIPMENT TYPE : CAT Excavator 3T
METHOD : Excavator
DATE EXCAVATED : 2/10/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0 / 299.5			Silty CLAY: very stiff to hard, medium plasticity, brown, grass and rootlets to 0.4m, trace of fine grained sand	D	VSt - H		ALLUVIUM
			0.40m B			CI-CH					
			0.70m B	0.5 / 299.0				D - M	H		
							0.70m				
							Silty SAND: dense to very dense, fine grained sand, brown, varying clay fines content	D	H		
			1.10m	1.0 / 298.5		SC					
							1.10m				
			1.30m B				Sandy CLAY: Hard, low to medium plasticity, brown to dark brown, fine grained sand				
			1.70m	1.5 / 298.0		CI-CH					
			2.00m				2.00m	D - M	H		
			B 2.30m	2.0 / 297.5		CI-CH	light brown to brown				
							2.30m				
			2.50m			CI-CH	shading lighter brown, slightly higher moisture content				
			B 2.70m	2.5 / 297.0		CI-CH	2.50m higher sand content				
			2.80m				2.70m				
			B 3.00m			SM	Silty SAND: very dense, fine to medium grained, yellow/orange brown, some clay fines, varying clay content grading toward clayey sand in parts	D - M	VD		
				3.0 / 296.5			3.00m EXCAVATION TPB15 TERMINATED AT 3.00 m No ground water encountered. Test pit backfilled on completion.				
				3.5 / 296.0							
				4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB16

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 678560.800, N: 7063094.100 (55 MGA94)
SURFACE ELEVATION : 301.700 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 30/10/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				301.5 / 0.0			Sandy CLAY: very stiff to hard, low to medium plasticity, dark grey, fine grained sand some medium grain, high silt content, grass, rootlets to 0.2m, dry	D	VSt to St		
			0.30m B			CI	0.30m slightly shading to dark brown grey, becoming dry to moist, hard				
			0.60m B	0.5		CI	0.60m becoming medium plasticity, very stiff, slight shading to dark brown grey/ dark grey brown slightly less silt content, fine grained sand content.				
			1.00m	301.0 / 1.0		CI			H		
			1.20m B			CI	1.20m becoming light brown, slight light grey brown, fine grained sand	D to M			
			1.50m	300.5 / 1.5		CI					
						SM	1.80m increasing fine grained sand content				
			2.00m B	300.0 / 2.0		SM	2.00m Silty SAND: dense, fine to medium grained, light brown/yellow brown, trace of fine grained, dry to moist		D		
			2.30m	299.5 / 2.5		SM	2.60m grading finer grains, less medium grains, increasing in clay fines content, grading toward clayey sand in pockets, shading light brown, less yellow brown, higher moisture content				
			2.70m B 3.00m	299.0 / 3.0		SM	3.20m				
				298.5 / 3.5			EXCAVATION TPB16 TERMINATED AT 3.20 m No ground water encountered. Test pit backfilled on completion.				
				298.0 / 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE / E / F / H / VH — No Resistance

WATER
- 10 Oct., 73 Water Level on Date shown
- water inflow
- water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB17

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679700.600, N: 7062784.200 (55 MGA94)
SURFACE ELEVATION : 302.500 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 9/11/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.45 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				302.5 0.0			Sandy CLAY: very stiff, medium plasticity, dark brown and grey, traces of fine grained sand, grass and rootlets to 0.15m, traces of fine to medium grained cobbles to 50mm	D	VSt		ALLUVIUM
			0.40m B			Cl	0.30m Silty CLAY: hard, medium to high plasticity, light brown to brown, slight grey brown trace of fine grained sand				
			0.80m B	302.0 0.5		Cl	0.80m XW Mudstone: extremely low strength, pale grey light brown and orange/ yellow brown, some fine grained sand content in parts with some white powdery calcide nodules >20mm diameter, easily friable, remoulds easily to clayey sand				WEATHERED ROCK
			1.10m 1.30m B	301.5 1.0			1.30m HW Sandstone: very low strength, fine to medium grained sand, pale grey, light brown and yellow/ orange brown with high fines content. Easily breaks down to sandy gravel, with some fines content. Some extremely low strength to very low strength siltstone and mudstone bands/ pockets	D to M	H		
			1.60m	301.0 1.5			1.80m varying extremely low strength, very low strength siltstone/ mudstone and sandstone bends, generally increasing in sand content in parts grading slightly coarse, breaking down to clayey sand/ silty sands in parts				1.80: Slow digging
			2.10m B 2.30m	300.5 2.0							
				300.0 2.5			2.50m less frequent sandstone bands, breaking down to clayey sand				
				299.5 3.0			2.80m EXCAVATION TPB17 TERMINATED AT 2.80 m No ground water encountered. Test pit backfilled on completion.				
				299.0 3.5							
				298.5 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB18

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679698.300, N: 7062762.700 (55 MGA94)
SURFACE ELEVATION : 302.100 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 9/11/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.45 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				302.0 / 0.0							ALLUVIUM
						CI	Sandy CLAY: very stiff, medium plasticity, dark brown and grey, fine grained sand in parts and grass and rootlets to 0.2m	D	VSt		
			0.30m B								
				301.5 / 0.5		SM	Silty SAND: medium density to dense, fine to medium grain sand, brown with varying interbedded bands/ lenses of brown silty sands and dark grey brown and sandy clay varying 10-200mm thick, generally 50:50	D to M	MD to D		
			0.70m								
			0.90m B								
			1.10m	301.0 / 1.0		CH	Silty CLAY: hard, high plasticity, dark brown and grey to black, with a trace of fine grained sand				
							1.50m				
				300.5 / 1.5		CH	trace to some fine to medium grained sand, increase in moisture content	D to M	H		
							2.00m				
				300.0 / 2.0		CH	increasing sand and moisture content				
			2.30m B				2.30m				
			2.60m	299.5 / 2.5		CH	Sandy CLAY: hard, high plasticity, dark brown grey to black, with fine to medium grain sand. Varying sand content grading, silty clay some sand content in parts	M			
							3.00m				
				299.0 / 3.0			EXCAVATION TPB18 TERMINATED AT 3.00 m No ground water encountered. Test pit backfilled on completion.				
				298.5 / 3.5							
				4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE / E / F / H / VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB19

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679696.800, N: 7062735.500 (55 MGA94)
SURFACE ELEVATION : 301.900 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 9/11/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0							ALLUVIUM
						SC	Clayey SAND: dense, high content clay fines, dark grey brown, fine to medium grained sand in parts, trace of fine to coarse angular to subrounded gravels, grass and rootlets to 0.15m, medium plasticity clay fines.				
			0.30m B 0.60m	301.5 0.5		SC	0.25m Sandy CLAY: hard, medium plasticity, light brown/ yellow brown, some fine to medium grained sand in parts	D	D to MD		
			0.80m B 1.10m	301.0 1.0		SC	0.80m Clayey SAND: dense to very dense, fine to coarse grained sand, light brown/ yellow and brown some fine to coarse gravels and cobbels to 50mm				
			1.20m B 1.50m	300.5 1.5			1.10m XW Mudstone/ Siltstone: extremely to very low strength, pale grey and light grey brown and yellow brown, varying bands pockets and sandstone bands, breaking down to clayey sand, some fine to medium gravels	D to M			WEATHERED ROCK
			2.00m B 2.30m	300.0 2.0			2.00m grading sandy with less frequent mudstone bands, breaking down to clayey sand, less weathered, higher gravel content				
				299.5 2.5			2.50m grading higher clay content, increase in grey and pale grey mudstone bands, higher moisture content	M			
				299.0 3.0			3.00m EXCAVATION TPB19 TERMINATED AT 3.00 m No ground water encountered. Test pit backfilled on completion.				
				298.5 3.5							
				298.0 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB20

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679734.900, N: 7062785.500 (55 MGA94)
SURFACE ELEVATION : 302.600 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 9/11/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.45 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0 302.5		SC	Clayey SAND: dense, fine to medium grained, medium plasticity clay fines, dark grey brown, grass and rootlets to 0.2m	D			ALLUVIUM
			0.30m B 0.50m	0.5 302.0		SC SC SC SC	0.20m shading light brown, increase in fine to medium grained sand content, increasing clayey sand and sandy clay in parts 0.30m shading dark grey brown, decreasing in fine to medium sand content 0.50m slightly ligther colour with some white powdery calcide nodules 0.70m grey brown with increasing moisture content 0.90m	D to M	D to MD		
				1.0 301.5 1.5 301.0 2.0 300.5 2.5			XW Mudstone/ Siltstone: extremely low strength, light grey brown and pale grey/ yellow brown, some sandstone bands, easily friable, breaking down to low to medium to plasticity, fine to medium grained sandy clay and silty clay. 2.60m				WEATHERED ROCK
				3.0 299.5 3.5 299.0 4.0			EXCAVATION TPB20 TERMINATED AT 2.60 m No ground water encountered. Test pit backfilled on completion.				

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
- 10 Oct., 73 Water Level on Date shown
- water inflow
- water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB21

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 2

POSITION : E: 679735.400, N: 7062760.800 (55 MGA94)
SURFACE ELEVATION : 302.600 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 9/11/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.45 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				302.5 / 0.0		SM	Silty SAND: loose to medium dense, brown , fine to coarse grained sand, trace of fine to medium rounded to sub-angular gravels. Grass and rootlets to 0.15m	D	L to MD		ALLUVIUM
				0.25m		SM	varying interbedded bands/ lenses of brown silty sand and vert stiff dark grey brown, medium plasticity, sandy clay, varying 10mm - 180mm thick generally 50-50				
				0.50m		SM	becoming dense/ very stiff/ hard		MD to D		
			0.90m B	302.0 / 0.5		SM					
				0.90m		SC	Clayey SAND: dense, medium plasticity, dark brown and grey to black, fine to coarse grained sand				
			1.30m B	301.5 / 1.0							
				1.30m		Cl	Sandy CLAY: hard, medium to high plasticity, dark brown grey with fine to medium grained sand	D to M			
			1.70m	301.0 / 1.5							
				1.70m		Cl	shading slightly to dark grey brown, increasing sand content and higher moisture content		VSt to H		
			2.20m B	300.5 / 2.0							
				2.20m		Cl	shading grey brown, decreasing sand content and higher moisture content				
				300.0 / 2.5							
				3.00m			EXCAVATION TPB21 TERMINATED AT 3.00 m No ground water encountered. Test pit backfilled on completion.				
				-3.0 / 299.5							
				3.5 / 299.0							
				4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

SMEC

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB21

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 2 OF 2

POSITION : E: 679735.400, N: 7062760.800 (55 MGA94)
SURFACE ELEVATION : 302.600 (AHD)

EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator

DATE EXCAVATED : 9/11/13
LOGGED BY : CM
CHECKED BY : JSM

EXCAVATION DIMENSIONS : 0.45 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
			6.00m 2.50m B	4.0 / 298.5 4.5 / 298.0 5.0 / 297.5 5.5 / 297.0 6.0 / 296.5 6.5 / 296.0 7.0 / 295.5 7.5 / 295.0 8.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB22

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679728.800, N: 7062726.000 (55 MGA94)
SURFACE ELEVATION : 302.600 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 9/11/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.45 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0 302.5		SM	Silty SAND: low to medium density, medium plasticity, brown, fine to medium grained sand, grass and rootlets to 0.25m	D	L to MD		ALLUVIUM
			0.40m B	0.5 302.0		SC	Clayey SAND: medium density, brown to slightly grey brown, fine to medium grained sand,	D to M	MD		
			0.70m B			SC	becoming dense, increasing clay content grading Clayey sand/ Sandy clay in parts		D		
			1.00m	1.0 301.5		CH	Sandy CLAY: hard, medium plasticity, brown to grey brown fine to medium grained sand, varying sand content, traces of silty clay in parts		H		
				1.5 301.0			XW Sandstone/ Siltstone: Extremely low strength, pale grey and yellow/ light brown and light grey brown, some mudstone bands, breaking down to low to medium plasticity sandy clay with fine to medium grained sand with some fine grained gravels				WEATHERED ROCK
				2.0 300.5			becoming very stiff, highly wheathered in parts, increasing in gravel content when broken down				
				2.5 300.0			EXCAVATION TPB22 TERMINATED AT 2.50 m No ground water encountered. Test pit backfilled on completion.				
				3.0 299.5							
				3.5 299.0							
				4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
- 10 Oct., 73 Water Level on Date shown
- water inflow
- water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB23

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679767.700, N: 7062789.900 (55 MGA94)
SURFACE ELEVATION : 303.300 (AHD)

EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator

DATE EXCAVATED : 9/11/13
LOGGED BY : CM
CHECKED BY : JSM

EXCAVATION DIMENSIONS : 0.45 m WIDE

DRILLING | MATERIAL

VE / E / F / H PENETRATION	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				303.0 / 0.0		CI	Sandy CLAY: very stiff, medium plasticity, light brown to brown, fine to medium grained sand, grass and rootlets to 0.2m	D	VSt		ALLUVIUM
				0.30m							
						CI	becoming medium to high plasticity, with dark brown grey brown				
				0.50m							
				302.5 / 0.5		CI	increase in moisture content	D to M	H		
				1.0							
				1.20m							
				302.0 / 1.5		CI	becoming hard, medium plasticity, grey brown to light grey brown and yellow/ orange brown, residual soil				RESIDUAL SOIL
				1.50m							
				301.5 / 2.0			XW Siltstone/ Mudstone: extremely low strength, light grey brown and yellow/ orange brown with some grey brown, some sandstone bands, easily friable, breaking down to low to medium plasticity, fine to medium grained sand, sandy clay and silty clay in parts				WEATHERED ROCK
				301.0 / 2.40m							
				2.5			EXCAVATION TPB23 TERMINATED AT 2.40 m No ground water encountered. Test pit backfilled on completion.				
				300.5 / 3.0							
				300.0 / 3.5							
				299.5 / 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

SMEC

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB24

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679768.100, N: 7062751.400 (55 MGA94)
SURFACE ELEVATION : 303.200 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 10/11/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.45 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				303.0 / 0.0		CI	Sandy CLAY: very stiff, medium plasticity, dark grey brown, fine to medium grained sand, grass and rootlets to 0.25m	D	VSt		ALLUVIUM
				0.25m							
				302.5 / 0.5		SM	Silty SAND: medium dense, brown/ dark grey brown, fine to coarse grained sand, varying interbedded bands/ lenses of silty sand and very stiff, medium plasticity sandy clay, varying 10-120mm thick	D to M	MD		
				1.10m							
				302.0 / 1.0		SM	Sand: medium dense to dense, light brown to brown, trace of silt content, trace of fine to medium grained sand				
				1.60m							
			1.70m B 2.00m	301.5 / 1.5		SC	Clayey SAND: dense, fine to medium grained, medium plasticity fines, yellow brown, sand, grading clayey sand in parts		MD to D		
				2.10m							
			2.20m B 2.50m	301.0 / 2.0		SC	becoming yellow brown, fine to coarse grained sand, some fine to coarse rounded to sub-angular gravels and cobbels to 150mm	M			
				2.40m							
				2.5 / 300.5		SC	grading coarser sands, increase in gravel content, decreasing in clay content, grading gravelly sand in parts		D		
				3.00m							
				3.0 / 300.0			EXCAVATION TPB24 TERMINATED AT 3.00 m No ground water encountered. Test pit backfilled on completion.				
				3.5 / 299.5							
				4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB25

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679771.700, N: 7062714.600 (55 MGA94)
SURFACE ELEVATION : 303.600 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 10/11/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.45 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				303.5 / 0.0		SM	Silty SAND: lose, brown, fine to coarse grained sand, grass and rootlets to 0.2m	D	L		ALLUVIUM
				0.40m							
				303.0 / 0.5		CL	Sandy CLAY: very stiff, low to medium plasticity, dark brown grey to black, fine to medium grained sand				
			0.60m B	0.60m			becoming medium plasticity, dark grey brown and grey brown, decreasing in sand content	D to M	VSt		
			1.00m	302.5 / 1.0		CI					
				302.0 / 1.5							
			1.90m B	1.90m							
				2.0		CI	Sandy CLAY: very stiff to hard, medium to high plasticity, light brown/ yellow brown and slight light grey brown, fine to medium grained sand, grading sandy clay in parts	M	H		
			2.20m B	2.10m		CI	becoming hard, low plasticity, light yellow brown, fine to coarse grained sand, some rounded to subangular fine to coarse gravels and cobbles to 80mm, grading clayey sand in parts				
			2.50m	301.5 / 2.40m							
				2.5 / 301.0		SM	Silty SAND: dense, light yellow brown, fine to coarse grained sand, some rounded to sub angular fine to coarse gravels and boulders to 250mm		D		
				2.70m							
							EXCAVATION TPB25 TERMINATED AT 2.70 m No ground water encountered. Test pit backfilled on completion.				
				3.0 / 300.5							
				3.5 / 300.0							
				4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

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EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB26

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679798.200, N: 7062789.900 (55 MGA94)
SURFACE ELEVATION : 304.100 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 10/11/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				304.0 / 0.0			Sandy CLAY: very stiff, medium plasticity, dark grey brown, fine to medium grained sand, grass and rootlets to 0.3m	D	VSt		ALLUVIUM
			0.30m B 0.60m	303.5 / 0.5		CI	Silty CLAY: hard, medium to high plasticity, dark grey brown, traces of fine to medium grained sand		H		
			0.90m B 1.20m	303.0 / 1.0			XW Mudstone/ Siltstone: extremely low strength, pale grey and yellow brown, laminated, friable, break down to medium plasticity silty clay				WEATHERED ROCK
				302.5 / 1.5			HW Siltstone/ Sandstone: extremely to very low strength, pale grey and yellow brown, breakes down to gravelly fine to medium grained sand and some fines	D to M			
				302.0 / 2.0			increase in fine to coarse grained sand, sandstone beds, decreasing fines content				
				301.5 / 2.5							
				301.0 / 3.0			EXCAVATION TPB26 TERMINATED AT 2.90 m No ground water encountered. Test pit backfilled on completion.				
				300.5 / 3.5							
				4.0							

1.50m
2.30m
2.90m

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

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SMEC BRISBANE LIBRARY - COLOUR.GLB Log TEST PIT ROMA FLOOD LEVEE.GPJ <<DrawingFile>> 12/03/2014 12:58 8.2.900

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB27

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679811.800, N: 7062756.500 (55 MGA94)
SURFACE ELEVATION : 303.600 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 10/11/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				303.5 / 0.0		CI	Sandy CLAY: very stiff, medium plasticity, dark brown grey, fine to medium grained sand, grass and rootlets to 0.25m	D	VSt		ALLUVIUM
				0.25m		SM	Silty SAND: medium density, dark grey brown, fine to coarse grained sand, interbedded bands/ layers of silty sand and very stiff, medium plasticity with dark grey brown sandy clay, 10-50mm thick	D to M	MD		
			0.50m B 0.80m	303.0 / 0.5		CI	Sandy CLAY: hard, medium plasticity, dark brown grey to black, fine to medium grained sand		H		
			1.50m B 2.00m	302.5 / 1.0 / 1.5		SC	Clayey SAND: dense, light brown, fine grained with some white powdery calcite nodules <15mm diameter.		D		
			2.40m B 2.70m	302.0 / 2.0		SC	higher sand content, some white fines, higher moisture content, fewer white calcite nodules.				WEATHERED ROCK
				301.5 / 2.5			XW Siltstone/ Mudstone: extremely low strength, light brown/ yellow brown, pale grey and white, interbedded, some fine to medium grain sandstone bands. very low strength/ highly weathered in parts, breaks down to clayey sand, some fine to medium gravels.				
				301.0			HW Sandstone: extremely to very low strength, fine to coarse grained sand, light brown and yellow/ orange brown and grey brown, breaks down to gravelly sand, some fines, some siltstone bands.				
				2.90m / 3.0 / 300.5 / 3.5 / 300.0 / 4.0			EXCAVATION TPB27 TERMINATED AT 2.90 m No ground water encountered. Test pit backfilled on completion.				

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB28

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679819.100, N: 7062730.700 (55 MGA94)
SURFACE ELEVATION : 303.700 (AHD)

EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator

DATE EXCAVATED : 10/11/13
LOGGED BY : CM
CHECKED BY : JSM

EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0 303.5		CI	Sandy CLAY: very stiff, medium plasticity, dark brown and grey, fine to medium grained sand, grass and rootlets to 0.2m	D	VSt		ALLUVIUM
				0.30m 0.5		SM	Silty SAND: medium density, brown, fine to coarse grained sand, varying interbedded bands/ layers of silty sand and very stiff, medium plasticity with dark grey brown sandy clay, 10/80mm thick	D to M	MD		
			0.60m B 1.00m	303.0 1.0		CI	Sandy CLAY: high plasticity, dark brown grey to black, fine grained sand, silty clay in parts		H		
				1.00m 302.5 1.5		CI	becoming medium to high plasticity, brown, some dark gray brown mottling, some white calcite nodules <20mm in diameter				
			1.70m B 2.00m	1.60m 302.0 2.0		CH	Silty CLAY: hard, high plasticity, dark grey brown, trace of fine grained sand				
				2.60m 301.5 2.5			EXCAVATION TPB28 TERMINATED AT 2.60 m No ground water encountered. Test pit backfilled on completion.				
				301.0 3.0							
				300.5 3.5							
				300.0 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

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EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB29

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 677940.067, N: 7062760.726 (55 MGA94)
SURFACE ELEVATION : 300.880 (AHD)

EQUIPMENT TYPE : SUMITOMO Excavator 20T
METHOD : Excavator

DATE EXCAVATED : 11/11/13
LOGGED BY : CM
CHECKED BY : JSM

EXCAVATION DIMENSIONS : 1.00 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0			Sandy CLAY: very stiff, medium to high plasticity, dark brown, grey, fine to medium grained sand, grass and rootlets to 0.15m		VSt		ALLUVIUM
			0.30m B 0.60m	0.5		CH	0.30m becoming hard 0.60m				
			0.70m B 1.00m	300.0 1.0		CH	shading light brown, some white powdery calcite nodules <15mm diameter 1.00m				
						CH	less frequent white nodules 1.50m				
			1.60m B 1.80m	1.5		CH	shading dark brown grey/ grey brown, some white powdery calcite nodules <5mm diameter, traces of fine grained sand		H		
			2.40m B 2.60m	299.0 2.0 2.5		CH	2.40m Sandy CLAY: hard, medium plasticity, light grey brown with slight yellow brown, fine grained sand	D to M			2.40: Slow digging. Tapered sides of excavations. Change to 0.6m wide bucket and single tooth ripper.
			3.50m B 3.90m	298.0 3.0 3.5		CL	3.40m becoming low plasticity, light grey brown, pale grey and grey brown mottles, high fine to coarse grained sand content, grading clayey sand in parts				
			4.30m B 4.60m	297.0 4.0 4.5		SC	4.10m Clayey SAND: very dense, light grey brown, pale grey and yellow/ orange brown mottled, fine to coarse grained sand, variable grading sandy clay in parts		VD		
				296.0 5.0		SM	5.10m Silty SAND: dense, light grey brown to white weakly cemented in parts 5.30m		D		
				5.5			EXCAVATION TPB29 TERMINATED AT 5.30 m No ground water encountered. Test pit backfilled on completion.				
				295.0 6.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
- 10 Oct., 73 Water Level on Date shown
- water inflow
- water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB30

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 677934.061, N: 7062789.307 (55 MGA94)
SURFACE ELEVATION : 300.965 (AHD)

EQUIPMENT TYPE : SUMITOMO Excavator 20T
METHOD : Excavator

DATE EXCAVATED : 11/11/13
LOGGED BY : CM
CHECKED BY : JSM

EXCAVATION DIMENSIONS : 1.00 m WIDE

DRILLING | MATERIAL

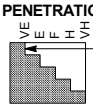
VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
			0.30m B 0.60m	0.0 0.5		CI	Silty CLAY: very stiff, medium plasticity, dark brown grey, fine to medium grained sand, grass and rootlets to 0.2m 0.30m becoming hard 0.60m		VSt		ALLUVIUM
			0.70m B 1.00m	300.0 1.0		CI	shading light brown, some white powdery calcite nodules <15mm diameter 1.00m				
			1.50m B 1.80m	1.5		CI	less frequent white nodules 1.50m shading dark brown grey/ grey brown, some white powdery calcite nodules <5mm diameter, traces of fine grained sand		H		
			2.30m B 2.50m	299.0 2.0		CI	2.40m Sandy CLAY: hard, medium plasticity, light grey, brown with slight yellow brown, fine grained sand	D to M			
			3.10m B 3.40m	298.0 3.0		CI	3.40m becoming low plasticity, light grey brown, pale grey and grey brown mottles, high fine to coarse grained sand content, grading clayey sand in parts.		H		3.00: Slow digging. Tapered sides of excavations. Change to 0.6m wide bucket and single tooth ripper.
			4.20m B 4.50m 4.60m B 4.80m	297.0 4.0 4.5		CL	4.60m Clayey SAND: very dense, light grey brown, pale grey and yellow/ orange brown mottled, fine to coarse grained sand, variable grading sandy clay in parts		VD		
				296.0 5.0		SC	5.10m Silty SAND: dense, light grey brown to white weakly cemented in parts		D		
				5.5		SM	5.40m EXCAVATION TPB30 TERMINATED AT 5.40 m No ground water encountered. Test pit backfilled on completion.				
				295.0 6.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION



No Resistance

WATER

10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB31

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 677967.614, N: 7062790.223 (55 MGA94)
SURFACE ELEVATION : 299.536 (AHD)

EQUIPMENT TYPE : SUMITOMO Excavator 20T
METHOD : Excavator

DATE EXCAVATED : 12/11/13
LOGGED BY : CM
CHECKED BY : JSM

EXCAVATION DIMENSIONS : 1.00 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0		SC	Silty SAND: loose, brown, fine to medium grained		L		ALLUVIUM
				0.20m			Silty CLAY: stiff to very stiff, medium to high plasticity, dark grey brown, trace of fine grained sand				
				0.5		CI-CH					
			0.70m B	299.0					St to VSt		
			1.00m	0.70m		CI-CH	shading grey brown, stiff, yellow brown, trace to no fine grained sand in parts				
				1.0							
				1.00m		CI-CH	shading light brown/ yellow, slight decrease in moisture content				
				1.5							
			1.70m B	298.0							
			2.00m	1.70m		CI	Sandy CLAY: very stiff, medium to high plasticity, yellow brown and pale grey mottled, fine to medium grained sand, some silt fines	M			
				2.0							
				2.5							
				297.0							
				2.80m			becoming low to medium plasticity, increase in sand content and grading fine to coarse grained sand, higher silt content		VSt		
			3.00m B	3.0							
			3.30m			CI					
				3.5							
				296.0							
				4.00m			Clayey SAND: dense, pale grey and light yellow/ orange, fine to coarse grained sand, varying clay fines content, decreasing with depth		D		
				4.0		SC		D to M			
				4.5							
				295.0							
				4.60m			Silty SAND: dense, pale grey to light grey brown and yellow brown, fine to coarse grained sand		D		
				5.0		SM					
				5.00m			EXCAVATION TPB31 TERMINATED AT 5.00 m No ground water encountered. Test pit backfilled on completion.				
				5.5							
				294.0							
				6.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

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EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB33

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 677895.510, N: 7062940.236 (55 MGA94)
SURFACE ELEVATION : 301.895 (AHD)

EQUIPMENT TYPE : SUMITOMO Excavator 20T
METHOD : Excavator

DATE EXCAVATED : 12/11/13
LOGGED BY : CM
CHECKED BY : JSM

EXCAVATION DIMENSIONS : 1.00 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0			Sandy CLAY: very stiff to hard, medium plasticity, dark brown, fine to medium grained sand, grass and rootlets to 0.2m	D	VSt to H		ALLUVIUM
			0.30m B 0.60m	0.5		CI	becoming hard				
			1.00m B 1.30m	301.0 1.0		CI	shading light brown/ yellow brown, increasing fine to medium grain sand content		H		
				1.5		CI	increasing sand content with depth, grading clayey sand in parts				
				300.0 2.0		SC	Silty SAND: dense, light brown yellow brown, some clay fines in parts, fine to medium grain sand	D to M			
				2.5		SC	decreasing clay fines content		D		
				299.0 3.0		SC	shading light grey brown and light brown, yellow brown, decreasing in moisture content				
				298.0 4.0			EXCAVATION TPB33 TERMINATED AT 4.30 m No ground water encountered. Test pit backfilled on completion.				
				4.5 297.0 5.0 5.5 296.0 6.0							

0.30m | 1.80m | 3.20m | 4.30m

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB34

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 678052.110, N: 7063041.470 (55 MGA94)
SURFACE ELEVATION : 301.160 (AHD)

EQUIPMENT TYPE : SUMITOMO Excavator 20T
METHOD : Excavator

DATE EXCAVATED : 13/11/13
LOGGED BY : CM
CHECKED BY : JSM

EXCAVATION DIMENSIONS : 1.00 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
			0.40m B	301.0 / 0.0		CI-CH	Silty CLAY: very stiff, medium to high plasticity, dark grey brown trace of fine grained sand		VSt		ALLUVIUM
			0.60m B	0.5							
			0.90m B	1.0		CI	Sandy CLAY: hard, medium plasticity, light brown to brown, fine to medium grained sand, occasional white calcite nodules, some grey brown mottles and staining				
				300.0 / 1.30m			shading light brown yellow brown, increasing in moisture, occasional brown staining				
			2.00m B	1.5		CI					
			2.40m	2.0					H		
				299.0 / 2.60m			shading yellow brown, light off grey brown, without white nodules, slight increase in moisture content	D to M			
			3.00m B	2.5							
			3.40m	3.0		CI					
				298.0							
				3.5							
				4.0							
				297.0 / 4.20m							
				4.5		SM	Silty SAND: dense to very dense, light to yellow brown, fine to medium grained sand		D to VD		
				4.60m							
						SP	SAND: dense, light yellow brown, fine to medium grained sand, trace of fines		D		
				5.0 / 5.00m			EXCAVATION TPB34 TERMINATED AT 5.00 m No ground water encountered. Test pit backfilled on completion.				
				296.0							
				5.5							
				6.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
- 10 Oct., 73 Water Level on Date shown
- water inflow
- water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB36

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 678070.194, N: 7063016.144 (55 MGA94)
SURFACE ELEVATION : 301.220 (AHD)

EQUIPMENT TYPE : SUMITOMO Excavator 20T
METHOD : Excavator

DATE EXCAVATED : 12/11/13
LOGGED BY : CM
CHECKED BY : JSM

EXCAVATION DIMENSIONS : 1.00 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
			0.20m B 0.40m	301.0 0.0		CI-CH	Silty CLAY: very stiff, medium to high plasticity, dark grey brown, traces of fine grained sand, grass and rootlets to 0.15m	D	VSt		ALLUVIUM
				0.20m		CI-CH	becoming very stiff to hard		VSt to H		
			B 0.60m	0.40m 0.5		CI	Sandy CLAY: hard, medium plasticity, light brown to brown, fine to medium grained sand, occasional white calcite nodules <20mm diameter, light brown/ yellow brown shading				
			1.00m B 1.30m	0.90m 300.0 1.0 1.5		CI	shading light brown/ yellow brown				
			2.20m B 2.40m	2.10m 299.0 2.0 2.5		CI	shading light brown slight grayish brown, some white powdery calcite nodules	D to M	H		
			3.60m B 3.90m	3.60m 298.0 3.0 3.5		CL-CI	becoming low to medium plasticity, light yellow brown/ light grey brown, fine grained sand content, higher silt content				
				4.10m 297.0 4.0		SM	Silty SAND: dense to very dense, yellow brown, fine to medium grained		D to VD		
				4.60m 4.5		SC	SAND: dense, light yellow brown, fine to medium grained, trace of fines		D		
				4.80m 296.0 5.0 5.5 6.0			EXCAVATION TPB36 TERMINATED AT 4.80 m No ground water encountered. Test pit backfilled on completion.				

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
- 10 Oct., 73 Water Level on Date shown
- water inflow
- water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB37

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 678049.585, N: 7062997.314 (55 MGA94)
SURFACE ELEVATION : 301.164 (AHD)

EQUIPMENT TYPE : SUMITOMO Excavator 20T
METHOD : Excavator

DATE EXCAVATED : 13/11/13
LOGGED BY : CM
CHECKED BY : JSM

EXCAVATION DIMENSIONS : 1.00 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0 301.0		CI-CH	Silty CLAY: very stiff, medium to high plasticity, dark grey brown, traces of fine grained sand, grass and rootlets to 0.2m		VSt		ALLUVIUM
			0.30m B 0.50m	0.20m		CI-CH	becoming very stiff to hard		VSt to H		
			0.60m B 0.80m	0.5 0.50m			Sandy CLAY: hard, medium plasticity, light brown to brown, fine to medium grained sand, some white calcite nodules <15mm diameter, light greyish brown				
				1.0 300.0		CI					
			1.60m B 1.90m	1.5 1.50m			shading light brown/ yellow brown, increase in moisture content, decreasing whilte calcite nodules				
				2.0 299.0		CI					
			2.70m B 3.00m	2.5 2.50m			shading yellow brown, slight light grey brown without white nodules with occasional grey brown staining, slight increase in fine to medium grained sand content	D to M	H		
				3.0 298.0		CI					
			3.50m B 3.70m	3.5 3.50m			varying sand content				
				4.0		CI					
				297.0 4.20m			Silty SAND: dense, light yellow brown, fine to medium grained sand, slight light grey brown		D		
				4.5 4.60m		SM	SAND: dense to very dense, light yellow brown and light grey brown, fine to medium grain sand, traces of fines		D to VD		
				5.0 5.00m 296.0		SC	EXCAVATION TPB37 TERMINATED AT 5.00 m No ground water encountered. Test pit backfilled on completion.				
				5.5							
				6.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
- 10 Oct., 73 Water Level on Date shown
- water inflow
- water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB38

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 678911.988, N: 7063046.991 (55 MGA94)
SURFACE ELEVATION : 301.333 (AHD)

EQUIPMENT TYPE : SUMITOMO Excavator 24T
METHOD : Excavator

DATE EXCAVATED : 27/11/13
LOGGED BY : CM
CHECKED BY : JSM

EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0			Silty SAND: loose, medium to high plasticity, brown to dark brown, fine to medium grained sand, varying clay fines, grass and rootlets to 0.25mm thick to 0.7m				ALLUVIUM
				301.0 0.5		SM			L		
				0.70m			becoming medium dense, increasing in clay fines content, variable	D to M			
				1.0		SM			MD		
			1.30m B 1.50m	1.30m 300.0 1.5		CI	Sandy CLAY: very stiff, medium plasticity, grey brown and some pale grey to grey mottling in parts, varying fine to medium grained sand content				
				1.70m			becoming brown to dark brown, slight greyish brown, fine to medium grained sand				
			2.00m B 2.30m	2.0							
				299.0 2.5		CI		M	VSt		
				3.0							
				298.0 3.5							
				3.80m			Silty SAND: dense, grey brown, fine to medium grained sand, high silt content				
			4.00m B 4.30m	4.0					D		
				297.0 4.5		CI					
				5.00m			becoming light brown and light grey brown, fine to medium grained sand, slight light grey brown, grading less fines with depth				
				5.0				D to M			
				296.0 5.5		SM					
				5.80m			EXCAVATION TPB38 TERMINATED AT 5.80 m No ground water encountered. Test pit backfilled on completion.				
				6.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

SMEC

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB39

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 678897.169, N: 7063121.187 (55 MGA94)
SURFACE ELEVATION : 301.489 (AHD)
EQUIPMENT TYPE : SUMITOMO Excavator 24T
METHOD : Excavator
DATE EXCAVATED : 27/11/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0		SM	Silty SAND: brown to dark brown, fine to medium grained sand, varying clay fines, grass and rootlets to 0.3m	M	L		ALLUVIUM
				0.30m			becoming medium dense	D to M	MD		
			1.00m B	301.0 0.5 1.0		SM					
				1.20m			Sandy CLAY: very stiff, medium plasticity, grey brown occasional pale grey to grey mottled, fine to medium grained sand		VSt		
			1.50m	300.0 1.5		Cl					
				1.60m			becoming light brown, orange brown and grey brown, finely mottled, fine to medium grained sand				
				2.0		Cl					
			2.20m B	2.20m			Clayey SAND: dense, light brown, fine to medium grained sand, some clay fines in parts				
			2.50m	299.0 2.5		Cl					
				2.90m			Silty SAND: dense, light brown, fine to medium grained sand, some clay fines in parts		D		
				3.0		SM					
				298.0 3.5							
				3.70m			grading less fines content, shading light brown/ slightly yellow brown				
				4.0		SM					
				4.40m			varying fines-content in bands				
				297.0 4.5		SM					
				5.0							
				5.20m			EXCAVATION TPB39 TERMINATED AT 5.20 m No ground water encountered. Test pit backfilled on completion.				
				296.0 5.5 6.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB40

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 678902.121, N: 7063096.366 (55 MGA94)
SURFACE ELEVATION : 301.499 (AHD)
EQUIPMENT TYPE : SUMITOMO Excavator 24T
METHOD : Excavator
DATE EXCAVATED : 27/11/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0		SM	Silty SAND: loose, brown to dark brown, fine to medium grained sand, varying clay fines, grass and rootlets to 0.3m	D to M	L		ALLUVIUM
				0.40m							
				301.0 0.5		SM	becoming medium dense	D	MD		
				0.90m							
				1.0		SM	increasing clay fines in parts				
				1.20m							
			1.30m B 1.60m	300.0 1.5		Cl	Clayey SAND: very dense, grey brown and pale grey to grey mottled in parts, high clay content, medium plasticity,		VSt		
				1.70m							
			2.00m B 2.50m	2.0		Cl	Sandy CLAY: very stiff, medium plasticity, light brown orange brown and grey brown mottled in parts, some clayey sand lenses				
				299.0 2.5							
				3.0		SM	Silty SAND: dense, light brown slight yellow brown, fine to medium grained sand, some clay fines in parts	D to M			
				3.50m							
				298.0 3.5			grading less fines content		D		
				4.0		SM					
				297.0 4.5							
				4.70m			some pale grey and yellow orange brown, sandy silt and clayey silt bands, gradual increase in fines content				
				5.0		SM					
				5.30m			EXCAVATION TPB40 TERMINATED AT 5.30 m No ground water encountered. Test pit backfilled on completion.				
				296.0 5.5							
				6.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

SMEC

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB41

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 678906.986, N: 7063072.247 (55 MGA94)
SURFACE ELEVATION : 301.397 (AHD)
EQUIPMENT TYPE : SUMITOMO Excavator 24T
METHOD : Excavator
DATE EXCAVATED : 27/11/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.60 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0		SM	Silty SAND: loose, brown to dark brown, fine to medium grained sand, varying clay fines, grass and rootlets to 0.2m	D to M	L		ALLUVIUM
				301.0 0.5			0.50m				
						SM	becoming medium dense		MD		
				1.0			1.20m				
			1.30m B 1.50m	300.0 1.5		SM	Clayey SAND: dense, light brown grey, fine to medium grained sand, varying clay content, grading sandy clay in parts	D	D		
							1.80m				
			2.00m B 2.30m	2.0		CI	Sandy CLAY: very stiff, medium plasticity, light brown to brown slightly grey brown, fine to medium grained sand, some clayey sand lenses		VSt		
				299.0 2.5							
				3.0			3.30m				
				298.0 3.5		SM	Silty SAND: dense, yellow brown, fine to medium grained sand	D to M			
							3.60m				
						SM	increase in moisture content				
				4.0			4.20m		D		
				297.0 4.5		SM	shading yellow/ orange brown in parts, varying clay fines, grading clayey sand in parts, increase in moisture content				
				5.0			5.00m				
						SM	decrease in fines content, shading light yellow brown/ light grey brown				
				296.0 5.5			5.50m				
							EXCAVATION TPB41 TERMINATED AT 5.50 m No ground water encountered. Test pit backfilled on completion.				
				6.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

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EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB42

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 678092.404, N: 7062356.942 (55 MGA94)
SURFACE ELEVATION : 303.080 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 18/12/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.45 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				303.0 / 0.0		SM	Silty SAND: loose to medium dense, fine to medium grained, brown, grass and rootlets to 0.15m depth	D	L to MD		ALLUVIUM
							0.20m				
						SM	trace of clay fines		MD to D		
				302.5 / 0.5			0.50m				
						CI	shading ligth brown and grey, increasing in clay fines content				
			0.70m				0.70m				
			B			CI	Sandy CLAY: very stiff to hard, medium plasticity, grey, slight brown grey and some yellow brown, fine to medium grained sand	D to M	VSt to H		
			1.00m				1.00m				
			1.20m	302.0 / 1.0			shading yellow brown, brown, some brown grey/grey, increase in moisture content				
			B			CI					
			1.50m								
				301.5 / 1.5			1.70m				
			1.80m				Silty SAND: dense, fine to medium grained yellow brown, varying in fines content, grading silty sand in lenses some sandy clay lenses/bands.				
			B			SC			D		
			2.10m	301.0 / 2.0			2.10m				
						SC	Sandy CLAY: very stiff to hard, medium to high plasticity, ligth yellow brown, fine to medium grained sand	M			
			2.50m				2.50m		VSt to H		
			B	300.5 / 2.5			high silt content, grading silty clay / clayey silt in parts				
			2.80m			SC					
							3.00m				
				300.0 / 3.0			EXCAVATION TPB42 TERMINATED AT 3.00 m No ground water encountered. Test pit backfilled on completion.				
				299.5 / 3.5							
				4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB43

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 678131.573, N: 7062359.779 (55 MGA94)
SURFACE ELEVATION : 302.999 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 18/12/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0			Silty SAND: loose to medium dense, fine to medium grained brown, grass and rootlets to 0.15m	D	L to MD		ALLUVIUM
						SM					
				0.40m			shading ligth grey brown, some clay fines content		MD to D		
				302.5 0.5		SM					
				0.60m			increasing clay fines content				
			0.70m B	0.70m		SM		D to M			
							Sandy CLAY: very stiff to hard, medium plasticity, ligth yellow brown and pale grey, fine to medium grained sand				
			1.00m	302.0 1.0		CI					
				1.40m			Silty CLAY: very stiff to hard, medium to high plasticity, grey slight brown grey, some ligth brown yellow brown, trace to some fine grained sand content		VSt to H		
			1.50m B								
			1.80m	301.5 1.5		CI-CH					
				301.0 2.0							
				2.20m			shading less ligth brown/yellow brown	M			
			2.50m B	300.5 2.5		CI-CH					
			2.80m								
				3.00m							
				300.0 3.0			EXCAVATION TPB43 TERMINATED AT 3.00 m No ground water encountered. Test pit backfilled on completion.				
				299.5 3.5							
				299.0 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

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EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB44

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 678170.320, N: 7062362.000 (55 MGA94)
SURFACE ELEVATION : 302.824 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 18/12/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0 / 302.824		SM	Clayey SAND: loose to medium dense, fine to medium grained, brown, ligth brown and ligth grey brown, some clayey sand and sandy clay lenses pockets, grass and rootlets to 0.15m	D	L to MD		ALLUVIUM
			0.30m B 0.50m	0.5 / 302.5		CL-CI	becoming ligth grey brown and yellow brown, fine to medium grained sand.				
			1.20m B 1.50m	1.0 / 302.0 1.5 / 301.5		CL-CI	Sandy CLAY: very stiff to hard, medium plasticity, yellow brown, varying fine grained sand content	D to M	VSt to H		
			2.40m B 2.70m	2.0 / 301.0 2.5 / 300.5		CI	shading less ligth grey brown, more yellow brown Silty CLAY: very stiff to hard, medium plasticity, yellow brown, varying fine grained sand content.	M			
				3.0 / 300.0 3.5 / 299.5 4.0 / 299.0			EXCAVATION TPB44 TERMINATED AT 3.00 m No ground water encountered. Test pit backfilled on completion.				

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB45

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679283.399, N: 7062806.446 (55 MGA94)
SURFACE ELEVATION : 299.838 (AHD)

EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator

DATE EXCAVATED : 13/1/14
LOGGED BY : CM
CHECKED BY : CM

EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0			Sandy CLAY: stiff to very stiff, medium to high plasticity, dark brown grey, varying fine grained sand content, grass, rootlets and organic content to 50mm depth, grading silty clay with some fine sand content in parts				ALLUVIUM
			0.50m B	0.5							
			1.00m	299.0 1.0		CI-CH		D	St to VSt		
				1.5							
							1.80m				
				298.0 2.0		CI-CH	becoming firm to stiff, moist (base of dam)		F to St		
			2.20m B				2.10m becoming medium plasticity, light brown to brown, some dark grey brown mottling,				
			2.50m	2.5		CI	2.60m				
			2.80m B				showing slightly darker, varying sand content	M			
			3.20m	297.0 3.0		CI			St		
				3.5			3.60m				
						SM	Silty SAND: medium dense to dense, fine to medium grained, light brown, slightly yellow brown				
				296.0 4.0			4.00m shading light brown to brown				
				4.5		SM					
				295.0 5.0			5.00m EXCAVATION TPB45 TERMINATED AT 5.00 m No ground water encountered. Test pit backfilled on completion.				
				5.5							
				294.0 6.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

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EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB46

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679196.899, N: 7062801.784 (55 MGA94)
SURFACE ELEVATION : 299.971 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 13/1/14
LOGGED BY : CM
CHECKED BY : CM
EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
			0.30m B 0.70m	0.0 / 299.5 / 0.5		CI-CH	Sandy CLAY: very stiff to hard, medium to high plasticity, dark grey, brown, fine grained sand, grass and rootlets to 0.15m		VSt to H		ALLUVIUM
			0.80m B 1.20m	0.70m			fine to medium grained sand, shading grey brown, without rootlets				
				299.0 / 1.0		CI-CH		D to M			
			1.40m B 1.80m	1.30m			Clayey SAND: fine to medium grained, light brown, slight yellow brown, medium plasticity clay fines				
				298.5 / 1.5		SC					
				298.0 / 2.0					D		
				2.50m			Silty SAND: dense, fine to medium grained, light brown, slight yellow brown, with varying clay fines content				
				297.5 / 2.5		SM		M			
				297.0 / 3.0							
				3.50m			decreasing clay fines content				
				296.5 / 3.5		SM					
				4.00m			EXCAVATION TPB46 TERMINATED AT 4.00 m No ground water encountered. Test pit backfilled on completion.				
				296.0 / 4.0							
				295.5 / 4.5							
				295.0 / 5.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

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EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB47

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679171.985, N: 7062926.630 (55 MGA94)
SURFACE ELEVATION : 300.372 (AHD)

EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator

DATE EXCAVATED : 13/1/14
LOGGED BY : CM
CHECKED BY : CM

EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

PENETRATION (VE, E, F, H)	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				300.0	0.0			Silty CLAY: very stiff to hard, medium to high plasticity, grey brown, slightly dark, trace of fine grained sand, grass and rootlets to 0.2m	D	VSt to H		ALLUVIUM
			0.50m B 0.80m	299.5	0.5		CI-CH					
				299.0	1.0							
					1.30m			shading light brown to brown, occasional white powdery calcite nodules < 10mm diameter, varying sand content				
				298.5	1.5		CI-CH		D to M			
			1.80m B 2.20m		1.60m			Clayey SAND: dense, light brown to brown, slightly grey brown, fine to medium grained sand, medium plasticity fines, occasional white powdery calcite nodules.				
			2.40m B 2.70m	298.0	2.0		SC			MD to D		
					2.40m			decrese in clay content				
				297.5	2.5		SC					
					2.80m			Silty SAND: medium dense to dense, fine to medium grained, light brown/yellow brown				
				297.0	3.0		SM					
				296.5	3.5							
					4.00m			EXCAVATION TPB47 TERMINATED AT 4.00 m No ground water encountered. Test pit backfilled on completion.				
				296.0	4.0							
					4.5							
				295.5	5.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
- 10 Oct., 73 Water Level on Date shown
- water inflow
- water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB48

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679221.757, N: 7062935.324 (55 MGA94)
SURFACE ELEVATION : 300.559 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 13/1/14
LOGGED BY : CM
CHECKED BY : CM
EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / E / F / H PENETRATION	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				300.5 / 0.0			Sandy CLAY: very stiff to stiff, medium to high plasticity, dark grey brown, trace of fine grained sand, grass and rootlets to 0.2m.				ALLUVIUM
			0.50m B 0.80m	300.0 / 0.5		CI-CH	0.50m slight increase in moisture content, shading lighter	D	VSt to H		
			1.30m B 1.70m	299.5 / 1.0		CI-CH	1.20m becoming very stiff to hard, medium plasticity, dark brown slightly grey brown, fine to medium grained sand				
			1.90m B 2.30m	299.0 / 1.5		CI	1.80m Clayey SAND: dense, shading light brown to brown occasional white powdery calcite nodules				
				298.5 / 2.0		SC	2.30m Silty SAND: dense fine to medium grained, light brown slight yellow brown, varying clay fines content	D to M	D		
				298.0 / 2.5		SM					
				297.5 / 3.0		SM	3.20m decreasing clay fines content, shading lighter				
				297.0 / 3.5			3.70m EXCAVATION TPB48 TERMINATED AT 3.70 m No ground water encountered. Test pit backfilled on completion.				
				296.5 / 4.0							
				4.5							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB49

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679307.623, N: 7062925.097 (55 MGA94)
SURFACE ELEVATION : 300.782 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 13/1/14
LOGGED BY : CM
CHECKED BY : CM
EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0							ALLUVIUM
			0.30m B 0.60m	300.5 0.5		CI-CH	Sandy CLAY: very stiff to hard, medium to high pasticity, dark, grey brown, trace of fine grained sand, grass and rootlets to 0.2m	D	VSt to H		
			0.70m B 1.00m	300.0 1.0		SC	0.60m Clayey SAND: dense, brown, fine to medium grained, medium plasticity clay fines	D to M			
				299.5 1.5		SM	1.20m Silty SAND: fine to medium grained, dense, slight grey brown, dark grey brown				
				299.0 2.0		SM	1.80m increase in sand content slightly coarse, grading clayey sand in parts, shading light brown,		D		
			2.40m B 2.60m	298.5 2.5		SM	2.70m fine to medium grained, light brown/yellow brown, varying clay fines content.	D			
				298.0 3.0		SM	3.40m decrease in clay fines content, shading lighter				
				297.5 3.5		SM	3.90m EXCAVATION TPB49 TERMINATED AT 3.90 m No ground water encountered. Test pit backfilled on completion.				
				297.0 4.0							
				296.5 4.5							
				296.0 5.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB50

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679309.279, N: 7062844.696 (55 MGA94)
SURFACE ELEVATION : 300.342 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 14/1/14
LOGGED BY : CM
CHECKED BY : CM
EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				300.0 0.0			Silty CLAY: very stiff to hard, medium to high plasticity, dark grey brown, trace of fine grained sand, grass and rootlets to 0.1m	D			ALLUVIUM
			0.70m B 1.00m	299.5 0.5		CI-CH	0.70m Sandy CLAY: very stiff to hard, medium to high plasticity, brown grey slightly dark, fine grained sand		VSt to H		
			1.20m B 1.60m	299.0 1.0		CI-CH	1.00m shading dark, grey brown				
			2.00m B 2.40m	298.5 1.5		CI-CH	1.80m fine grained sand, light brown to brown, occasional white powdery calcite nodules <5mm diameter	D to M			
			B 2.80m	298.0 2.0		CI-CH	2.40m fine grained sand content, light brown slight yellow brown, occasional white powdery calcite nodules, < 8mm diameter, increase sand content grading clayey sand in parts.				
				297.5 2.5		CI-CH	2.80m Silty SAND: dense, fine to medium grained, yellow brown		D		
				297.0 3.0		SM					
				296.5 3.5							
				296.0 4.0			4.00m EXCAVATION TPB50 TERMINATED AT 4.00 m No ground water encountered. Test pit backfilled on completion.				
				295.5 4.5							
				5.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB51

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679313.119, N: 7063062.371 (55 MGA94)
SURFACE ELEVATION : 300.921 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 14/1/14
LOGGED BY : CM
CHECKED BY : CM
EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				300.921 0.0		SM	Silty SAND: loose to medium dense, fine to medium grained, dark brown grey, with clay fines, grass and rootlets to 0.2m	D	L to MD		ALLUVIUM
				0.20m		SM	becoming medium dense				
				0.40m		SM	shading dark brown, slight grey brown, grading sandy silt in parts, finer sand content.		MD		
				300.5 0.5		SM					
				300.0 1.0		SM					
				1.00m		SC	Clayey SAND: dense, dark brown grey, fine grained, medium plasticity clay fines.				
			1.30m B	1.30m		SC	shading dark grey brown, increase in moisture content	D to M	D		
			1.60m	299.5 1.5		SC					
				299.0 2.0		SC					
				298.5 2.5		SC					
			2.60m B	2.60m		CI	Sandy CLAY: very stiff to hard, medium plasticity, brown, fine to medium grained sand		VSt to H		
			3.00m	2.90m 298.0 3.0		CI	grading clayey sand in parts				
				3.10m		SM	Silty SAND: dense, fine to medium grained, light brown to brown, with clay fines.	M	D		
				297.5 3.5		SM					
				3.90m			EXCAVATION TPB51 TERMINATED AT 3.90 m No ground water encountered. Test pit backfilled on completion.				
				297.0 4.0							
				296.5 4.5							
				296.0 5.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

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EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB52

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679268.267, N: 7063070.392 (55 MGA94)
SURFACE ELEVATION : 300.991 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 14/1/14
LOGGED BY : CM
CHECKED BY : CM
EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0		SM	Silty SAND: loose to medium dense, fine to medium grained, dark brown grey, with clay fines, grass and rootlets to 0.55	D	L to MD		ALLUVIUM
				0.25m							
				300.5 0.5		SM	becoming medium dense, occassional rootlets to 0.8m		MD		
				0.60m							
						SM	shading brown grey to dark brown grey				
			0.90m	0.90m							
			B	300.0 1.0		CI	Sandy CLAY: very stiff to hard, medium plasticity, dark grey brown, fine grained sand		VSt to H		
			1.20m	1.20m							
				299.5 1.5		CI	increase in moisture content, occasional white powdery calcite modules <10mm diameter				
				2.00m							
			2.10m	299.0 2.0		SC	Clayey SAND: dense, fine to medium grained, brown, varying sand content grading sandy clay/ claying sand in parts.	D to M			
			B	2.50m							
			2.40m	298.5 2.5		SM	Silty SAND: dense, fine to medium grained light brown, with clay fines.		D		
				298.0 3.0							
				3.20m							
						SM	decrease in clay fines content				
				297.5 3.5							
				3.90m							
				297.0 4.0			EXCAVATION TPB52 TERMINATED AT 3.90 m No ground water encountered. Test pit backfilled on completion.				
				296.5 4.5							
				296.0 5.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

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File: 30031182 TPB52 Page 1 OF 1

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EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB53

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679181.816, N: 7063069.064 (55 MGA94)
SURFACE ELEVATION : 300.758 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 14/1/14
LOGGED BY : CM
CHECKED BY : CM
EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0			Silty SAND: loose to medium dense, fine to medium grained, dark grey brown with clay fines content, grass rootlets to 0.3m	D	L to MD		ALLUVIUM
				300.5 0.5		SM					
				0.60m			shading brown grey		D		
				300.0 1.0		SM					
				1.20m			Sandy CLAY: very stiff to hard, medium plasticity, dark grey brown, brown, orange brown, fine to medium grained sand				
			1.30m B 1.70m	299.5 1.5							
				299.0 2.0		CI		D to M	VSt to H		
			2.40m B	298.5 2.5			becoming low to medium plasticity, increase in sand content, shading light brown.				
			2.80m	298.0 3.0		CL-CI	Silty SAND: dense, fine to medium grained, light brown/yellow brown with varying clay fines.				
				297.5 3.5		SM					
				3.50m			decrease in clay fines content		D		
				297.0 4.0		SM					
				4.30m			EXCAVATION TPB53 TERMINATED AT 4.30 m No ground water encountered. Test pit backfilled on completion.				
				296.5 4.5							
				296.0 5.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB54

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679891.042, N: 7062766.769 (55 MGA94)
SURFACE ELEVATION : 304.989 (AHD)

EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator

DATE EXCAVATED : 14/1/14
LOGGED BY : CM
CHECKED BY : CM

EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				304.989	0.0		SM	Silty SAND: loose to medium dense, fine to coarse grained, brown to dark brown, grass and rootlets to 0.2m	D	L to MD		
					0.20m			some sandy clay and claying sand bands				
				304.5	0.5		SM			MD		
					0.70m			Sandy CLAY: very stiff to hard, medium plasticity, dark brown grey to black, fine to medium grained sand high organic content, possible organic clay				
				304.0	1.0		CI			VSt to H		
				303.5	1.5		CI	Gravelly CLAY: very stiff to hard, medium plasticity, light brown, grey brown, orange brown and brown grey, mottled, fine to coarse subangular to rounded igneous gravels and cobbles to 100mm diameter, high fine to coarse grained sand content				
					1.90m							
				303.0	2.0		GC	Clayey GRAVEL: dense to very dense, fine to coarse, light brown, subangular to rounded, igneous, with cobbles to 200mm diameter, high fine to coarse grained sand content	D to M	D to VD		
					2.40m							
				302.5	2.5		SM	Silty SAND: dense, fine to coarse grained, light brown, with clay fines content.		D		
				302.0	3.0							
					3.40m							
				301.5	3.5			MUDSTONE/SILTSTONE: very low strength, highly weathered, dark grey and yellow/orange brown in parts; remoulds to clayey gravel.				
				301.0	4.0							
					4.20m							
				300.5	4.5			EXCAVATION TPB54 TERMINATED AT 4.20 m No ground water encountered. Test pit backfilled on completion.				
				300.0	5.0							
				299.5	5.5							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

SMEC

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB55

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679964.332, N: 7062771.437 (55 MGA94)
SURFACE ELEVATION : 305.753 (AHD)

EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator

DATE EXCAVATED : 14/1/14
LOGGED BY : CM
CHECKED BY : CM

EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

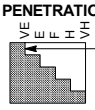
VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				305.5 0.0		SM	Silty SAND: loose to medium dense, fine to coarse grained, brown to dark brown, grass and rootlets to 0.2m with clay fines content	D	L to MD		ALLUVIUM
				0.30m			varying bands/ lenses of silty sand, clayey sand and sandy clay, gravelly in parts, trace of cobbles to 100mm diameter.				
				305.0 0.5							
				304.5 1.0		SM			MD		
				304.0 1.5							
				1.90m			XW MUDSTONE/SILTSTONE: extremely low strength, extremely weathered, pale grey, grey brown and yelow/orange brown, breaks down to gravelly clay.				WEATHERED ROCK
				303.5 2.0				D to M			
				2.20m			becoming VLS, HW breaks down to clayey gravel				
				303.0 2.5							
				302.5 3.0							
				302.0 3.5							
				4.20m							
				301.5 4.0			EXCAVATION TPB55 TERMINATED AT 4.20 m No ground water encountered. Test pit backfilled on completion.				
				301.0 4.5							
				300.5 5.0							
				5.5							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

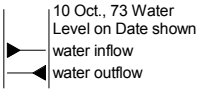
METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION



WATER



SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB56

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 678569.264, N: 7061469.252 (55 MGA94)
SURFACE ELEVATION : 298.517 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 25/1/14
LOGGED BY : CM
CHECKED BY : CM
EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				298.5 0.0		CI	Sandy CLAY: very stiff to hard, medium plasticity, dark grey brown, fine to medium grained sand; grass and rootlets to 0.2m.	D	VSt to H		ALLUVIUM
				0.30m		CI	becoming hard, shading grey brown, slow digging		D		
			0.50m B	298.0 0.5		SC	Clayey SAND: dense, dark grey, brown, fine to medium grained, medium plasticity clay fines.				
			0.70m B	0.70m		SC	shading light brown to brown; occasional white powdery calcite modules < 5mm diameter, slight increase in sand content		H		
			1.00m B	297.5 1.0		SC	shading light brown, slow digging (single tyne ripper used)				
			1.30m	1.50m		SC	occasional pale grey and light grey brown, finely mottled	D to M			
			2.50m B	297.0 1.5		SC					
			2.70m	296.5 2.0		SC					
				2.30m		CI	Sandy CLAY: hard, grey brown, medium plasticity, light brown and pale grey to grey, mottled		H		
				296.0 2.5		CI					
				295.5 3.0		CI					
				3.30m		CI	increase in sand content, grading fine to coarse grained				
				3.50m		SM	Silty SAND: dense, fine to coarse grained, light grey brown/light brown with clay fines		D		
				295.0 3.5							
				4.00m			EXCAVATION TPB56 TERMINATED AT 4.00 m No ground water encountered. Test pit backfilled on completion.				
				294.5 4.0							
				294.0 4.5							
				5.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
- 10 Oct., 73 Water Level on Date shown
- water inflow
- water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB57

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 678641.666, N: 7061486.153 (55 MGA94)
SURFACE ELEVATION : 298.765 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 25/1/14
LOGGED BY : CM
CHECKED BY : CM
EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0		SM	Silty SAND: Loose to medium dense, fine to medium grained, brown, slight grey brown, grass and rootlets to 0.2m,	D	L to MD		ALLUVIUM
				0.20m		SM	with clay fines				
			0.40m B 0.60m	298.5 0.5		SC	Clayey SAND: slight grey brown, dense, fine grained, medium plasticity clay fines, light brown to brown,				
			0.70m B 1.00m	298.0 1.0		SC	shading light brown to brown and orange brown				
						SM	Silty SAND: dense, fine to medium grained, light brown/yellow brown, with clay fines	D to M	D		
				1.20m		SM	increase in silt content with clay fines, grading sand in parts,				
				297.5 1.5		SM	decrease in silt clay fines				
				297.0 2.0		SM					
				2.20m		SM	shading light brown/light grey brown, slight yellow brown.				
				296.5 2.5		SM	decrease in fines content				
				2.60m			EXCAVATION TPB57 TERMINATED AT 2.60 m No ground water encountered. Test pit backfilled on completion.				
				296.0 3.0							
				295.5 3.5							
				295.0 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

SMEC

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB58

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 678917.392, N: 7061849.195 (55 MGA94)
SURFACE ELEVATION : 298.797 (AHD)

EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator

DATE EXCAVATED : 26/1/14
LOGGED BY : CM
CHECKED BY : CM

EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
			0.50m B 0.80m	0.0 / 298.0 / 0.5		CI-CH	Sandy CLAY: very stiff to hard, medium to high plasticity, light brown grey, fine to medium grained sand, grass and rootlets to 0.15	D			ALLUVIUM
			0.90m B 1.20m	1.0 / 1.5 / 297.0 / 2.0		CI-CH	0.80m shading grey brown with white powdery calcite nodules,	D to M			
			2.80m B 3.10m	2.5 / 296.0 / 3.0 / 3.5 / 295.0 / 4.0		CL-CI	2.10m becoming low to medium plasticity, shading light brown grey, some orange brown mottles, increase in sand content, 2.80m becoming medium to high pasticity, decrease in sand content, silty clay in parts	M	VSt to H		
			4.50m B 4.80m	4.5 / 294.0 / 5.0		CH	4.30m becoming high pasticity, pale grey to grey and orange brown mottled.				
				5.5 / 293.0 / 6.0		SP	5.50m SAND: dense, fine to medium grained, orange brown	M to W	D		
				6.5 / 292.0 / 7.0 / 7.5 / 291.0 / 8.0		SW	6.20m Gravelly SAND and COBBLES: very dense, fine to coarse grained, brown and grey, fine to coarse rounded to subangular igneous gravels and cobbles to 150mm, some clay content in pockets. 6.50m EXCAVATION TPB58 TERMINATED AT 6.50 m No ground water encountered. Test pit backfilled on completion.	W	D to VD		

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB59

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 678917.468, N: 7061887.564 (55 MGA94)
SURFACE ELEVATION : 298.780 (AHD)

EQUIPMENT TYPE : CAT Excavator 36T
METHOD : Excavator

DATE EXCAVATED : 26/1/14
LOGGED BY : CM
CHECKED BY : CM

EXCAVATION DIMENSIONS : 0.50 m WIDE

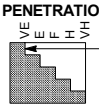
DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
			0.20m B 0.30m	298.5 0.0		CI-CH	Sandy CLAY: very stiff to hard, medium to hard plasticity, dark grey brown, with fine grained sand, grass and rootlets to 0.15m	D			ALLUVIUM
			0.40m B 0.70m	0.5		CI-CH	0.30m shading grey brown to brown				
			1.00m B 1.30m	298.0 1.0 297.5 1.5		CI-CH	0.80m shading light brown to brown, some white powdery calcite nodules to 10mm diameter		VSt to H		
			1.70m B 2.00m	297.0 2.0		CI-CH	1.60m shading light brown, some pale grey brown, mottling calcite nodules, increase in moisture content.	D to M			
			2.10m B 2.40m	296.5 2.5		CI	2.10m becoming medium plalsticity, light brown, pale grey and some grey brown, mottled, fine to medium grained sand				
				296.0 3.0		SP	2.60m SAND: dense, fine to medium grained, light grey brown, varying silt content decreasing with depth		D		
				295.5 3.5 295.0 4.0			3.20m EXCAVATION TPB59 TERMINATED AT 3.20 m No ground water encountered. Test pit backfilled on completion.				

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION


No Resistance

WATER

10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB60

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 678959.925, N: 7061893.249 (55 MGA94)
SURFACE ELEVATION : 298.944 (AHD)

EQUIPMENT TYPE : CAT Excavator 36T
METHOD : Excavator

DATE EXCAVATED : 26/1/14
LOGGED BY : CM
CHECKED BY : CM

EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				298.944 0.0			Sandy CLAY: very stiff to hard, low plasticity, dark brown grey, fine grained sand, grass and rootlets to 0.2m				ALLUVIUM
			0.20m B 0.40m			CL		D			
				0.40m			shading grey brown to brown, fine to medium sand content				
			0.50m B 0.80m	298.5 0.5		CL					
				0.80m			shading light brown to brown, occasional white powdery calcite nodules to 10mm diameter		VSt to H		
			0.90m B 1.20m	298.0 1.0		CL					
				297.5 1.5				D to M			
				1.60m			shading light brown to brown slight grey brown, decrease in sand content, slight increase in moisture content.				
			1.70m B 2.00m			CL					
				297.0 2.0							
				2.00m			SAND: dense, fine to medium grained, light brown/yellow brown, varying silt content decrease with depth		D		
				296.5 2.5		SM					
				2.80m			EXCAVATION TPB60 TERMINATED AT 2.80 m No ground water encountered. Test pit backfilled on completion.				
				296.0 3.0							
				295.5 3.5							
				295.0 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

SMEC

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB61

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 678970.062, N: 7061831.483 (55 MGA94)
SURFACE ELEVATION : 299.039 (AHD)
EQUIPMENT TYPE : CAT Excavator 36T
METHOD : Excavator
DATE EXCAVATED : 26/1/14
LOGGED BY : CM
CHECKED BY : CM
EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				299.0 / 0.0			Sandy CLAY: very stiff to hard, medium plasticity, dark brown grey, fine to medium grained sand, grass and rootlets to 0.25m	D			ALLUVIUM
			0.40m B 0.70m	298.5 / 0.5		CI	shading grey brown to brown				
			0.90m B 1.20m	298.0 / 1.0		CI	shading light brown to brown, some white powdery calcite nodules <10mm diameter	D to M	VSt to H		
				297.5 / 1.5		SM	Silty SAND: dense, fine to medium grained, pale grey to grey 1.80m 1.95m	D	D		
			2.00m B 2.30m	297.0 / 2.0		CI	Sandy CLAY: very stiff to hard, medium plasticity, dark grey brown to brown, fine to medium grained, some white powdery calcite modules <10mm diameter	D to M	VSt to H		
				296.5 / 2.5		SM	Silty SAND: dense, fine to medium grained, light brown/yellow brown, varying clay fines content 2.60m 3.00m		D		
				296.0 / 3.0			EXCAVATION TPB61 TERMINATED AT 3.00 m No ground water encountered. Test pit backfilled on completion.				
				295.5 / 3.5							
				4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB62

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679235.975, N: 7062244.498 (55 MGA94)
SURFACE ELEVATION : 299.269 (AHD)
EQUIPMENT TYPE : CAT Excavator 36T
METHOD : Excavator
DATE EXCAVATED : 26/1/14
LOGGED BY : CM
CHECKED BY : CM
EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0 299.0		SM	Silty SAND: loose to medium dense, fine to medium grained, brown, grass and rootlets to 0.3m	D	L to MD		ALLUVIUM
				0.20m		SM	with some clay fines		MD		
			0.40m B 0.70m	0.5 298.5		SC	Clayey SAND: dense, light brown/orange brown, fine to medium grained, medium plasticity clay fines	D to M	D		
			0.90m B 1.20m	0.90m 1.0		SM	Silty SAND: dense, fine to medium grained, light brown/yellow brown with some varying clay fines content in parts, decreasing fines content with depth.				
				298.0 1.5 297.5							
			2.00m B 2.30m	2.0		SM	pale grey to white sandy clay band, approximately 150mm thick				
				2.20m 297.0			SAND: Dense, fine to medium grained, light brown/yellow brown.				
				2.5		SM					
				2.80m 296.5			EXCAVATION TPB62 TERMINATED AT 2.80 m No ground water encountered. Test pit backfilled on completion.				
				3.0 296.0							
				3.5 295.5							
				4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

SMEC

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB63

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679314.094, N: 7062260.951 (55 MGA94)
SURFACE ELEVATION : 299.452 (AHD)

EQUIPMENT TYPE : CAT Excavator 36T
METHOD : Excavator

DATE EXCAVATED : 26/1/14
LOGGED BY : CM
CHECKED BY : CM

EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0		SM	Silty SAND: loose to medium dense, fine to medium grained, brown, grass and rootlets to 0.3m	D	L to MD		ALLUVIUM
				0.20m		SM	with some clay fines		MD		
				0.40m 299.0 0.5		Cl	Sandy CLAY: very stiff to hard, medium plasticity, light brown/orange brown, fine to medium grained sand		VSt to H		
				0.90m 298.5 1.0		SM	Silty SAND: dense, fine to medium grained, light brown/yellow brown with some varying clay fines content in parts, decreasing fines content with depth.	D to M	D		
				298.0 1.5							
				297.5 2.0							
				2.05m		SM	pale grey to white sandy clay band, approximately 150mm thick				
				2.20m		SP	SAND: Dense, fine to medium grained, light brown/yellow brown.				
				297.0 2.5							
				2.80m			EXCAVATION TPB63 TERMINATED AT 2.80 m No ground water encountered. Test pit backfilled on completion.				
				296.5 3.0							
				296.0 3.5							
				295.5 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
- 10 Oct., 73 Water Level on Date shown
- water inflow
- water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

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EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB64

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679184.522, N: 7062229.417 (55 MGA94)
SURFACE ELEVATION : 300.269 (AHD)
EQUIPMENT TYPE : CAT Excavator 36T
METHOD : Excavator
DATE EXCAVATED : 26/1/14
LOGGED BY : CM
CHECKED BY : CM
EXCAVATION DIMENSIONS : 0.50 m WIDE

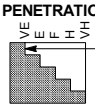
DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0		SM	Silty SAND: loose to medium dense, fine to medium grained, brown, grass and rootlets to 0.3m,	D	D to MD		
				0.20m							
				300.0		SM	with some clay fines		MD		
				0.5							
			0.60m B 0.90m	299.5		CI	Sandy CLAY: very stiff to hard, medium plasticity, light brown/orange brown, fine to medium grained sand, occasional white powdery calcite nodules				
				1.00m							
			1.20m B 1.50m	299.0		CI	shading light brown/light grey brown with white powdery calcite nodules, decrease in sand content	D to M	VSt to H		
				1.80m							
				298.5		CI	increase in sand content				
				2.00m							
				298.0		SM	Silty SAND: dense, fine to medium grained, light brown/light grey brown vary clay fines content		D		
				2.60m							
				297.5		SM	decreasing fines content				
				3.00m							
				3.0			EXCAVATION TPB64 TERMINATED AT 3.00 m No ground water encountered. Test pit backfilled on completion.				
				297.0							
				3.5							
				296.5							
				4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION


No Resistance

WATER

10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

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EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB65

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679231.746, N: 7062310.146 (55 MGA94)
SURFACE ELEVATION : 300.554 (AHD)

EQUIPMENT TYPE : CAT Excavator 36T
METHOD : Excavator

DATE EXCAVATED : 26/1/14
LOGGED BY : CM
CHECKED BY : CM

EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				300.5 / 0.0		SM	Silty SAND: loose to medium dense, fine to medium grained, brown, grass and rooflets to 0.3m	D to M	L to MD		ALLUVIUM
							0.20m with some clay fines				
				300.0 / 0.5		SM					
							0.60m shading lighter brown with depth				
						SM					
				299.5 / 1.0			1.00m shading lighter grey brown				
						SM					
				299.0 / 1.5			1.60m				
						CI	Silty CLAY: very stiff to hard, medium plasticity, lighter brown/orange brown, fine to medium grained sand		VSt to H		
				298.5 / 2.0			2.20m				
						SM	Silty SAND: dense, fine to medium grained, light brown, with varying clay content		D		
				298.0 / 2.5							
						SM	2.80m shading light grey brown and orange brown				
				297.5 / 3.0			3.00m EXCAVATION TPB65 TERMINATED AT 3.00 m No ground water encountered. Test pit backfilled on completion.				
				297.0 / 3.5							
				4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

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EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB66

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679841.289, N: 7061714.238 (55 MGA94)
SURFACE ELEVATION : 302.427 (AHD)

EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator

DATE EXCAVATED : 11/2/14
LOGGED BY : CM
CHECKED BY : CM

EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				302.427 / 0.0		CI-CH	Sandy CLAY: very stiff, medium to high plasticity, dark grey brown, fine grained sand, grass and rootlets to 0.2m	D	VSt		ALLUVIUM
							0.30m				
				302.0 / 0.5		CI-CH	shading brown	D to M			
							0.60m				
						CI-CH	shading light brown to brown, some white powdery and crystalline calcite nodules, < 10mm diameter				
							0.90m				
				301.5 / 1.0		CI-CH	shading light brown and dark brown grey with calcite nodules as above trace of fine angular gravels, increase in moisture content				
							1.20m				
				301.0 / 1.5		CI-CH	Silty CLAY: very stiff, medium to high plasticity, light brown, some white powdery crystalline calcite nodules with fine to medium sand and trace of gravel				
							1.90m				
				300.5 / 2.0			shading light brown/yellow brown becoming moist, without calcite nodules, trace of fine grained sand.	M			
				300.0 / 2.5		CI-CH					
							2.90m				
				299.5 / 3.0			EXCAVATION TPB66 TERMINATED AT 2.90 m No ground water encountered. Test pit backfilled on completion.				
				299.0 / 3.5							
				298.5 / 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB67

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679896.057, N: 7061718.663 (55 MGA94)
SURFACE ELEVATION : 303.157 (AHD)

EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator

DATE EXCAVATED : 11/2/14
LOGGED BY : CM
CHECKED BY : CM

EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				303.0	0.0		CI	Gravelly CLAY: very stiff to hard, medium plasticity, light brown, brown and brown grey variable, fine to coarse angular to subrounded gravels, with fine to coarse sand in parts, grass and rootlets to 0.2m,	D	VSt - H		ALLUVIUM
					0.30m			Sandy CLAY: very stiff to hard, medium to high plasticity, dark grey brown, fine to medium grained sand.				
				302.5	0.5		CI-CH					
					0.60m			shading brown, becoming very stiff,				
							CI-CH					
					0.90m			shading light brown and dark grey brown, with white powdery and crystalline calcite nodules, trace of fine angular gravels, fissured in parts.	D to M			
				302.0	1.0		CI-CH					
					1.5							
					1.60m			Silty CLAY: very stiff, medium to high pasticity, light brown, some white powdery and crystaline calcite modules, with fine to medium grained sand and fine gravels.		VSt		
				301.5			CI-CH					
				301.0	2.0		CI-CH					
					2.5							
					2.50m			shading light, brown yellow brown, moist without calcite nodules, trace of fine grained sand	M			
				300.5			CI-CH					
					3.00m			EXCAVATION TPB67 TERMINATED AT 3.00 m No ground water encountered. Test pit backfilled on completion.				
				300.0	3.0							
				299.5	3.5							
					4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB68

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679885.762, N: 7061686.003 (55 MGA94)
SURFACE ELEVATION : 302.712 (AHD)

EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator

DATE EXCAVATED : 11/2/14
LOGGED BY : CM
CHECKED BY : CM

EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0 / 302.5		CI	Gravelly CLAY: very stiff to hard, medium plasticity, light brown and brown, variable, fine to coarse gravels, with fine to medium grained sand, grass, rootlets to 0.15m	D	VSt to H		ALLUVIUM
				0.20m		CI	Sandy CLAY: very stiff to hard, medium plasticity, dark grey brown, fine to medium grained sand, occasional rootlets to 0.3m				
				0.40m		CI-CH	increase in moisture content, becoming medium to high plasticity				
				0.5 / 302.0							
				0.70m		CI-CH	becoming very stiff, brown,				
				1.0 / 301.5							
				1.10m		CI-CH	occasional white powdery calcite nodules,				
				1.30m		CI-CH	shading brown and dark brown grey, with white powdery and crystalline calcite nodules, < 10mm diameter trace of fine, angular gravels in parts,				
				1.5 / 301.0							
				1.60m		CI-CH	Silty CLAY: very stiff, medium to high pasticity, light brown, with some white powdery and crystalline calcite nodules, with fine to medium grained sand and fine gravels	D to M	VSt		
				2.0 / 300.5							
				2.30m		CI-CH	shading light brown/yellow brown without nodules, trace of fine grained sand, moist.				
				2.5 / 300.0							
				3.00m		CI-CH					
				3.0 / 299.5			EXCAVATION TPB68 TERMINATED AT 3.00 m No ground water encountered. Test pit backfilled on completion.				
				3.5 / 299.0							
				4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

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EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB69

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679877.674, N: 7061648.173 (55 MGA94)
SURFACE ELEVATION : 301.614 (AHD)

EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator

DATE EXCAVATED : 11/2/14
LOGGED BY : CM
CHECKED BY : CM

EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION (Soil Type, Colour, Plasticity or Particle Characteristic, Secondary and Minor Components)	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
301.5 / 0.0		SM	Silty SAND: medium dense, fine to medium grained, light brown and brown, some clay content, some fine to medium gravels	D	MD		ALLUVIUM
			0.10m				
		Cl	Sandy CLAY: very stiff to hard, medium plasticity, dark grey brown, fine to medium grained sand, occasional rootlets to 0.3m		VSt - H		
			0.25m				
		Cl	0.30m increase in moisture content,				
		Cl	0.40m becoming very stiff, brown,		VSt		
			with white powdery and crystalline calcite nodules < 15 mm diameter,				
301.0 / 0.5		Cl					
			1.00m	D to M			
		Cl	1.10m shading brown and dark brown grey, with calcite nodules as above, trace of fine angular gravels, fissured in parts.				
300.5 / 1.0			Silty CLAY: very stiff, medium to high plasticity, light brown, with some white powdery and crystalline calcite nodules with fine to medium grained sand, trace of fine gravels				
		CI-CH					
300.0 / 1.5							
			1.90m				
299.5 / 2.0			shading light brown/yelow brown, without white nodules, trace of fine grained sand, moist		VSt		
		CI-CH		M			
299.0 / 2.5							
			3.10m				
298.5 / 3.0			EXCAVATION TPB69 TERMINATED AT 3.10 m No ground water encountered. Test pit backfilled on completion.				
298.0 / 3.5							
4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

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EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB70

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679252.688, N: 7059313.809 (55 MGA94)
SURFACE ELEVATION : 295.972 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 12/2/14
LOGGED BY : CM
CHECKED BY : CM
EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0		SM	0.10m Silty SAND: loose to medium dense, fine to medium grained, dark brown, grass and rootlets to 0.1m depth	D	L to MD		ALLUVIUM
						CI	Gravelly CLAY: very stiff to hard, medium pasticity, brown and orange brown, fine to coarse gravels trace of cobbles to 60mm				
			0.40m B 0.60m	295.5 0.5		CI-CH	0.40m Silty CLAY: very stiff to hard, medium to high plasticity, dark grey brown, with fine grained sand'				
			0.70m B 1.00m	295.0 1.0		CI-CH	0.60m shading brown to dark grey brown,				
						CI-CH	1.20m Sandy CLAY: very stiff to hard, medium to high pasticity, light brown to brown, some white powdery calcite modules, < 20mm diameter, fine to medium grained sand,	D to M	VSt to H		
				294.5 1.5		CI-CH					
				294.0 2.0		CI-CH	2.00m shading brown and grey mottled, partly fissured, some dark grey veneer / staining along fissures				
			2.20m B 2.40m	293.5 2.5		CI-CH	2.60m shading pale grey, light brown and brown, mottled.				
				293.0 3.0		CI-CH	3.20m EXCAVATION TPB70 TERMINATED AT 3.20 m No ground water encountered. Test pit backfilled on completion.				
				292.5 3.5							
				292.0 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
- 10 Oct., 73 Water Level on Date shown
- water inflow
- water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

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EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB71

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679283.227, N: 7059258.564 (55 MGA94)
SURFACE ELEVATION : 295.799 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 12/2/14
LOGGED BY : CM
CHECKED BY : CM
EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				295.5 0.0			Silty CLAY: very stiff to hard, medium to high plasticity, dark grey brown, with some fine to medium grained sand, grass rootlets to 0.2m	D			ALLUVIUM
				0.5		CI-CH	0.50m increase in moisture content	D to M			
				295.0 0.9		CI-CH	0.90m Sandy CLAY: very stiff to hard, medium to high plasticity, brown, fine to medium grained sand	M	VSt to H		
				1.0		CI-CH					
				294.5 1.5		CI-CH					
				294.0 2.0		CI-CH	2.10m becoming medium plasticity, shading slight grey brown, increase in sand content				
				293.5 2.4		CI-CH	2.40m some pale grey and dark brown grey mottling	D to M			
				2.5		CI-CH					
				293.0 3.0		CI-CH	3.20m EXCAVATION TPB71 TERMINATED AT 3.20 m No ground water encountered. Test pit backfilled on completion.				
				292.5 3.5							
				292.0 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

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EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB72

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679260.679, N: 7059216.999 (55 MGA94)
SURFACE ELEVATION : 296.914 (AHD)

EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator

DATE EXCAVATED : 12/2/14
LOGGED BY : CM
CHECKED BY : CM

EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				296.5 0.0			Silty CLAY: very stiff to hard, medium to high pasticity, dark grey brown, with some fine to medium grained sand, grass rootlets to 150mm	D			ALLUVIUM
						CI-CH					
				0.60m			increase in moisture content	D to M			
				296.0 1.0		CI-CH					
				1.10m			Sandy CLAY: very stiff to hard, medium to high plasticity, brown slight grey brown, fine to medium grained sand				
			1.20m B 1.40m B			CI-CH					
				1.40m			becoming medium plasticity, light brown, occasional white powdery calcite nodules, increase in fine to medium grained sand content, moist		VSt to H		
			1.50m	295.5 1.5							
			1.80m			CI		M			
				295.0 2.0							
				2.30m			shading light grey brown and some orange brown mottling, increase in sand content, slightly lower plasticity.				
			2.40m B 2.80m	294.5 2.5		CI		D to M			
				294.0 3.0							
				3.10m			EXCAVATION TPB72 TERMINATED AT 3.10 m No ground water encountered. Test pit backfilled on completion.				
				293.5 3.5							
				293.0 4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

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EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB73

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679261.146, N: 7059185.803 (55 MGA94)
SURFACE ELEVATION : 296.529 (AHD)

EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator

DATE EXCAVATED : 12/2/14
LOGGED BY : CM
CHECKED BY : CM

EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / E / F / H PENETRATION	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				296.5 / 0.0			Sandy CLAY: very stiff to hard, medium to high plasticity, dark grey brown, with some fine to medium grained sand, grass rootlets to 0.2m	D			ALLUVIUM
			0.50m B	296.0 / 0.5		CI-CH					
			1.00m	295.5 / 1.0			1.00m shading slight grey, brown to dark grey brown				
						CI-CH					
				295.0 / 1.5			1.60m becoming medium to high plasticity, brown, fine to medium grained sand	D to M	VSt to H		
			1.80m B 2.20m	294.5 / 2.0		CI-CH					
				294.0 / 2.5			2.50m partly fissured, shading slight greyish brown with dark grey veneer/staining along fissures,				
						CI-CH					
				293.5 / 3.0			3.10m EXCAVATION TPB73 TERMINATED AT 3.10 m No ground water encountered. Test pit backfilled on completion.				
				293.0 / 3.5							
				4.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB74

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679810.652, N: 7062123.589 (55 MGA94)
SURFACE ELEVATION : 305.628 (AHD)

EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator

DATE EXCAVATED : 12/2/14
LOGGED BY : CM
CHECKED BY : CM

EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / E / F / H PENETRATION	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0 305.5 0.5 305.0		CI	Sandy CLAY: very stiff to hard, medium pasticity, light grey brown and some orange brown mottling, trace of fine angular gravels	D to M	VSt to H		ALLUVIUM
				0.80m			tending ELS, EW sandstone in parts				RESIDUAL SOIL
				1.00m 1.0 304.5		CI	SANDSTONE: medium strength, slightly weathered, fine to medium grained light grey brown, yellow and orange brown.				WEATHERED ROCK
				1.20m			EXCAVATION TPB74 TERMINATED AT 1.20 m No ground water encountered. Test pit backfilled on completion.				
				1.5 304.0 2.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
- 10 Oct., 73 Water Level on Date shown
- water inflow
- water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPB75

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679817.657, N: 7062179.472 (55 MGA94)
SURFACE ELEVATION : 306.867 (AHD)

EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator

DATE EXCAVATED : 12/2/14
LOGGED BY : CM
CHECKED BY : CM

EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / E / F / H PENETRATION	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				306.5 0.0		CI	Sandy CLAY: very stiff to hard, medium plasticity, light grey brown and light brown, some orange brown mottling, trace of fine angular gravels	D to M	VSt to H		ALLUVIUM
				0.50m							
				306.0 0.5			SANDSTONE: ELS-VLS, EW-HW, fine to coarse grained, remoulds to silty sand, non-plastic				WEATHERED ROCK
				0.90m							
				1.0			SANDSTONE/MUDSTONE: ELS-VLS, HW, interbedded bands 30-100mm thick, fine to coarse grained orange brown sandstone and pale grey orange brown and light brown mudstone.				
				1.30m							
				305.5 1.5			MUDSTONE/SILTSTONE: ELS - VLS, HW, light brown/yellow/orange brown				
				1.80m							
				305.0 2.0			EXCAVATION TPB75 TERMINATED AT 1.80 m No ground water encountered. Test pit backfilled on completion.				
				304.5 2.5							
				304.0 3.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPX01

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 677483.897, N: 7063387.895 (55 MGA94)
SURFACE ELEVATION : 302.769 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 5/12/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0			0.02m Bituminous Spray Seal: 20mm thick.				ROAD SURFACE
							Cement Treated Base (CTB) course: grey to dark grey and brown, angular to subrounded gravel, fine grained sands and some fines	D	VD		BASECOURSE
			0.22m				0.22m				
			B 0.30m	302.5		SP	Gravely SAND: dense, fine to medium grained angular to sub-rounded gravels, some fines content, grading sandy gravel in parts 0.30m	D to M	D		SUB-BASECOURSE
			B 0.45m			CH	Silty CLAY: stiff to very stiff, high plasticity, dark grey to black, some fine to medium grained sand 0.45m				FILL
			B 0.60m	0.5		CI	Sandy CLAY: stiff to very stiff, medium plasticity, grey brown, some fine to medium grained sand 0.60m		St to VSt		
			B	302.0		CI-CH	becoming medium plasticity to high plasticity, brown grey/ slight dark grey				
			0.90m				0.90m				
				1.0			becoming very stiff, decreasing fine to medium grained sand, sand content grading silty clay, some sand impacts shading, grey brown				
				301.5		CI-CH		M	VSt		
				1.5							
						CI-CH	1.67m 1.70m Bituminous Spray Seal: old road surfacing of about 30mm thick				ROAD SURFACE
				301.0		CI	Silty CLAY: very stiff to hard, medium plasticity to high plasticity, dark brown, some white powdery calcide nodules >15mm diameter		VSt to H		FILL
				2.0			2.10m				
							EXCAVATION TPX01 TERMINATED AT 2.10 m No ground water encountered. Test pit backfilled on completion.				
				300.5							
				2.5							
				300.0							
				3.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
- 10 Oct., 73 Water Level on Date shown
- water inflow
- water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

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EXCAVATION - GEOLOGICAL LOG

PIT NO : TPX02

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 677557.020, N: 7063047.447 (55 MGA94)
SURFACE ELEVATION : 303.242 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 6/12/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
				0.0 / 303.0			0.03m Asphalt: 30mm thick				ROAD SURFACE
			B 0.20m			GM	Sandy GRAVEL: very dense, some fine grained sand, red brown, rounded to angular gravels, trace of cobbles to 75mm, some fines content				BASECOURSE
			0.33m				0.33m				
			B			CI	Sandy CLAY: hard, medium plasticity, grey brown, with firm to medium grained sand	D to M			FILL
			0.55m	0.5 / 302.5			0.55m		VD		
			B			CI	Silty SAND: dense, light brown with slight grey brown with some white powdery calcide nodules >25mm diameter				
			0.80m				0.80m				
						CI	becoming light grey brown/ yellow brown, increase in fine to medium grained sand content, fewer white powdery calcide nodules	M			
				1.0 / 302.0			1.00m				
							EXCAVATION TPX02 TERMINATED AT 1.00 m No ground water encountered. Test pit discontinued at 1.0m. Test pit backfilled on completion, pavement surface reinstated with 150mm thick compacted asphalt concrete				
				1.5 / 301.5							
				2.0 / 301.0							
				2.5 / 300.5							
				3.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

SMEC

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPX04

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679176.353, N: 7062624.455 (55 MGA94)
SURFACE ELEVATION : 301.109 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 17/12/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
			B	301.0 / 0.0			0.02m Bituminous Spray Seal: 15mm thick Sandy GRAVEL: very dense, red brown angular to subrounded, fine to coarse grading, with some fines content				ROAD SURFACE BASECOURSE
			0.22m B			GM	0.22m				
						SM	0.30m Silty SAND: very dense, fine to medium grained, ligth brown, with varying clay fines content.				FILL
						SM	shading light brown to brown	D to M	VD		
			0.50m	300.5 / 0.5		SM	0.50m decreasing fines content 0.80m				
							EXCAVATION TPX04 TERMINATED AT 0.80 m No ground water encountered. Test pit backfilled on completion.				
				300.0 / 1.0							
				299.5 / 1.5							
				299.0 / 2.0							
				298.5 / 2.5							
				3.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

EXCAVATION - GEOLOGICAL LOG

PIT NO : TPX06

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679179.382, N: 7060810.796 (55 MGA94)
SURFACE ELEVATION : 297.863 (AHD)

EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator

DATE EXCAVATED : 17/12/13
LOGGED BY : CM
CHECKED BY : JSM

EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
			B 0.18m	0.0			0.03m Asphalt: 30mm thick				ROAD SURFACE
						GM	Sandy GRAVEL: very dense, fine to coarse, ligth brown, angular to subrounded with low plasticity fines, dry to moist				BASECOURSE
			B 0.40m	297.5		CL	0.18m Gravelly SILT: very stiff to hard, low plasticity, light brown and grey brown, variable layers < 50mm thick, fine to coarse angular to subrounded gravels with fine to coarse grading sands.	D to M	VD		FILL
			B 0.50m	0.5		SC	0.40m ClayeySAND: very dense, low to medium plasticity, fine to coarse grading, red brown, trace of subangular and rounded gravels and cobbles to 50mm.				
			B 0.80m	297.0		CI-CH	0.50m Silty CLAY: stiff, medium to high plasticity, dark brown grey, trace of fine grained sand.	M	St		
				1.0			1.00m EXCAVATION TPX06 TERMINATED AT 1.00 m No ground water encountered. Test pit backfilled on completion.				
				296.5							
				1.5							
				296.0							
				2.0							
				295.5							
				2.5							
				295.0							
				3.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

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EXCAVATION - GEOLOGICAL LOG

PIT NO : TPX08

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679275.378, N: 7060809.143 (55 MGA94)
SURFACE ELEVATION : 298.195 (AHD)

EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator

DATE EXCAVATED : 17/12/13
LOGGED BY : CM
CHECKED BY : JSM

EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
			B 0.20m	0.0 0.03m			Asphalt: 30m thick		VD		ROAD SURFACE
						GM	Silty Sandy GRAVEL: very dense, fine to coarse, grey and ligth brown, fine to coarse grained sands, low plasticity fines, dry to moist.	D to M	VD		BASECOURSE
			B 0.30m	298.0 0.20m			Sandy CLAY: very stiff, medium plasticity, ligth brown to brown, fine to medium grained sand, occasional rootlets, moist				FILL
			B 0.60m	0.5		CI					
				0.60m			shading brown, ligth brown and grey brown with some some angular to rounded, fine to coarse gravels, variable, trace of cobbles to 50mm, moist	M	VSt to H		
				297.5		CI					
				1.0 1.00m			Silty CLAY: hard, medium to high plasticity, dark brown grey, trace of fine to grained sand	D to M	H		ALLUVIUM
				1.20m		CI					
				297.0			EXCAVATION TPX08 TERMINATED AT 1.20 m No ground water encountered. Test pit backfilled on completion.				
				1.5							
				296.5							
				2.0							
				296.0							
				2.5							
				295.5							
				3.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
- 10 Oct., 73 Water Level on Date shown
- water inflow
- water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

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EXCAVATION - GEOLOGICAL LOG

PIT NO : TPX09

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679040.312, N: 7060807.014 (55 MGA94)
SURFACE ELEVATION : 297.833 (AHD)
EQUIPMENT TYPE : KUBOTA Excavator 4T
METHOD : Excavator
DATE EXCAVATED : 17/12/13
LOGGED BY : CM
CHECKED BY : JSM
EXCAVATION DIMENSIONS : 0.50 m WIDE

DRILLING | MATERIAL

VE / PENETRATION / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	DCP 5 10 15 20	STRUCTURE & Other Observations
			B 0.18m	297.5 0.0 0.5		GM	0.02m Bituminous SpraySeal: 15mm thick Sandy GRAVEL: very dense, fine to medium grained, orange/ligth brown, slight red brown, fine to coarse grained, sand content, high fines content 0.18m		VD		ROAD SURFACE BASECOURSE
			B 0.50m 0.70m			CI-CH	Silty CLAY: hard, medium to high plasticity, dark brown, grey, trace of fine grained sand, occasional rootlets. 0.70m	D to M	H		ALLUVIUM
			B 0.90m	297.0 1.0		CI-CH	shading ligth brown, slight ligth grey brown with clay fines in parts, occasional white powdery calcite nodules less that 15mm diameter. 1.00m	M			
							EXCAVATION TPX09 TERMINATED AT 1.00 m No ground water encountered. Test pit backfilled on completion.				
				296.5 1.5							
				296.0 2.0							
				295.5 2.5							
				295.0 3.0							

PHOTOGRAPHS NOTES ☐ YES ☒ NO

METHOD
- N Natural Exposure
- E Existing Excavation
- BH Backhoe Bucket
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U50 - Undisturbed Sample 50 mm diameter
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH14

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 677931.047, N: 7062952.378 (55 MGA94) SURFACE ELEVATION : 301.490 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Hydrapower Scout MOUNTING : Truck CONTRACTOR : GEODRILL DRILLER : TP

DATE STARTED : 2/10/13 DATE COMPLETED : 2/10/13 DATE LOGGED : 9/10/13 LOGGED BY : OC CHECKED BY : JSM

DRILLING							MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T			02/10/13, Water level estimated during auger drilling	1.00m SPT 2, 8, 8 N=16 1.45m	301.0	0.0		CI	0.20m Silty CLAY: stiff, medium plasticity, dark brown, some fine sand, dry, some rootlets	D	St to VSt	TOPSOIL ALLUVIUM
				2.00m SPT 8, 10, 11 N=21 2.45m	300.0	1.0 2.0		CI	changing to orange brown 2.20m			
				3.00m SPT 9, 9, 10 N=19 3.45m	299.0	3.0		CI	Sandy CLAY: very stiff, medium plasticity, orange brown, dry to moist, fine grained sand 3.50m			
				4.00m SPT 7, 8, 10 N=18 4.45m	298.0	4.0		ML	Clayey SILT: very stiff, medium plasticity, dark brown, dry to moist 4.20m			
				5.50m SPT 8, 9, 12 N=21	297.0	5.0		CI	Sandy CLAY: very stiff, medium plasticity, dry to moist , orange brown, fine grained sand 5.50m	D to M	VSt	
					296.0	6.0		CI	becoming moist, with pale grey interbedding 6.70m			
				7.00m SPT 6, 8, 9 N=17 7.45m	295.0	7.0		CI	sand is becoming fine to medium grained 7.20m	M to W		
					294.0	8.0		CI	7.30m becoming wet becoming grey 8.30m	W		7.93: standing water level measured on 03/10/13 before conducting insitu permeability testing
				8.50m SPT 6, 9, 17 N=26 8.95m	293.0	9.0		SW	Gravelly SAND: medium dense well graded, yellow brown, white and grey, fine gravels, wet 8.95m		MD	
				10.00m SPT 30/140mm N=R 10.14m	292.0 291.0	10.0 11.0			XW Mudstone: Dark grey and orange brown mottling, some white interbedding, very low strength, moist 10.14m BOREHOLE BH14 TERMINATED AT 10.14 m Target depth Piezometer pipe installed on completion of the borehole			

See Explanatory Notes for details of abbreviations & basis of descriptions.

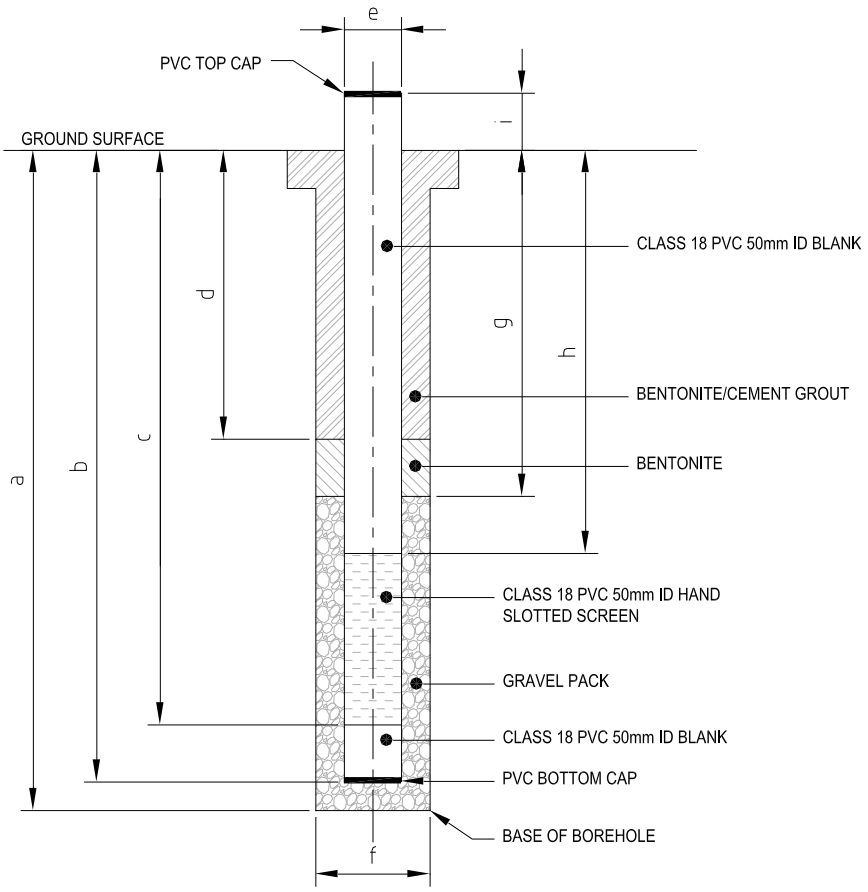
SMEC AUSTRALIA

STANDARD GROUNDWATER MONITORING BORE INSTALLATION

HOLE No	BH14
SHEET	1 OF 1
PROJECT No	30031083

CLIENT Ostwald Brothers
PROJECT Roma Flood Mitigation Levee
FEATURE Piezometer Installation
LOCATION Roma

CO-ORDINATE SYSTEM
Easting:
Northing:
SURFACE ELEVATION
ANGLE FROM HORIZONTAL **90 degrees**



PROJECT NAME :	Roma Flood Mitigation Levee	(a) = BOREHOLE DEPTH (m)	=	10.14
PROJECT ID :	30031083	(b) = MONITORING BORE BASE DEPTH (m)	=	9.00
BOREHOLE ID:	BH14	(c) = MONITORING BORE SCREEN BASE DEPTH (m)	=	8.50
DNR ID :		(d) = DEPTH OF BENTONITE/CEMENT GROUT (m)	=	2.00
INSTALLATION DATE :	10/02/2013	(e) = MONITORING BORE EXTERNAL DIAMETER (mm)	=	50
DRILLER :	GeoDrill	(f) = BOREHOLE DIAMETER (mm)	=	100
PVC JOINTS :		(g) = BASE DEPTH OF BENTONITE PLUG(m)	=	N/A
STANDING WATER LEVEL (m) :	7.93	(h) = MONITORING BORE SCREEN TOP DEPTH (m)	=	2.00
DATE :	03/10/2013	(i) = MONITORING BORE STICK UP (m)	=	0.63

NOTES :(Instrumentation etc)

CONTRACTOR	GEODRILL	COMMENCED	02/10/2013	LOGGED BY	OC
EQUIPMENT	HYDROPOWER SCOUT	COMPLETED	02/10/2013	CHECKED BY	JM

BASIS OF DESCRIPTIONS AND DETAILS OF ABBREVIATIONS ARE GIVEN ON EXPLANATORY NOTES

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH15

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 678613.170, N: 7062909.382 (55 MGA94) SURFACE ELEVATION : 301.182 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Hydrapower Scout MOUNTING : Truck CONTRACTOR : GEODRILL DRILLER : TP

DATE STARTED : 2/10/13 DATE COMPLETED : 2/10/13 DATE LOGGED : 9/10/13 LOGGED BY : OC CHECKED BY : JSM

DRILLING							MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T					301.0	0.0		CI	0.20m Silty CLAY: hard, high plasticity, dark brown, with some fine sand, dry, some rootlets and grass, dry			TOPSOIL
								CI	becoming very stiff, rootlets discontinuing 1.00m			ALLUVIUM
				1.00m SPT 8, 13, 14 N=27 1.45m	300.0	1.0		ML	Clayey SILT: very stiff, medium to high plasticity, dark brown, with some fine sand 2.00m	D		
				2.00m SPT 13, 13, 12 N=25 2.45m	299.0	2.0		CI	Sandy CLAY: very stiff, fine grained, medium plasticity, dry 2.70m		VSt	
				3.00m SPT 7, 8, 12 N=20 3.45m	298.0	3.0		CI	sand content increasing with depth 3.20m becoming orange brown, sand becoming fine to medium grained, dry to moist, decreasing in fines content.	D to M		
				4.00m SPT 5, 5, 7 N=12 4.45m	297.0	4.0		CI	4.70m		St	
				5.50m SPT 8, 11, 15 N=26 5.95m	296.0	5.0		SW	SAND: medium dense, well graded, orange brown, with some fine gravel subangular and subrounded, orange brown, yellow and pink, dry to moist. 5.80m			
WB/TC				7.00m SPT 7, 10, 11 N=21 7.45m	295.0	6.0		SW	becoming yellow brown 7.00m	W	MD	6.52: standing water level measured on 03/10/13 before conducting insitu permeability testing
				8.50m SPT 12, 30/150mm N>30 8.80m	294.0	7.0		SP	becoming poorly graded, with some gravel 8.40m			
				10.00m SPT 0, 0, 0 N=0	293.0	8.0			XW Mudstone: dark grey with orange brown and yellow, iron staining throughout, very low strength 10.27m	M		WEATHERED ROCK
				10.45m	292.0	9.0			BOREHOLE BH15 TERMINATED AT 10.27 m Target depth Piezometer pipe installed on completion of the borehole			
					291.0	10.0						
						11.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

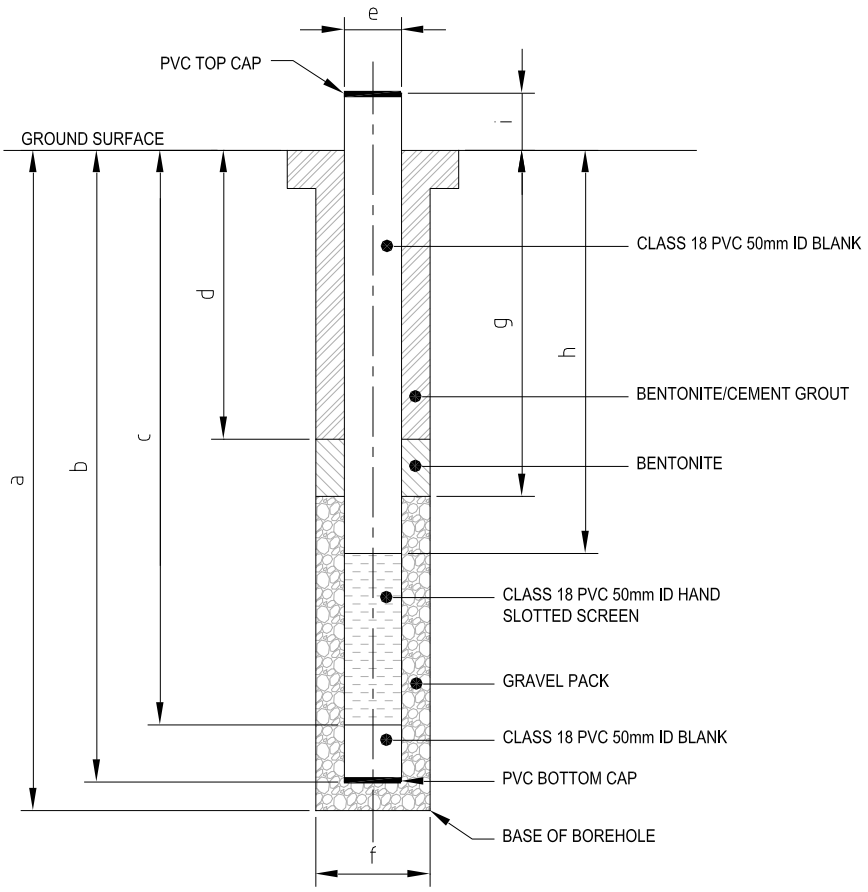
SMEC AUSTRALIA

STANDARD GROUNDWATER MONITORING BORE INSTALLATION

HOLE No	BH15
SHEET	1 OF 1
PROJECT No	30031083

CLIENT Ostwald Brothers
PROJECT Roma Flood Mitigation Levee
FEATURE Piezometer Installation
LOCATION Roma

CO-ORDINATE SYSTEM
Easting:
Northing:
SURFACE ELEVATION
ANGLE FROM HORIZONTAL **90 degrees**



PROJECT NAME :	Roma Flood Mitigation Levee	(a) = BOREHOLE DEPTH (m)	=	10.27
PROJECT ID :	30031083	(b) = MONITORING BORE BASE DEPTH (m)	=	7.30
BOREHOLE ID:	BH15	(c) = MONITORING BORE SCREEN BASE DEPTH (m)	=	6.80
DNR ID :		(d) = DEPTH OF BENTONITE/CEMENT GROUT (m)	=	1.30
INSTALLATION DATE :	10/02/2013	(e) = MONITORING BORE EXTERNAL DIAMETER (mm)	=	50
DRILLER :	GeoDrill	(f) = BOREHOLE DIAMETER (mm)	=	100
PVC JOINTS :		(g) = BASE DEPTH OF BENTONITE PIUG (m)	=	N/A
STANDING WATER LEVEL (m) :	6.52	(h) = MONITORING BORE SCREEN TOP DEPTH (m)	=	1.30
DATE :	.03/10/2013	(i) = MONITORING BORE STICK UP (m)	=	0.49

NOTES :(Instrumentation etc)

CONTRACTOR	GEODRILL	COMMENCED	03/10/2013	LOGGED BY	OC
EQUIPMENT	HYDROPOWER SCOUT	COMPLETED	03/10/2013	CHECKED BY	JM

BASIS OF DESCRIPTIONS AND DETAILS OF ABBREVIATIONS ARE GIVEN ON EXPLANATORY NOTES

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH16

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679125.878, N: 7062016.657 (55 MGA94) SURFACE ELEVATION : 299.783 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Hydrapower Scout MOUNTING : Truck CONTRACTOR : GEODRILL DRILLER : TP

DATE STARTED : 30/9/13 DATE COMPLETED : 30/9/13 DATE LOGGED : 9/10/13 LOGGED BY : OC CHECKED BY : JSM

DRILLING							MATERIAL						
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T				1.00m SPT 4, 10, 10 N=20 **1.45m**	299.0	1.0		SC	0.20m Silty SAND: medium dense, fine to medium grained, orange brown, with some rootlets, dry becoming fine grained, rootlets discontinuing	D	MD	TOPSOIL ALLUVIUM
				2.00m SPT 4, 4, 5 N=9 **2.45m**	298.0	2.0		SC	1.30m 1.50m becoming fine grained, orange brown, dry becoming moist	M		
				3.00m SPT 3, 4, 10 N=14 **3.45m**	297.0	3.0		SC	3.00m becoming moist to wet, increase in fines content	M to W		
				4.00m SPT 10, 9, 19 N=28 4.45m	296.0	4.0		SP SC	3.40m 3.60m SAND: medium dense, fine grained, orange brown, moist Clayey SAND: medium dense, fine grained, orange brown with some XW Sandstone nodules, wet 4.20m	W		WEATHERED ROCK 4.48: standing water level measured on 03/10/13 before conducting insitu permeability testing
				5.50m SPT 8, 13, 18 N=31 5.95m	295.0 294.0	5.0 6.0			4.40m XW Sandstone/Siltstone: pale grey and orange brown with some coal laminations, iron staining throughout, very low strenght, wet XW Mudstone: dark grey and orange brown mottling, some white interbedding, very low strength, weathered to a silty clay, moist 4.80m with some silty sand layers interbedded, probably XW Sandstone/Siltstone as previous 5.20m XW Mudstone: dark grey and orange brown mottling and iron staining throughout, very low strength, weathered to a silty clay, moist	M		
				7.00m SPT 4, 13, 21 N=34 7.45m	293.0	7.0						
				8.50m SPT 2, 20, 30/80mm N>50 8.88m	292.0	8.0		CI	8.50m 8.70m Silty CLAY: Clay seam, dense, high plasticity, dark grey, some fine to medium gravel, subangular	W		
				9.50m SPT 11, 30/130mm N>30 9.78m	291.0 290.0	9.0 10.0			XW Mudstone: as previous 9.50m with some reddish brown and some quartz fragments and iron staning throughout 10.00m	M		
					289.0	11.0			BOREHOLE BH16 TERMINATED AT 10.00 m Target depth Piezometer pipe installed on completion of the borehole			

See Explanatory Notes for details of abbreviations & basis of descriptions.

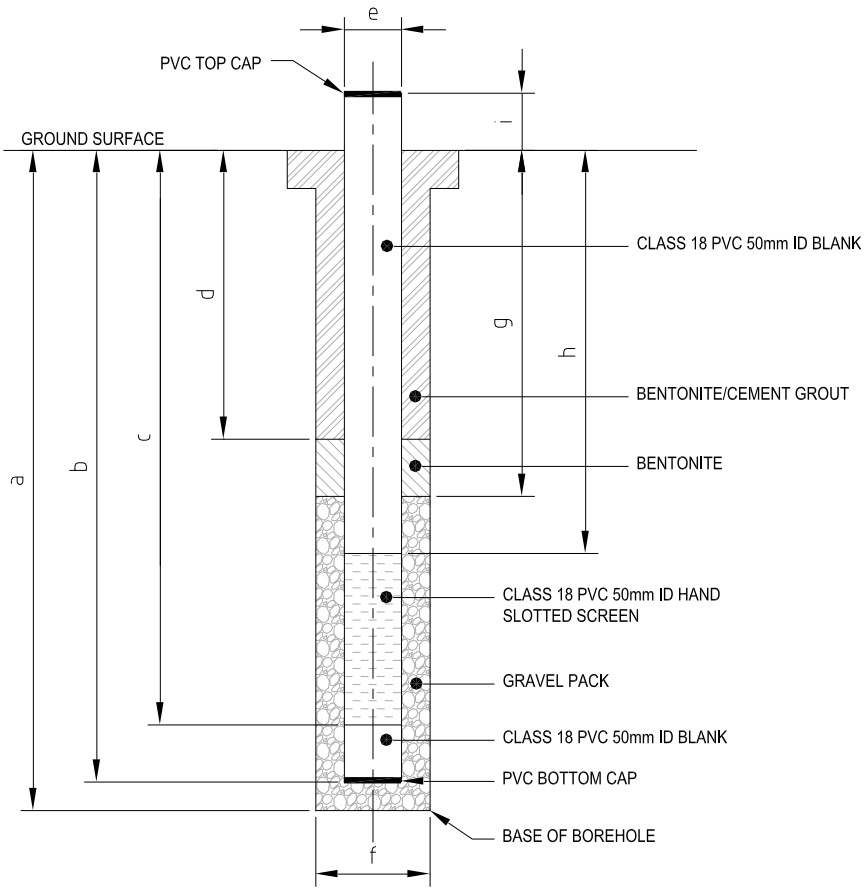
SMEC AUSTRALIA

STANDARD GROUNDWATER MONITORING BORE INSTALLATION

HOLE No	BH16
SHEET	1 OF 1
PROJECT No	30031083

CLIENT Ostwald Brothers
PROJECT Roma Flood Mitigation Levee
FEATURE Piezometer Installation
LOCATION Roma

CO-ORDINATE SYSTEM
Easting:
Northing:
SURFACE ELEVATION
ANGLE FROM HORIZONTAL **90 degrees**



PROJECT NAME :	Roma Flood Mitigation Levee	(a) = BOREHOLE DEPTH (m)	=	10.27
PROJECT ID :	30031083	(b) = MONITORING BORE BASE DEPTH (m)	=	5.00
BOREHOLE ID:	BH16	(c) = MONITORING BORE SCREEN BASE DEPTH (m)	=	4.50
DNR ID :		(d) = DEPTH OF BENTONITE/CEMENT GROUT (m)	=	1.00
INSTALLATION DATE :	30/09/2013	(e) = MONITORING BORE EXTERNAL DIAMETER (mm)	=	50
DRILLER :	GeoDrill	(f) = BOREHOLE DIAMETER (mm)	=	100
PVC JOINTS :		(g) = BASE DEPTH OF BENTONITE PLUG (m)	=	N/A
STANDING WATER LEVEL (m) :	4.48	(h) = MONITORING BORE SCREEN TOP DEPTH (m)	=	1.00
DATE :	03/10/2013	(i) = MONITORING BORE STICK UP (m)	=	0.38

NOTES : (Instrumentation etc)

CONTRACTOR	GEODRILL	COMMENCED	30/09/2013	LOGGED BY	OC
EQUIPMENT	HYDROPOWER SCOUT	COMPLETED	30/09/2013	CHECKED BY	JM

BASIS OF DESCRIPTIONS AND DETAILS OF ABBREVIATIONS ARE GIVEN ON EXPLANATORY NOTES

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH17

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679212.439, N: 7061359.343 (55 MGA94) SURFACE ELEVATION : 299.011 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Hydrapower Scout MOUNTING : Truck CONTRACTOR : GEODRILL DRILLER : TP

DATE STARTED : 30/9/13 DATE COMPLETED : 30/9/13 DATE LOGGED : 9/10/13 LOGGED BY : OC CHECKED BY : JSM

DRILLING							MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T					299.0 / 0.0		SC	0.20m Clayey SAND: medium dense, fine grained, brown to light brown, dry, some tree rootlets		MD	TOPSOIL
							SC	rootlets discontinuing			ALLUVIUM
								0.70m becoming dense, fine to medium grained, light brown, some clay fines, dry	D		
				1.00m SPT 11, 12, 21 N=33 1.45m	298.0 / 1.0		SC				
								1.70m becoming dry to moist			
				2.00m SPT 16, 17, 16 N=33 2.45m	297.0 / 2.0		SC	2.20m becoming reddish brown, increasing in clay content with depth	D to M	D	
				3.00m SPT 5, 7, 8 N=15 **3.45m**	296.0 / 3.0		SC	3.00m decreasing in clay content, sand is increasing in grain size			
							SC	3.50m becoming moist	M		
				4.00m SPT 7, 12, 11 N=23 4.45m	295.0 / 4.0		SC	4.00m becoming dense to very dense, with reddish brown iron staining throughout		D to VD	
								5.00m increasing in clay fines, sand is becoming coarser with , some fine gravels, moist to wet, medium dense.	M to W	MD	
				5.50m SPT 4, 8, 10 N=18 **5.95m**	294.0 / 5.0		SC	5.70m becoming wet			
WB/TC			30/09/13, Water level estimated during auger drilling		293.0 / 6.0		SP	6.00m Silty SAND: dense, medium grained, pale grey, with some fine gravels, subangular, wet	W		6.09: standing water level measured on 03/10/13 before conducting insitu permeability testing
				7.00m SPT 6, 11, 30 N=41 **7.45m**	292.0 / 7.0		SP	7.30m becoming very dense, coarser, some nodules of XW		VD	
								7.45m Sandstone/Siltstone, orange brown and greenish grey, wet.			WEATHERED ROCK
								7.60m XWSandstone/Siltstone: weathered to a very dense Sand/Silty Sand, orange brown and greenish grey, wet, boulder			
				8.00m SPT 4, 9, 12 N=21 8.45m	291.0 / 8.0		SP	Silty SAND: dense, medium grained, pale grey and brown, with some silt and clay fines, wet			
								8.20m becoming medium dense, reducing in silt content		MD	
							SP	8.50m			
					290.0 / 9.0			BOREHOLE BH17 TERMINATED AT 8.50 m Target depth Piezometer pipe installed on completion of the borehole			
					289.0 / 10.0						
					11.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

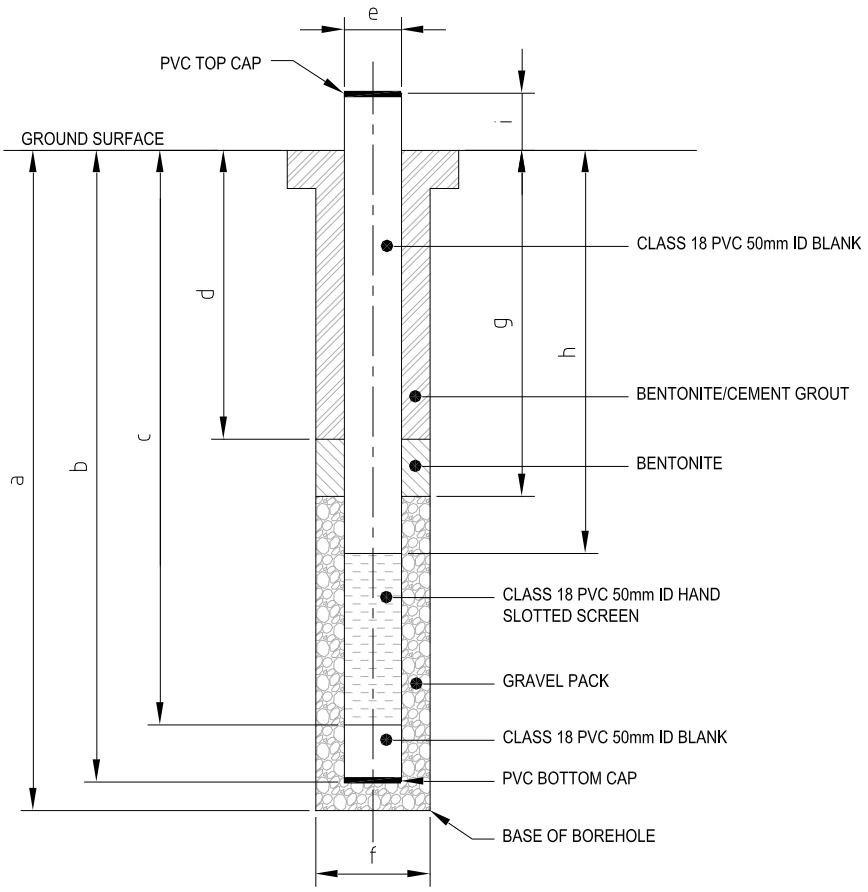
SMEC AUSTRALIA

STANDARD GROUNDWATER MONITORING BORE INSTALLATION

HOLE No	BH17
SHEET	1 OF 1
PROJECT No	30031083

CLIENT Ostwald Brothers
PROJECT Roma Flood Mitigation Levee
FEATURE Piezometer Installation
LOCATION Roma

CO-ORDINATE SYSTEM
Easting:
Northing:
SURFACE ELEVATION
ANGLE FROM HORIZONTAL **90 degrees**



PROJECT NAME :	Roma Flood Mitigation Levee	(a) = BOREHOLE DEPTH (m)	=	8.50
PROJECT ID :	30031083	(b) = MONITORING BORE BASE DEPTH (m)	=	7.50
BOREHOLE ID:	BH17	(c) = MONITORING BORE SCREEN BASE DEPTH (m)	=	7.00
DNR ID :		(d) = DEPTH OF BENTONITE/CEMENT GROUT (m)	=	1.25
INSTALLATION DATE :	30/09/2013	(e) = MONITORING BORE EXTERNAL DIAMETER (mm)	=	50
DRILLER :	GeoDrill	(f) = BOREHOLE DIAMETER (mm)	=	100
PVC JOINTS :		(g) = BASE DEPTH OF BENTONITE (m)	=	N/A
STANDING WATER LEVEL (m) :	6.09	(h) = MONITORING BORE SCREEN TOP DEPTH (m)	=	1.25
DATE :	03/10/2013	(i) = MONITORING BORE STICK UP (m)	=	0.47

NOTES: (Instrumentation etc)

CONTRACTOR	GEODRILL	COMMENCED	30/09/2013	LOGGED BY	OC
EQUIPMENT	HYDROPOWER SCOUT	COMPLETED	30/09/2013	CHECKED BY	JM

BASIS OF DESCRIPTIONS AND DETAILS OF ABBREVIATIONS ARE GIVEN ON EXPLANATORY NOTES

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH18

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 677526.818, N: 7063351.668 (55 MGA94) SURFACE ELEVATION : 302.420 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Hydrapower Scout MOUNTING : Truck CONTRACTOR : GEODRILL DRILLER :

DATE STARTED : 6/11/13 DATE COMPLETED : 7/11/13 DATE LOGGED : 12/10/13 LOGGED BY : CM CHECKED BY : JSM

DRILLING							MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T				1.00m SPT 2, 3, 4 N=7 1.45m	302.0 / 0.0		CI	Sandy CLAY: firm, low to medium plasticity, dark brown, grey, firm to medium grained sand, dry, grass and rootlets to 0.15m depth	D	F	ALLUVIUM
							CI	0.50m becoming medium plasticity, grey brown, slightly grey brown, some white powdery calcite nodules and glass like medium to coarse sand sized shiny crystals		F to St	
					301.0 / 1.0		CI	1.00m becoming firm to stiff, fewer white calcite nodules and crystals			
				2.00m SPT 10, 13, 11 N=24 2.45m			SC	1.60m Clayey SAND: medium dense, fine medium grained, light brown to brown, varying clay content, grading clayey sand/sandy clay, dry to moist		MD	
					300.0 / 2.0		SM	1.90m clay fines reducing			
				3.00m SPT 2, 12, 17 N=29 3.45m			CL-CI	2.30m Sandy CLAY: very stiff, low to medium plasticity, light brown and light grey brown and pale grey, fine to medium grained sand		VSt	
					299.0 / 3.0		CL-CI	3.20m becoming very stiff to hard, varying fine to medium grained sand content	D to M	VSt to H	
				4.00m SPT 15, 17, 16 N=33 4.45m			SC	4.10m Clayey SAND: medium dense to dense, fine to medium grained, light brown, pale grey and light grey brown, high clay content in bands, grading, sandy clay/clayey sand		MD to D	
					298.0 / 4.0		SC	4.70m grading fine to coarse grained, some fine to coarse angular to subrounded gravels, less clay content			
				5.50m SPT 9, 13, 15 N=28 5.95m			SP	5.30m SAND: medium dense to dense, fine to medium grained, brown and grey, some fine to medium angular to subrounded gravels, trace of fines, dry	D		
					297.0 / 5.0		SP	6.20m increase in clay fines content, grading clayey sand in bands < 100mm, some fine to coarse gravels and cobbles to 50mm diameter (slow augering)			
					296.0 / 6.0		SC	7.00m Clayey SAND: dense to very dense, fine to coarse angular to subrounded gravels and cobbles to 80mm, dry to moist.	D to M		
				7.50m SPT 6, 30/140mm N>30 7.80m							
					295.0 / 7.0						
					294.0 / 8.0		SC	8.50m increasing in gravel content, shading orange brown and light brown, becoming moist, less frequent cobbles.	M	D to VD	
					293.0 / 9.0						
				10.40m SPT 17, 30/100mm N>30 10.65m	292.0 / 10.0			10.45m 10.65m XW Mudstone: Extremely low strength, grey and dark grey, so yellow brown mottles, dry to moist, laminated, remoulds to high plasticity silty clay	D to M		WEATHERED ROCK
					11.0			BOREHOLE BH18 TERMINATED AT 10.65 m Target depth Piezometer pipe installed on completion of the borehole			

See Explanatory Notes for details of abbreviations & basis of descriptions.

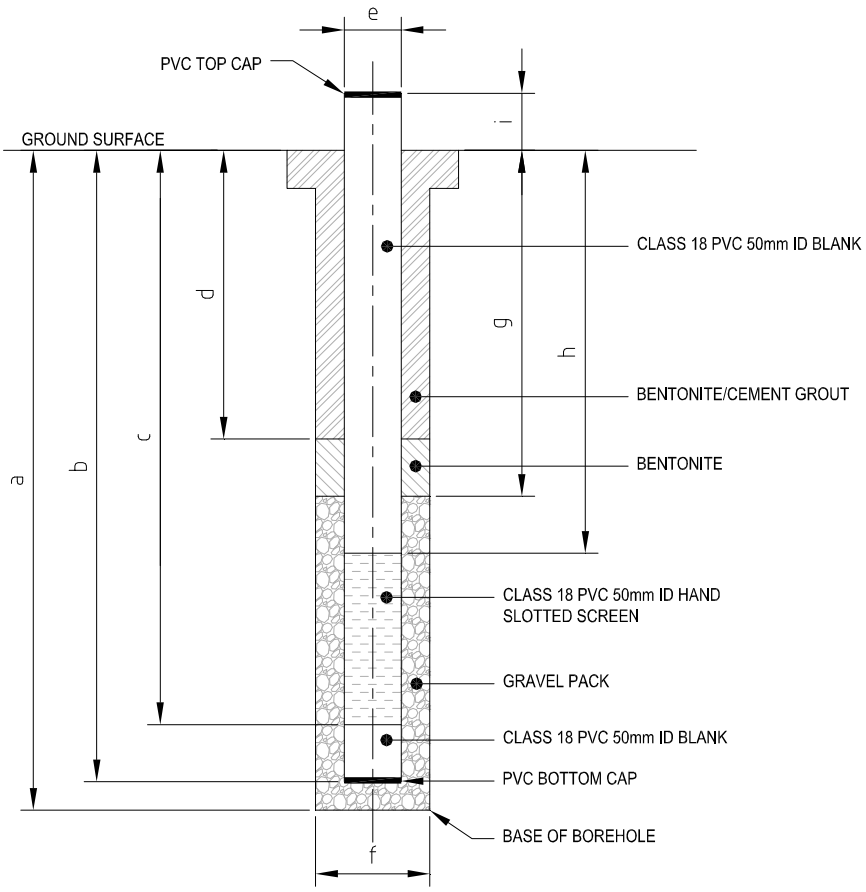
SMEC AUSTRALIA

STANDARD GROUNDWATER MONITORING BORE INSTALLATION

HOLE No	BH18
SHEET	1 OF 1
PROJECT No	30031182

CLIENT Ostwald Brothers
PROJECT Roma Flood Mitigation Levee
FEATURE Piezometer Installation
LOCATION Roma

CO-ORDINATE SYSTEM
Easting:
Northing:
SURFACE ELEVATION
ANGLE FROM HORIZONTAL **90 degrees**



PROJECT NAME :	Roma Flood Mitigation Levee	(a) = BOREHOLE DEPTH (m)	=	10.65
PROJECT ID :	30031182	(b) = MONITORING BORE BASE DEPTH (m)	=	10.65
BOREHOLE ID:	BH14	(c) = MONITORING BORE SCREEN BASE DEPTH (m)	=	10.15
DNR ID :		(d) = DEPTH OF BENTONITE/CEMENT GROUT (m)	=	3.0
INSTALLATION DATE :	7 Nov 2013	(e) = MONITORING BORE EXTERNAL DIAMETER (mm)	=	50
DRILLER :	GeoDrill	(f) = BOREHOLE DIAMETER (mm)	=	100
PVC JOINTS :		(g) = BASE DEPTH OF BENTONITE PLUG(m)	=	N/A
STANDING WATER LEVEL (m) :	8.90	(h) = MONITORING BORE SCREEN TOP DEPTH (m)	=	4.15
DATE :	7 Nov 2013	(i) = MONITORING BORE STICK UP (m)	=	0.55

NOTES :(Instrumentation etc)

CONTRACTOR	GEODRILL	COMMENCED	07/11/2013	LOGGED BY	CM
EQUIPMENT	HYDROPOWER SCOUT	COMPLETED	07/11/2013	CHECKED BY	OC

BASIS OF DESCRIPTIONS AND DETAILS OF ABBREVIATIONS ARE GIVEN ON EXPLANATORY NOTES

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH19

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 677560.166, N: 7063357.903 (55 MGA94) SURFACE ELEVATION : 301.476 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Hydrapower Scout MOUNTING : Truck CONTRACTOR : GEODRILL DRILLER :

DATE STARTED : 7/11/13 DATE COMPLETED : 7/11/13 DATE LOGGED : 12/10/13 LOGGED BY : CM CHECKED BY : JSM

DRILLING							MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
					301.0	0.0		CL-CI	Sandy CLAY: firm, low to medium plasticity, dark brown grey, fine to medium grained sand, grass rootlets to 0.15m	D	F	ALLUVIUM
						0.50m		CL-CI	becoming stiff, light brown, fine grained sand	D to M	St	
				1.00m SPT 6, 10, 10 N=20 1.45m	300.0	1.0 1.00m		CI	becoming very stiff medium plasticity, orange/yellow brown, pale grey and grey brown, some white powdery calcite nodules		VSt	
				2.00m SPT 18, 17, 18 N=35 2.45m	299.0	2.0 2.00m		CL-CI	becoming very stiff to hard		VSt to H	
				3.00m SPT 8, 9, 11 N=20 3.45m	298.0	2.70m 3.0		CL-CI SC	increasing in sand content, decreasing in moisture content. Silty SAND: medium dense, fine to medium grained, yellow, light brown and light grey brown		MD	
				4.00m SPT 9, 12, 13 N=25 4.45m	297.0	3.50m 4.0		SC SC SC	increase in clay content, grading clayey sand/sandy clay in parts traces of fine to medium gravels becoming fine to coarse grained, grading of sand varying in bands less than 50mm thick.	D		
				5.50m SPT 6, 9, 11 N=20 5.95m	296.0	4.70m 5.0 5.30m 5.60m 6.0		SC SC SP SP	Clayey SAND: medium dense, fine to coarse grained, light brown, medium dense, varying clay fines grading towards sandy clay in bands decreasing clay fines content SAND: medium dense, fine to coarsed grained, light grey brown yellow brown and pale grey, trace of angular fine gravels, trace of fines, varying bands trace of fine to medium grained angular gravel	D to M D		
				7.00m SPT 27, 30/80mm N>30 7.23m	295.0 294.0	6.40m 7.0 7.00m 8.0			XW Mudstone: extremely low strength, extremely weathered, grey and dark grey some orangee yellow brown mottles, dry to moist, visibly laminated, extremely low strength to very low strenght in parts,			WEATHERED ROCK
				8.50m SPT 30/140mm N=R 8.64m	293.0	8.50m 9.0			shading dark grey, pale grey and yellow brown, occasional brown medium grained, extremely low strength, higher moisture content			
				10.00m SPT 21, 30/95mm N>30 10.25m	292.0 291.0	10.0 10.25m 11.0			BOREHOLE BH19 TERMINATED AT 10.25 m Target depth Borehole grouted to surface on completion.			

WB/TC

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH20

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 677590.388, N: 7063360.726 (55 MGA94) SURFACE ELEVATION : 301.207 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Hydrapower Scout MOUNTING : Truck CONTRACTOR : GEODRILL DRILLER :

DATE STARTED : 7/11/13 DATE COMPLETED : 7/11/13 DATE LOGGED : 12/10/13 LOGGED BY : CM CHECKED BY : JSM

DRILLING							MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
WB/TC					301.0	0.0		CI	Sandy CLAY: Firm to stiff, medium plasticity, dark brown, slightly dark grey brown, fine to medium grained sand grass and rootlets to 0.1m	D	F to St	ALLUVIUM
						0.40m		CI	shading light brown, fine grained sand, some medium grains.		St	
				1.00m SPT 8, 11, 14 N=25 **1.45m**	300.0	1.0		CI	becoming very stiff, medim plasticity, light and yellow brown, pale grey and light grey brown, mottled			
						1.50m		CI	some white powdery calcite nodules <10 mm diameter generally shading lighter browns		VSt	
				2.00m SPT 6, 11, 14 N=25 **2.45m**	299.0	2.0		CI				
						2.50m		CL-CI	becoming low to medium plasticity, increasing fine to medium grained sand			
				3.00m SPT 9, 12, 13 N=25 3.45m	298.0	3.0		CL-CI	higher silt content	D to M		
						3.10m		SC	Clayey SAND: medium dense, fine to medium grained, some coarse grains, yellow orange brown, pale grey and ligth grey brown.		MD	
				4.00m SPT 9, 14, 30/140mm N>44	297.0	4.0		SC	becoming dense to very dense, fine to coarse angular to subrounded weathered mudstone and gravels		D to VD	
				5.50m SPT 21, 30/120mm N>30 5.77m	296.0	5.0		SC				
						5.50m		SC	decreasing in clay content			
						5.70m			XW Mudstone: extremely low strength, light grey brown and yellow brown, trace of fine grained sand, dry remoulds to high plasticity,			WEATHERED ROCK
				7.00m SPT 18, 30/110mm N>30 7.26m	295.0	6.0						
						6.80m			shading dark grey and yellow brown laminations, dry to moist			
					294.0	7.0						
						7.20m			extremely low strength, fine to medium grained brown sandstone interbeds <30mm			
				8.50m SPT 12, 24, 26 N=50 8.95m	293.0	8.0						
						8.50m			shading dark grey, grey and yellow brown, higher moisture contnent, becoming low strength or stronger at 9.8.			
					292.0	9.0						
				9.80m SPT 20/5mm HB N=R 9.81m								
					291.0	10.0						
						9.81m			BOREHOLE BH20 TERMINATED AT 9.81 m Target depth Borehole grouted to surface on completion.			
						11.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH21

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 1

POSITION : E: 679097.354, N: 7062595.889 (55 MGA94) SURFACE ELEVATION : 300.663 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Hydrapower Scout MOUNTING : Truck CONTRACTOR : GEODRILL DRILLER : TP

DATE STARTED : 1/10/13 DATE COMPLETED : 1/10/13 DATE LOGGED : 9/10/13 LOGGED BY : OC CHECKED BY : JSM

DRILLING							MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T			01/10/13, Water level estimated during auger drilling	1.00m SPT 10, 16, 17 N=33 1.45m 2.00m SPT 6, 7, 8 N=15 2.45m 3.00m SPT 6, 8, 9 N=17 3.45m 4.00m SPT 5, 7, 11 N=18 4.45m 5.50m SPT 5, 9, 10 N=19 5.95m 7.00m SPT 5, 12, 15 N=27 7.45m 8.50m SPT 5, 13, 17 N=30 8.95m 10.00m SPT 12, 17, 24 N=41 10.45m	0.0 300.0 1.0 299.0 2.0 298.0 3.0 297.0 4.0 296.0 5.0 295.0 6.0 294.0 7.0 293.0 8.0 292.0 9.0 291.0 10.0 290.0 11.0		SC SC SC SC SP SP SP SP	0.20m Clayey SAND: medium dense, fine to medium grained, with rootlets throughout, some fine gravel and clay fines, dry rootlets discontinuing, becoming fine grained 1.70m becoming dry to moist 3.20m shading to reddish brown 4.40m Silty SAND: medium dense, fine to medium grained, light grey with dark grey 5.60m becoming wet, 5.90m sand fraction becoming coarser with some fine to medium gravels and iron stained nodules 7.40m some medium coarse gravels 8.90m XW Mudstone: dark grey and orange brown, with some iron staining nodules and quartz laminations, very low strength, moist 10.15m BOREHOLE BH21 TERMINATED AT 10.15 m Target depth Borehole grouted to surface on completion.	D D to M W M	MD MD to D	TOPSOIL ALLUVIUM WEATHERED ROCK

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH22

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 2

POSITION : E: 679105.613, N: 7062556.552 (55 MGA94) SURFACE ELEVATION : 300.476 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Hydrapower Scout MOUNTING : Truck CONTRACTOR : GEODRILL DRILLER : TP

DATE STARTED : 1/10/13 DATE COMPLETED : 1/10/13 DATE LOGGED : 9/10/13 LOGGED BY : OC CHECKED BY : JSM

DRILLING								MATERIAL						
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T					300.0	0.0		SC	0.20m Clayey SAND: medium dense, fine grained, reddish brown, dry, with some clay fines, some rootlets.	D	L to MD	TOPSOIL
								SC	0.40m rootlets discontinuing			ALLUVIUM
								SC	increasing in clay fines content,			
								SC	0.80m becoming dry to moist	D to M		
				1.00m SPT 2, 2, 12 N=14 1.45m	299.0	1.0		SC	1.50m becoming moist, sand becoming fine to medium grained, decreasing in clay content	M	MD	
				2.00m SPT 6, 9, 10 N=19 2.45m	298.0	2.0		SC	2.60m becoming dry to moist, medium dense	D to M		
				3.00m SPT 6, 8, 9 N=17 3.45m	297.0	3.0		SC	3.50m intebedded with XW Mudstone, orange brown with iron staining throughout, very low strength	M		
				4.00m SPT 11, 14, 17 N=31 4.45m	296.0	4.0		SC	4.20m			
						5.0		SP	Silty SAND: medium dense to dense, fine to medium grained, light brown and yellow white, moist 5.20m		D	
				5.50m SPT 6, 13, 16 N=29 5.95m	295.0	6.0		SC	Clayey SAND: medium dense, medium to coarse grained, orange brown with some iron stained nodules throughout, low plasticity fines, wet 5.70m becoming fine grained, increasing in fines content, increase in plasticity, brown		MD to D	
				7.00m SPT 4, 6, 8 N=14 7.45m	294.0	7.0		SC	7.00m becoming fine to medium grained, colour change to grey with some orange brown streaking	W	MD	
			01/10/13, Water level estimated during auger drilling		293.0	8.0		SC				
WB/TC				8.50m SPT 10, 16, 21 N=37 8.95m	292.0	9.0			9.20m becoming dense, shading bluish grey with some orange brown		D	
				10.00m SPT 10, 22, 30/120mm N>52 10.42m	291.0	10.0		SC	10.10m			
					290.0	11.0			XW Mudstone: dark grey and orange brown with iron staining throughout, some quartz laminations, very low strengt, moist	M	D	WEATHERED ROCK

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH22

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 2 OF 2

POSITION : E: 679105.613, N: 7062556.552 (55 MGA94) SURFACE ELEVATION : 300.476 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Hydrapower Scout MOUNTING : Truck CONTRACTOR : GEODRILL DRILLER : TP

DATE STARTED : 1/10/13 DATE COMPLETED : 1/10/13 DATE LOGGED : 9/10/13 LOGGED BY : OC CHECKED BY : JSM

DRILLING							MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)		GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
WB/TC					11.0				XW Mudstone: dark grey and orange brown with iron staining throughout, some quartz laminations, very low strengt, moist *(continued)*	M	D	WEATHERED ROCK
				11.50m SPT 15, 30/120mm N>30 11.77m	289.0				11.50m as above, quartz laminations discontinued			
					12.0				11.95m BOREHOLE BH22 TERMINATED AT 11.95 m Target depth Piezometer pipe installed on completion of the borehole			
					288.0	13.0						
					287.0	14.0						
					286.0	15.0						
					285.0	16.0						
					284.0	17.0						
					283.0	18.0						
					282.0	19.0						
					281.0	20.0						
					280.0	21.0						
					279.0	22.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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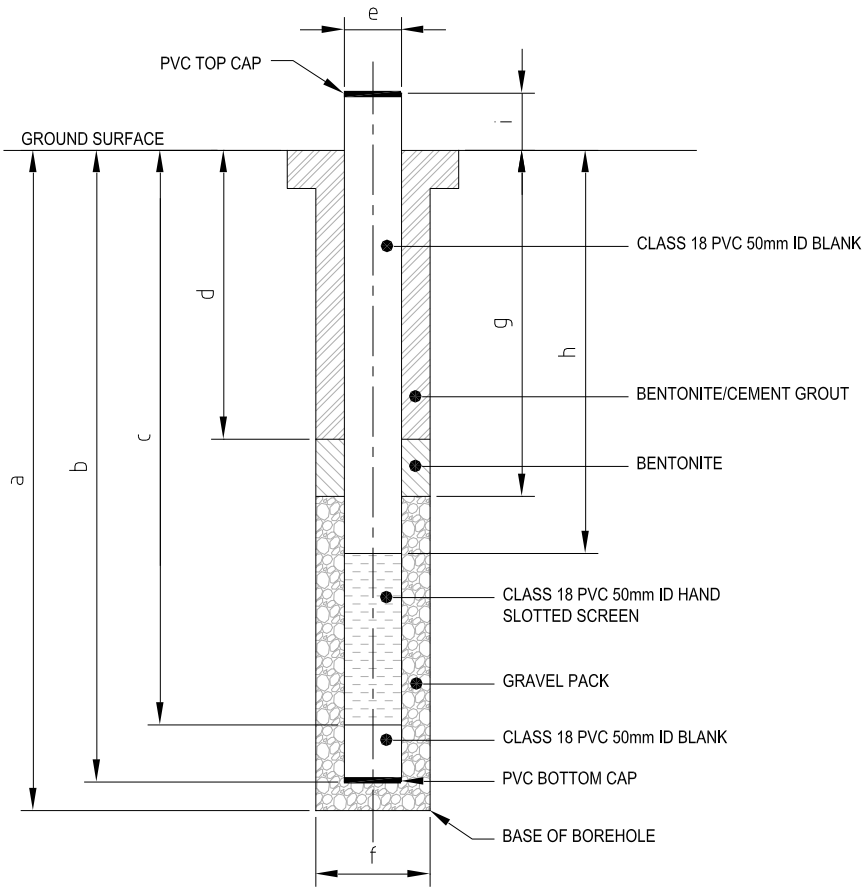
STANDARD GROUNDWATER MONITORING BORE INSTALLATION

HOLE No	BH22
SHEET	1 OF 1
PROJECT No	30031083

CLIENT Ostwald Brothers
PROJECT Roma Flood Mitigation Levee
FEATURE Piezometer Installation
LOCATION Roma

CO-ORDINATE SYSTEM
Easting:
Northing:
SURFACE ELEVATION
ANGLE FROM HORIZONTAL **90 degrees**



PROJECT NAME :	Roma Flood Mitigation Levee	(a) = BOREHOLE DEPTH (m)	=	11.95
PROJECT ID :	30031083	(b) = MONITORING BORE BASE DEPTH (m)	=	8.70
BOREHOLE ID:	BH22	(c) = MONITORING BORE SCREEN BASE DEPTH (m)	=	8.20
DNR ID :		(d) = DEPTH OF BENTONITE/CEMENT GROUT (m)	=	4.70
INSTALLATION DATE :	30/09/2013	(e) = MONITORING BORE EXTERNAL DIAMETER (mm)	=	50
DRILLER :	GeoDrill	(f) = BOREHOLE DIAMETER (mm)	=	100
PVC JOINTS :		(g) = BASE DEPTH OF BENTONITE PLUG (m)	=	N/A
STANDING WATER LEVEL (m) :	5.90	(h) = MONITORING BORE SCREEN TOP DEPTH (m)	=	4.70
DATE :	03/10/2013	(i) = MONITORING BORE STICK UP (m)	=	0.60

NOTES: (Instrumentation etc)

CONTRACTOR	GEODRILL	COMMENCED	30/09/2013	LOGGED BY	OC
EQUIPMENT	HYDROPOWER SCOUT	COMPLETED	30/09/2013	CHECKED BY	JM

BASIS OF DESCRIPTIONS AND DETAILS OF ABBREVIATIONS ARE GIVEN ON EXPLANATORY NOTES

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH23

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 1 OF 2

POSITION : E: 679111.967, N: 7062507.173 (55 MGA94) SURFACE ELEVATION : 300.431 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Hydrapower Scout MOUNTING : Truck CONTRACTOR : GEODRILL DRILLER : TP

DATE STARTED : 1/10/13 DATE COMPLETED : 1/10/13 DATE LOGGED : 9/10/13 LOGGED BY : OC CHECKED BY : JSM

DRILLING								MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T					300.0	0.0		SC	0.20m Clayey SAND: medium dense, fine to medium grained, orange brown, dry, with some clay fines, some rootlets rootlets discontinuing	D	MD	TOPSOIL ALLUVIUM
								SC	0.70m decreasing in fines content			
				1.00m SPT 2, 8, 8 N=16 1.45m	299.0	1.0		SC	1.50m becoming dry to moist	D to M		
				2.00m SPT 2, 7, 6 N=13 2.45m	298.0	2.0		SC	2.70m becoming moist	M		
				3.00m SPT 7, 9, 12 N=21 3.45m	297.0	3.0		SC	3.50m becoming pale brown, fine grained, dense		D	
				4.00m SPT 9, 21, 22 N=43 4.45m	296.0	4.0		SC				
				5.50m SPT 7, 9, 14 N=23 5.95m	295.0	5.0		SC	5.50m becoming orange brown, medium dense		MD	
WB/TC			01/10/13, Water level estimated during auger drilling	7.00m SPT 6, 9, 11 N=20 7.45m	294.0	6.0		SC	7.00m becoming wet	W		
				8.50m SPT 5, 11, 11 N=22 8.95m	293.0	7.0		SC	8.00m Silty SAND: medium dense, fine to medium grained, bluish grey, wet.			
				10.00m SPT 30/140mm N=R 10.14m	292.0	8.0		SC	10.00m XW Mudstone: dark grey and orange brown, with some iron staining nodules and quartz laminations, very low strength, moist	M		WEATHERED ROCK
					291.0	9.0						
					290.0	10.0						
						11.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH23

PROJECT : Roma Flood Mitigation
LOCATION : Roma
CLIENT : Ostwald Bros Pty Ltd
FEATURE :
FILE / JOB NO : 30031182
SHEET : 2 OF 2

POSITION : E: 679111.967, N: 7062507.173 (55 MGA94) SURFACE ELEVATION : 300.431 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Hydrapower Scout MOUNTING : Truck CONTRACTOR : GEODRILL DRILLER : TP

DATE STARTED : 1/10/13 DATE COMPLETED : 1/10/13 DATE LOGGED : 9/10/13 LOGGED BY : OC CHECKED BY : JSM

DRILLING						MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
WB/TC				11.50m SPT 30/140mm N=R 11.64m	11.0 / 289.0			XW Mudstone: dark grey and orange brown, with some iron staining nodules and quartz laminations, very low strength, moist *(continued)*	M		WEATHERED ROCK
								11.50m 11.64m becoming dark grey, homogenous throughout BOREHOLE BH23 TERMINATED AT 11.64 m Target depth Borehole grouted to surface on completion			
					12.0 / 288.0						
					13.0 / 287.0						
					14.0 / 286.0						
					15.0 / 285.0						
					16.0 / 284.0						
					17.0 / 283.0						
					18.0 / 282.0						
					19.0 / 281.0						
					20.0 / 280.0						
					21.0 / 279.0						
					22.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

SMEC AUSTRALIA

APPENDIX D TEST PIT AND SPT SAMPLE PHOTOS

Test Pit Photos

Test Pit TP3

Test Pit TP4

Test Pit TP5

Test Pit TP6

Test Pit TP9

Test Pit TP11

Test Pit TP12

Test Pit TP13

Test Pit TP14

Test Pit TP15

Test Pit TP16

Test Pit TP17

Test Pit TP19

Test Pit TP20

Test Pit TP22

Test Pit TP23

Test Pit TP24

Test Pit TP25

Test Pit TP26

Test Pit TP27

Test Pit TP28

Test Pits Borrow Areas Photos

Test Pit TPB1

Test Pit TPB2

Test Pit TPB3

Test Pit TPB4

Test Pit TPB5

Test Pit TPB6

Test Pit TPB7

Test Pit TPB8

Test Pit TPB9

Test Pit TPB10

Test Pit TPB11

Test Pit TPB12

Test Pit TPB13

Test Pit TPB14

Test Pit TPB15

Test Pit TPB16

Test Pit TPB17

Test Pit TPB18

Test Pit TPB19

Test Pit TPB20

Test Pit TPB21

Test Pit TPB22

Test Pit TPB23

Test Pit TPB24

Test Pit TPB25

Test Pit TPB26

Test Pit TPB27

Test Pit TPB28

Test Pit TPB29

Test Pit TPB30

Test Pit TPB31

Test Pit TPB33

Test Pit TPB34

Test Pit TPB36

Test Pit TPB37

Test Pit TPB38

Test Pit TPB39

Test Pit TPB40

Test Pit TPB42

Test Pit TPB43

Test Pit TPB44

Test Pit TPB45

Test Pit TPB47

Test Pit TPB48

Test Pit TPB49

Test Pit TPB50

Test Pit TPB51

Test Pit TPB52

Test Pit TPB53

Test Pit TPB54

Test Pit TPB55

Test Pit TPB56

Test Pit TPB57

Test Pit TPB58

Test Pit TPB59

Test Pit TPB60

Test Pit TPB61

Test Pit TPB62

Test Pit TPB63

Test Pit TPB64

Test Pit TPB66

Test Pit TPB67

Test Pit TPB68

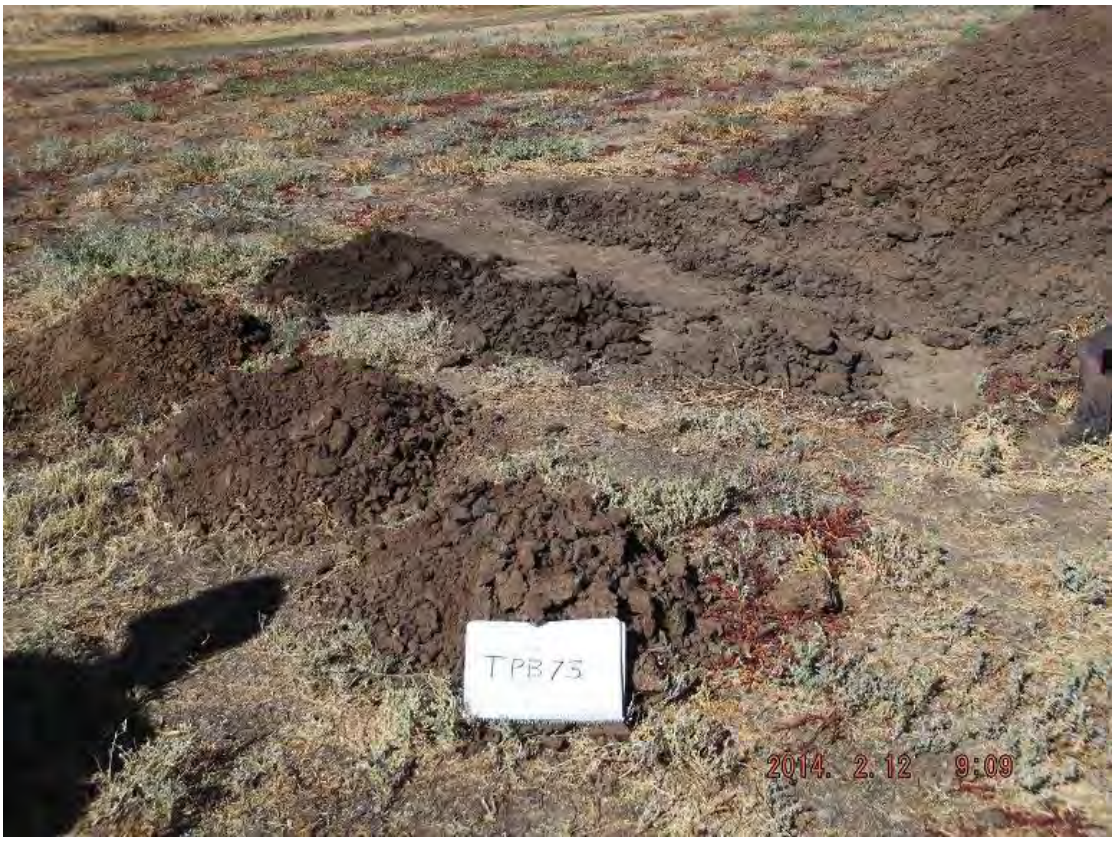
Test Pit TPB69

Test Pit TPB70

Test Pit TPB71

Test Pit TPB72

Test Pit TPB73



Test Pit TPB74

Test Pit TPB75

Pavement Test Pits

Test Pit TPX01

Test Pit TPX02

Test Pit TPX4

Test Pit TPX6

Test Pit TPX8

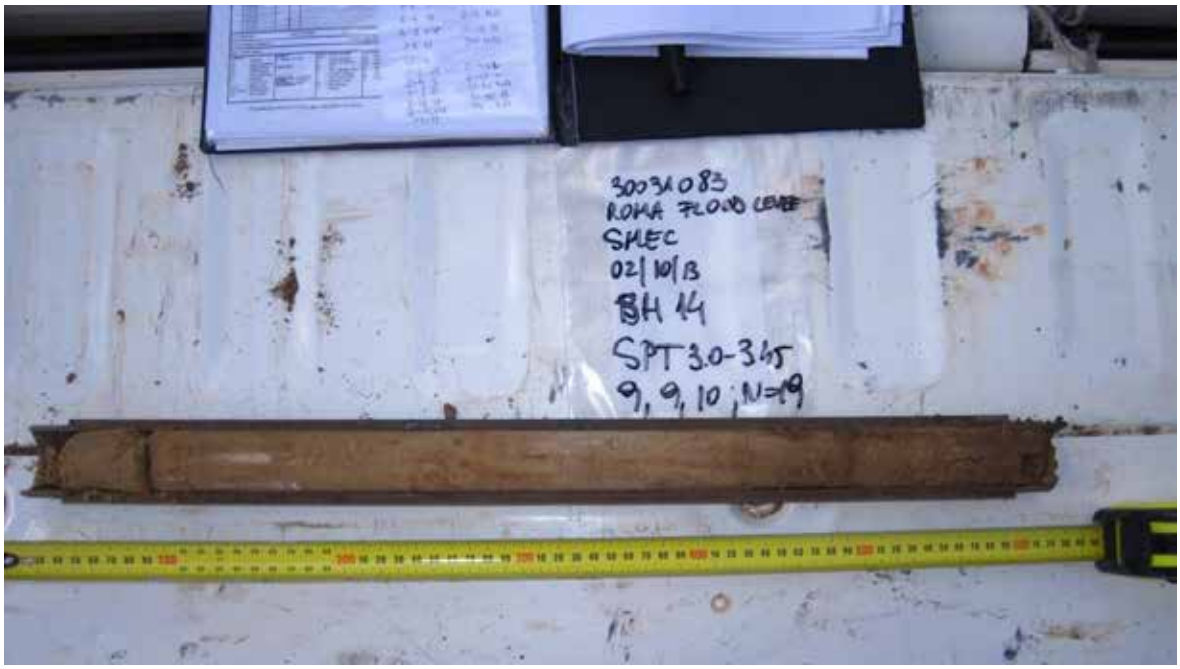
Test Pit TPX09

Bore Holes SPT Samples Photographs:

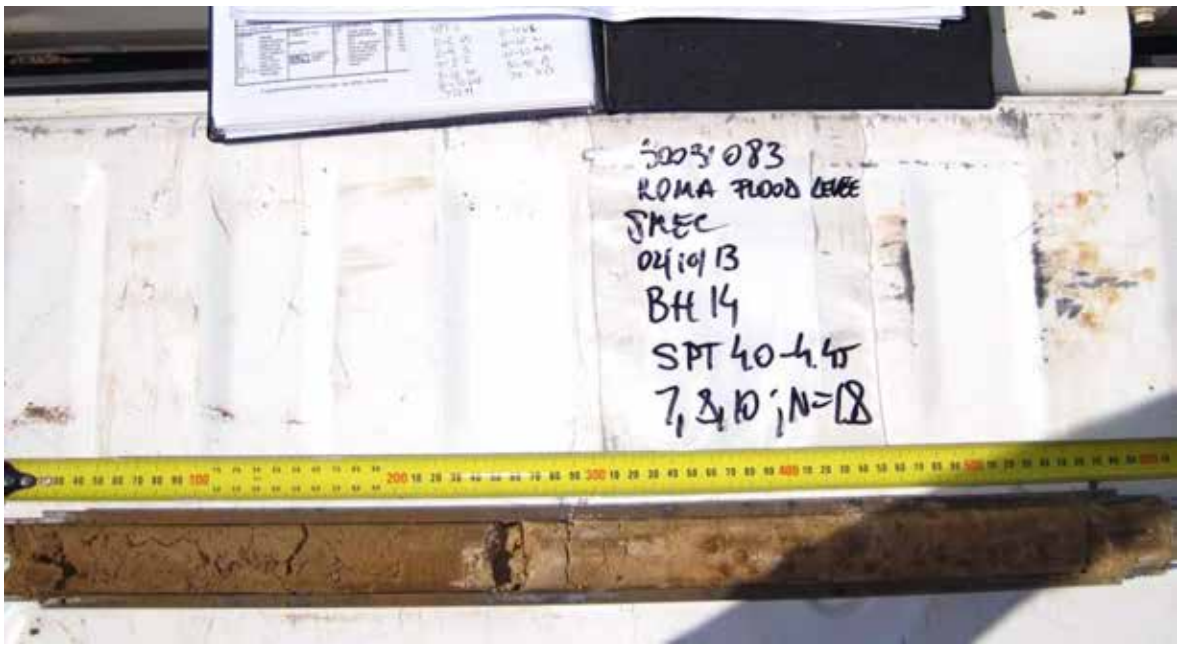
BH14 – SPT 1.0-1.45:

BH14 – SPT 2.0-2.45:

BH14 – SPT 3.0-3.45:

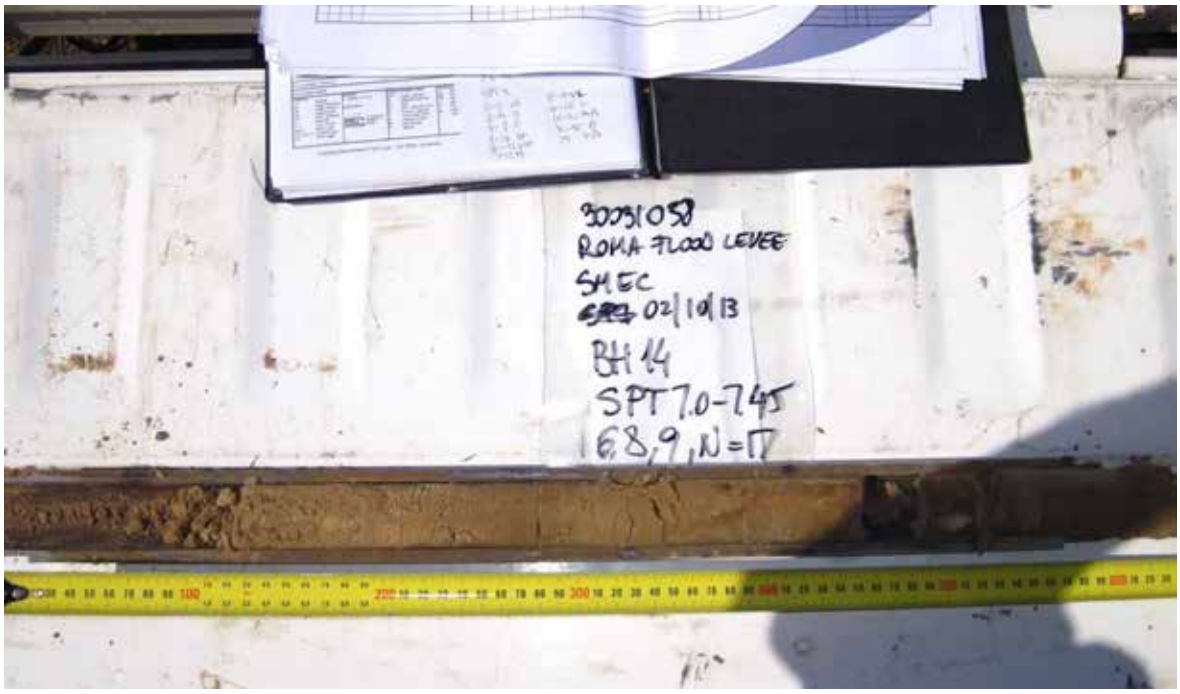


BH14 – SPT 4.0-4.45:

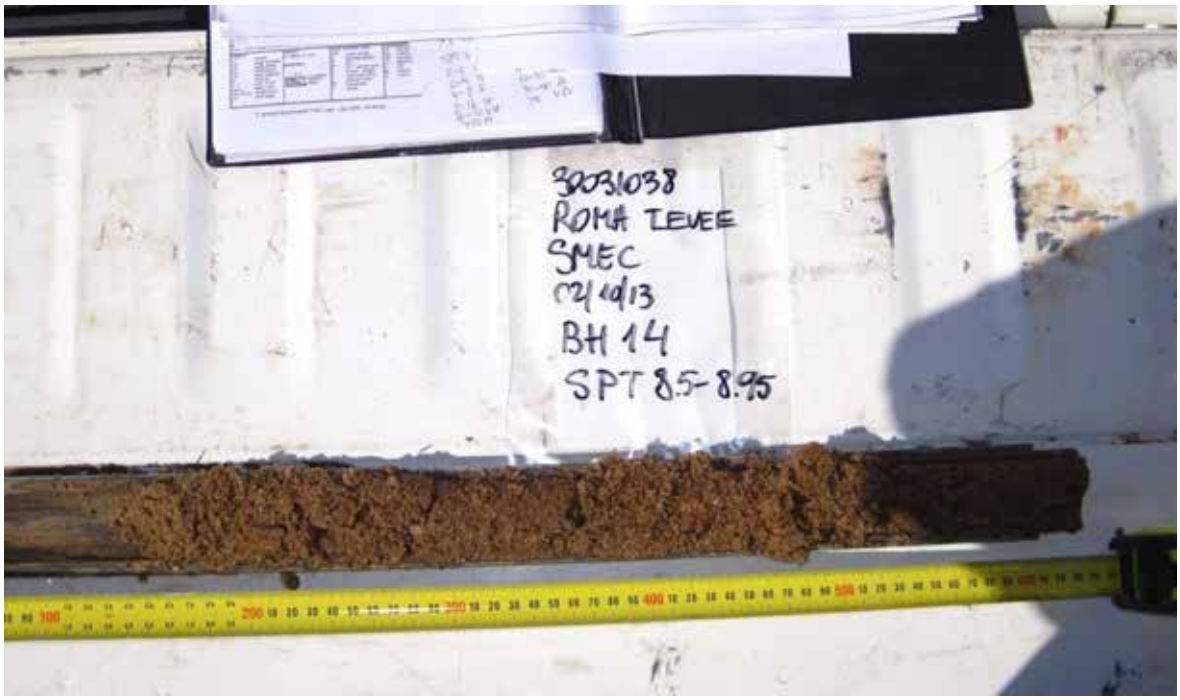


BH14 – SPT 5.5-5.95:

BH14 – SPT 7.0-7.45:



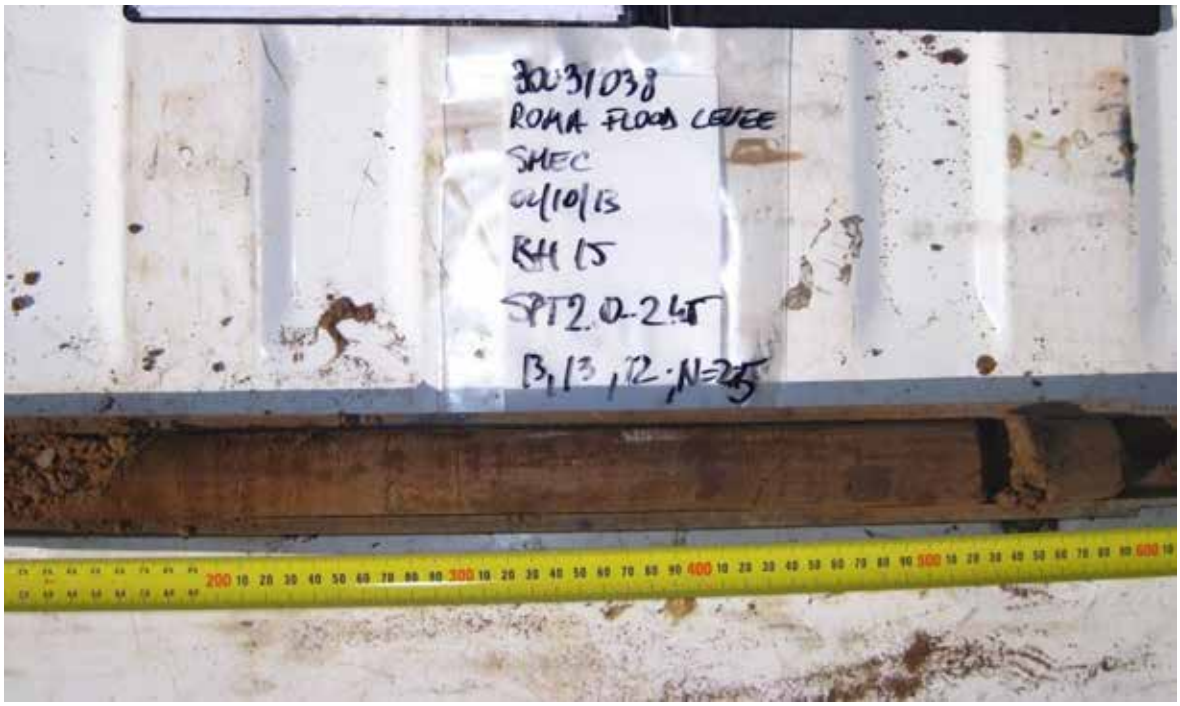
BH14 – SPT 8.5-8.95:



BH14 – SPT 10.0-10.45:

BH15 – SPT1.0-1.45:

BH15 – SPT 2.0-2.45:



BH15 – SPT 3.0-3.45:

BH15 – SPT 4.0-4.45:

BH15 – SPT 5.5-5.95:

BH15 – SPT 8.5-8.95:

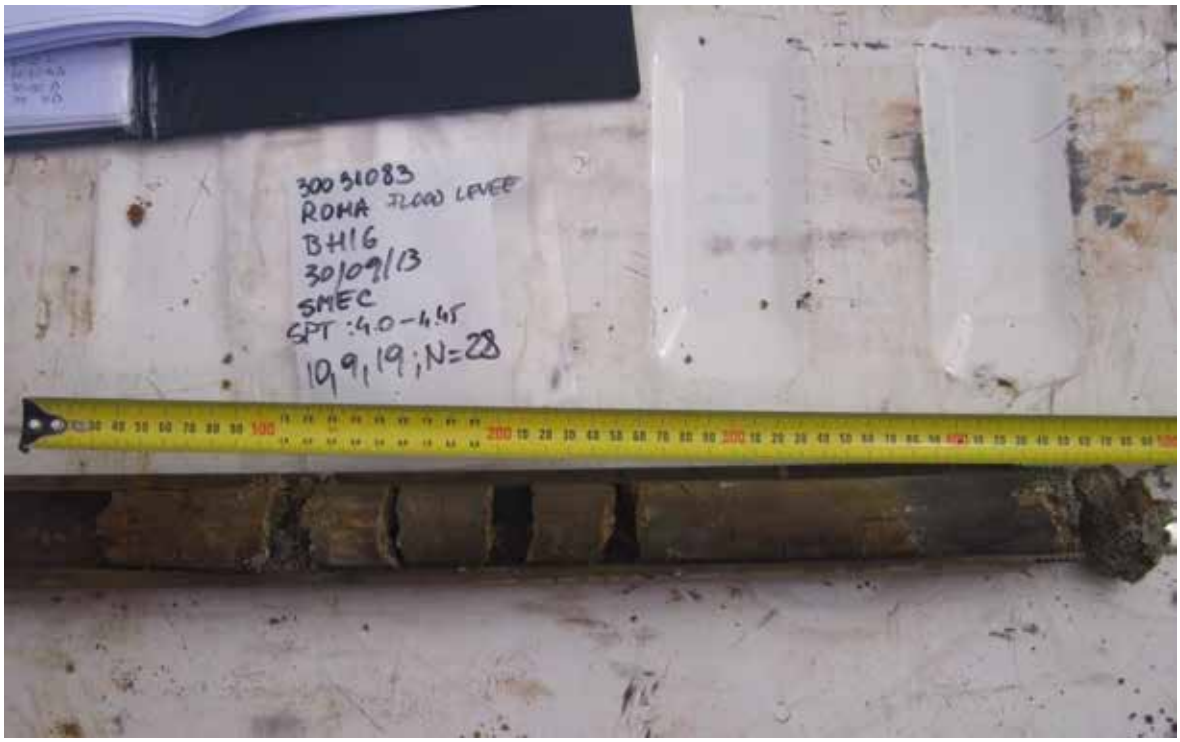
BH15 – SPT 10.0-10.45:

BH16 – SPT 1.0-1.45:

BH16 – SPT 2.0-2.45:

BH16 – SPT 3.0-3.45:

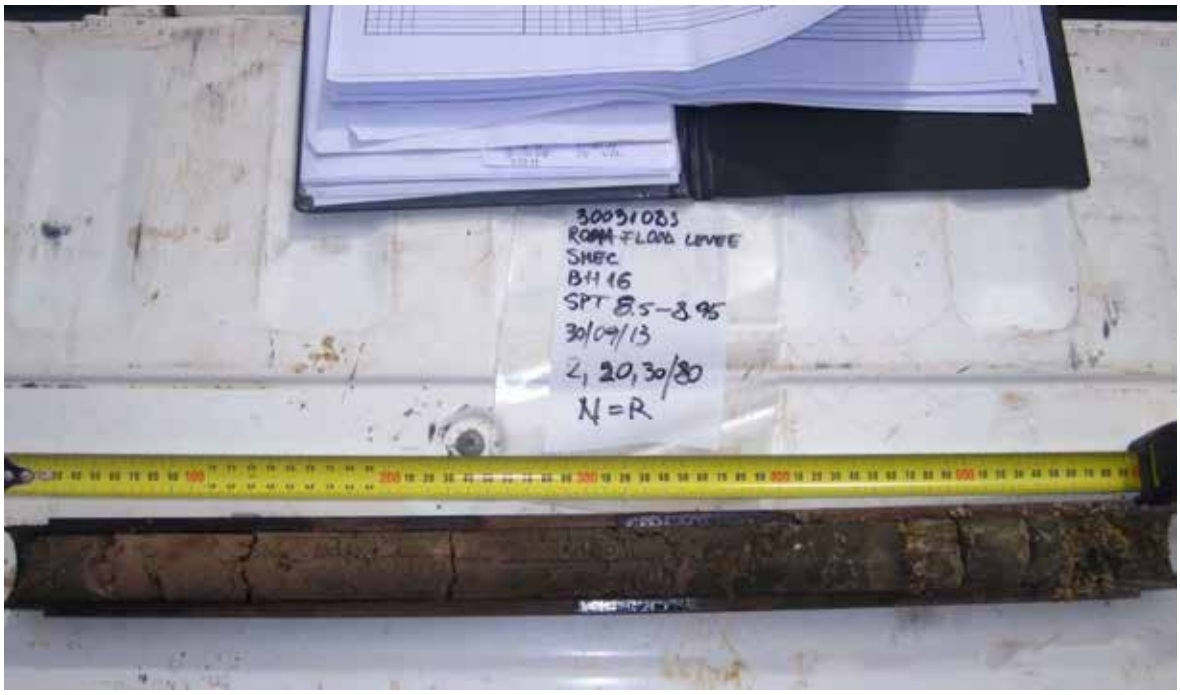
BH16 – SPT 4.0-4.45:



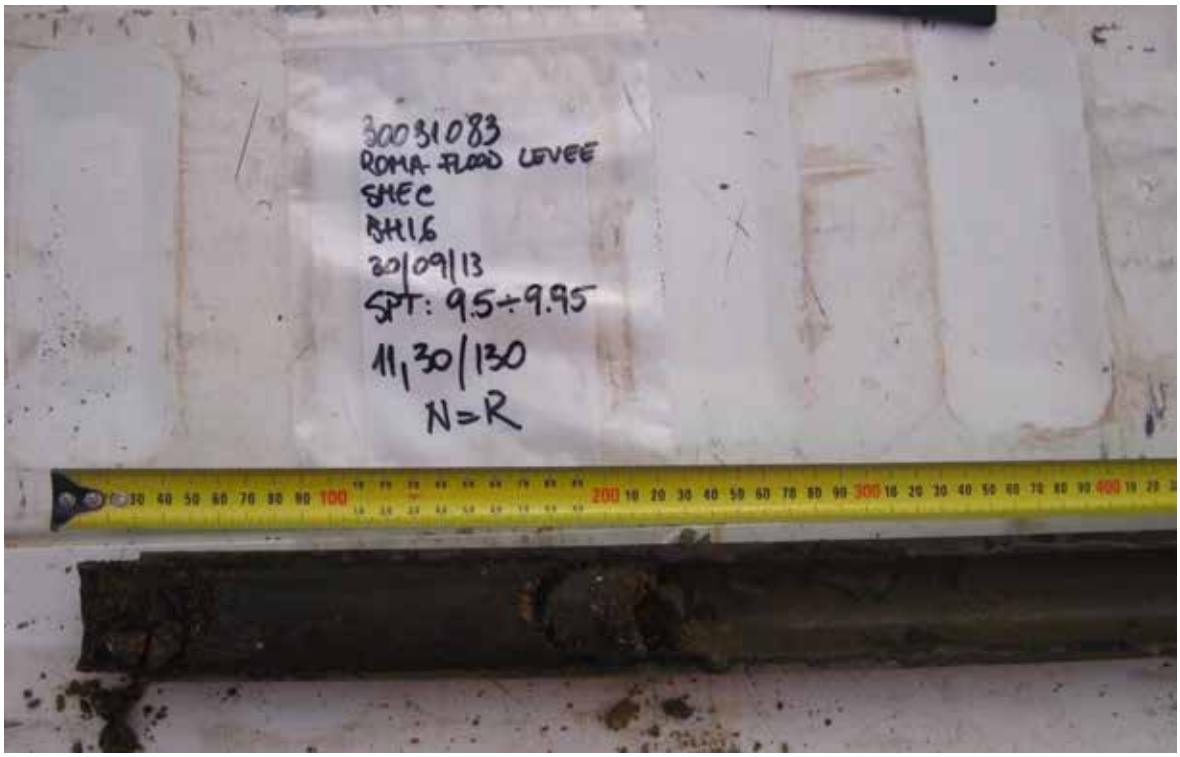
BH16 – SPT 5.5-5.95:

BH16 – SPT 7.0-7.45:

BH16 – SPT 8.5-8.95:



BH16 – SPT 9.5-9.95:



BH17 – SPT 1.0-1.45:

BH17 – SPT 2.0-2.45:

BH17 – SPT 3.0-3.45:

BH17 – SPT 4.0-4.45:

BH17 – SPT 5.5-5.95:

BH17 – SPT 7.0-7.45:

BH17 – SPT 8.0-8.45:

BH18 – SPT 1.0-1.45:

BH18 – SPT 2.5-2.45:

BH18 – SPT 3.0-3.45:

BH18 – SPT 3.0-3.45:

BH18 – SPT 3.0-3.45:

BH18 – SPT 4.0-4.45:

BH18 – SPT 5.50-5.95:

BH18 – SPT 7.0-7.45:

BH18 – SPT 7.5-7.79:

BH18 – SPT 8.5-8.95:

BH18 – SPT 10.5-10.65:

BH19 – SPT 1.0- 1.45:

BH19 – SPT 2.0-2.45:

BH19 – SPT 3.00-3.45:

BH19 – SPT 4.0-4.45:

BH19 – SPT 5.5-5.95:

BH19 – SPT 7.0-7.23:

BH19 – SPT 8.5-8.64:

BH19 – SPT 8.5-8.64:

BH19 – SPT 10.0-10.245:

BH20 – SPT 1.0-1.45:

BH20 – SPT 2.0-2.45:

BH20 – SPT 2.0-2.45:

BH20 – SPT 3.0-3.45:

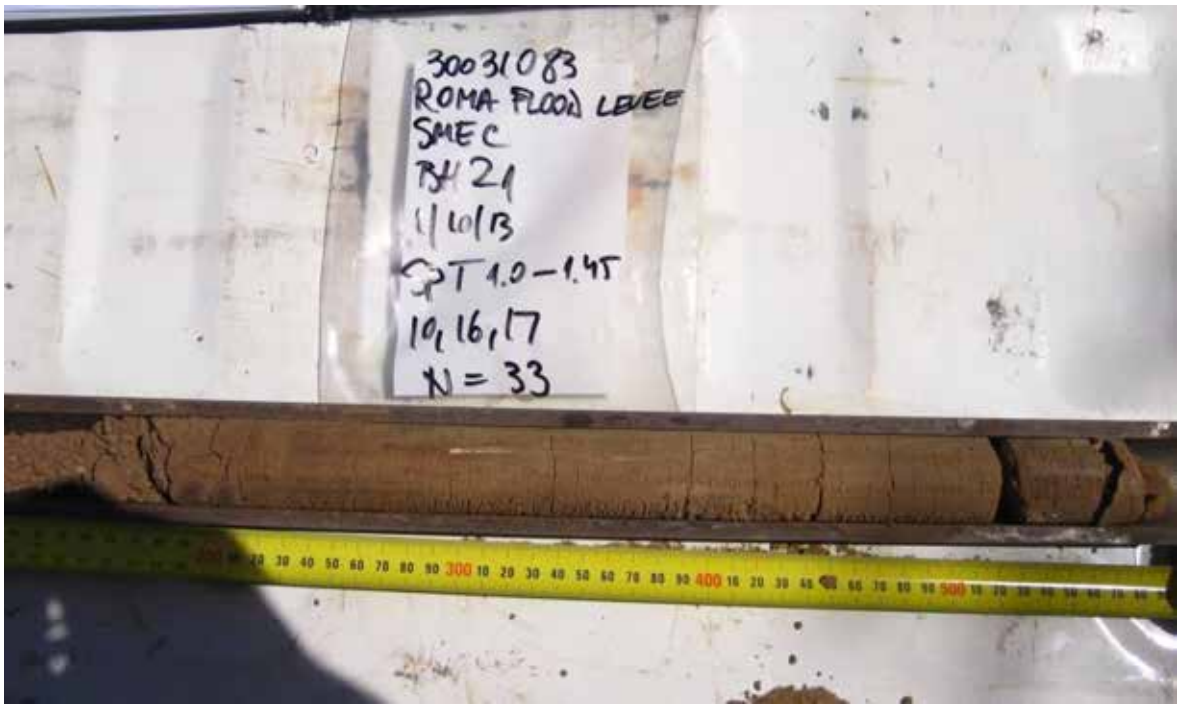
BH20 – SPT 4.0-4.45:

BH20 – SPT 5.5-5.77:

BH20 – SPT 7.0-7.26:

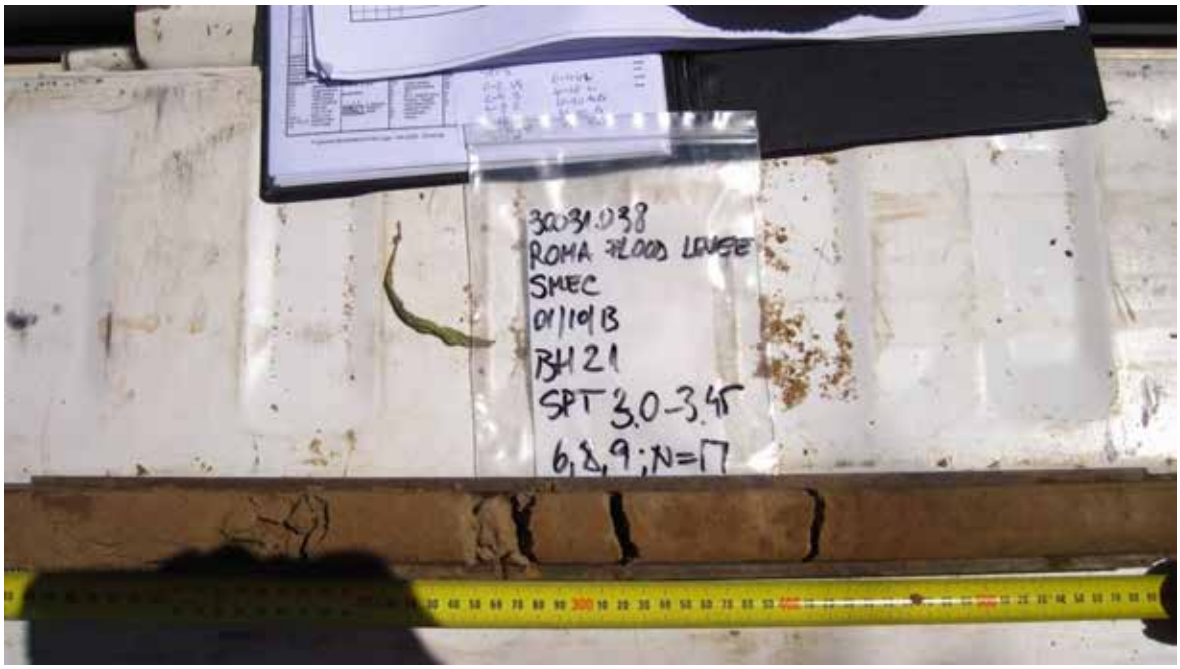
BH20 – SPT 8.5-8.95:

BH21 – SPT 1.0-1.45:

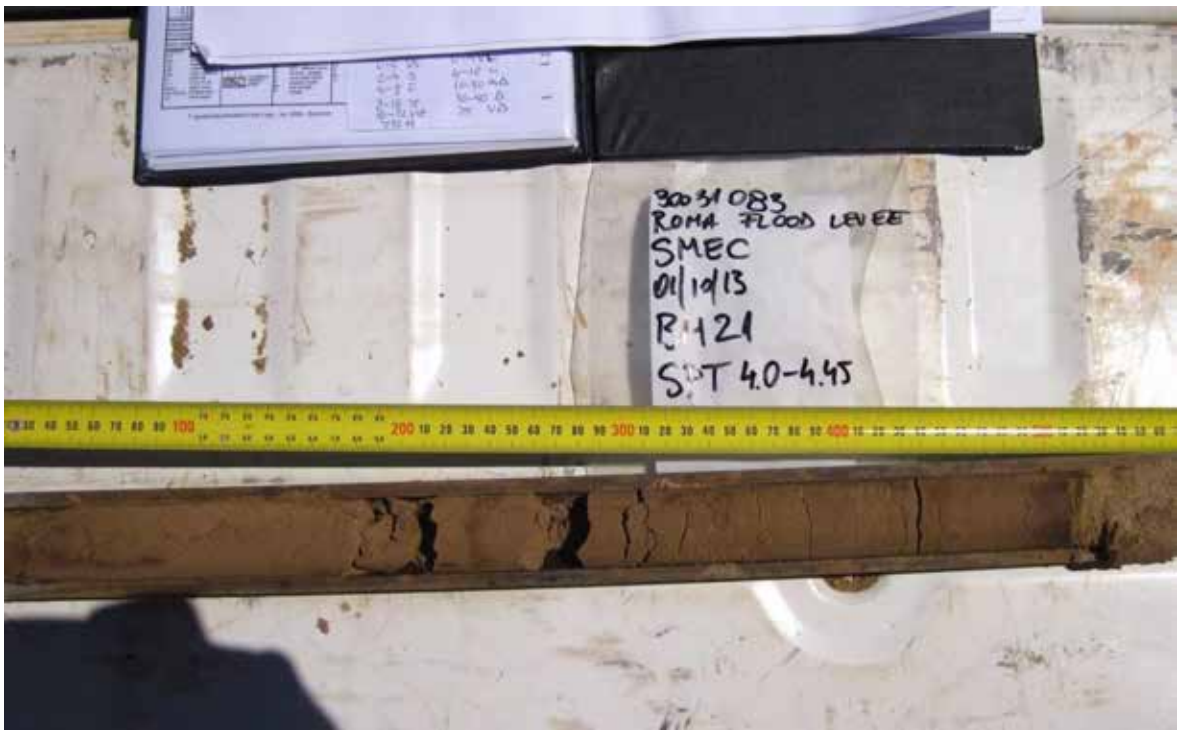


BH21 – SPT 2.0-2.45:

BH21 – SPT 3.0-3.45:



BH21 – SPT 4.0-4.45:



BH21 – SPT 5.5-5.95:

BH21 – SPT 7.0-7.45:

BH21 – SPT 8.0-8.45:

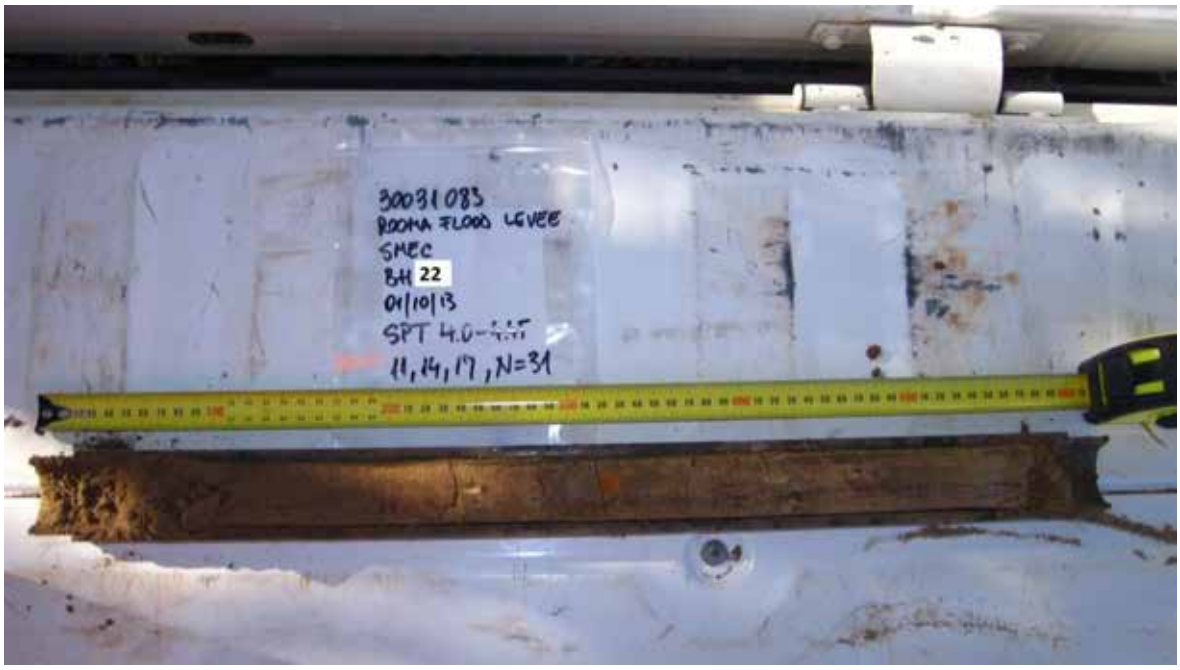
BH21 – SPT 10.0-10.15:

BH22 – SPT 1.0-1.45:

BH22 – SPT 2.0-2.45:

BH22 – SPT 3.0-3.45:

BH22 – SPT 4.0-4.45:



BH22 – SPT 5.5-5.95:

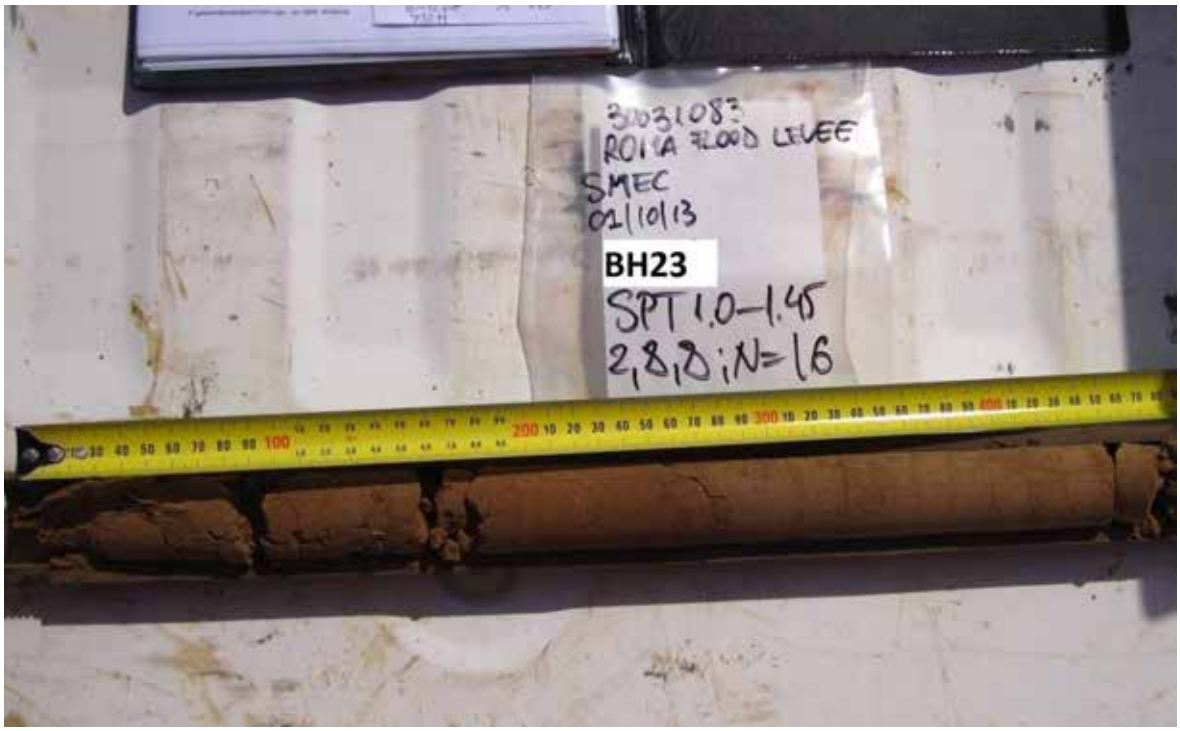
BH22 – SPT 7.0-7.45:

BH22 – SPT 8.5-8.95:

BH22 – SPT 10.0-10.45:

BH22 – SPT 11.5-11.95:

BH23 – SPT 1.0-1.45:



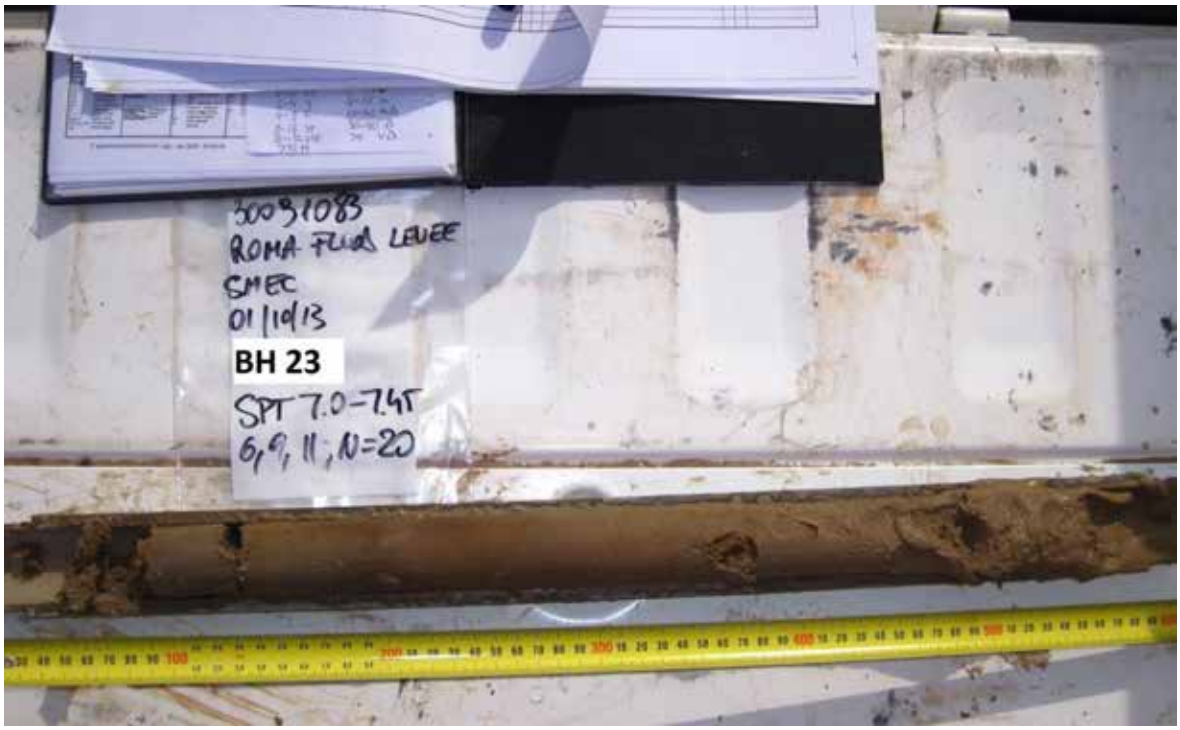
BH23 – SPT 2.0-2.45:

BH23 – SPT 3.0-3.45:

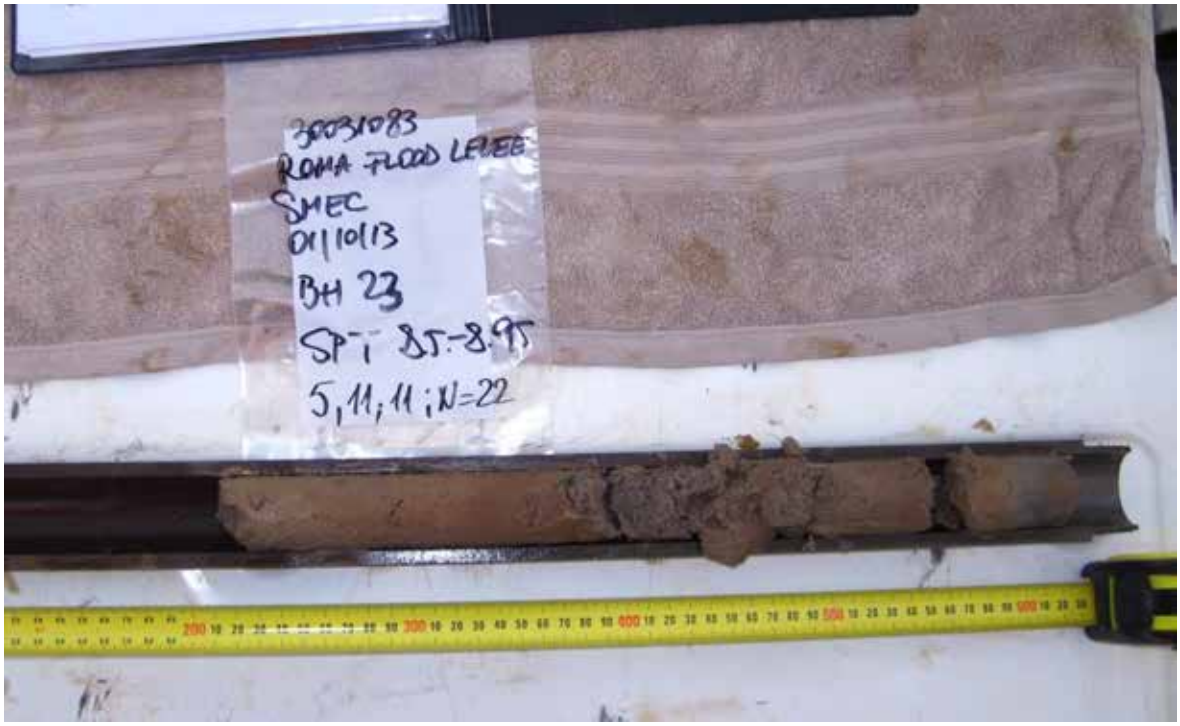
BH23 – SPT 4.0-4.45:

BH23 – SPT 5.5-5.95:

BH23 – SPT 7.0-7.45:



BH23 – SPT 8.5-8.95:



BH23 – SPT 10.0-10.45: