FSA CONSULTING

STORMWATER UPGRADE DETAILED DESIGN

TEYS BEENLEIGH TRANSITIONAL ENVIRONMENTAL PROGRAM (TEP)

PREPARED FOR:

TEYS AUSTRALIA (BEENLEIGH) PTY LTD
PO BOX 15
BEENLEIGH QLD 4207

TOOWOOMBA HEAD OFFICE
PO Box 2175
(11 Clifford St)
Toowoomba QLD 4350

P: 07 4632 8230
F: 07 4632 8057
E: fsa@fsaconsulting.net

EXECUTIVE SUMMARY

Teys Australia (Beenleigh) Pty Ltd are undertaking an upgrade of their current stormwater management infrastructure to transition to compliance with conditions of the site Environmental Authority, administered by the Department of Environmental and Heritage Protection (EHP), as well as industry best practice. In addition to those administrative and minor operational modifications the site has already implemented, EHP have agreed with Teys Beenleigh Pty Ltd in their Transitional Environmental Program (TEP) that the stormwater system must be capable of capturing runoff from a 1:20 year ARI 24-hour storm event. This is, in accordance with environmental best practice for cattle feedlots.

Two catchments referred to in the TEP defined as the "Eastern Catchment" and the "Western Catchment", both require stormwater management redesign.

Design of both catchments in this document is limited to a 1:20 year ARI 24-hour storm event, as agreed to by EPH and Teys Australia (Beenleigh) Pty Ltd. Event considered greater than a 1:20 year, 24 hour storm event are beyond the scope of this design.

The Eastern Catchment area collects stormwater from cattle holding pens which drains into a stormwater pond behind the workshop. Currently the pond is too small to capture the volume of runoff generated by a 1:20 year ARI 24-hour storm event. Modelling of the eastern catchment calculated that in order to capture the runoff from a 1:20 year ARI 24-hour storm event the eastern pond needs to have a volume of 2.53 ML. Land use in the eastern catchment severely restricts the design options. To the north and west of the pond is infrastructure which cannot be moved and to the south and east of the pond is a mapped stream order. With these limitations in place the maximum volume achieved by redesigning the pond is 2.13 ML. In order to overcome the volume limitation of this pond a pump capable of dewatering a volume of 3.46 ML per day will begin dewater during a storm event, giving the pond pump system the capability of capturing 5.59 ML of runoff exceeding the 1:20 year ARI 24-hour storm event volume. Water from the eastern pond will be pumped to the decommissioned waste water ponds which have a calculated volume of 31.9 ML. The combination of the pump and pond will mean that the pond will not overtop in a 1:20 year ARI 24-hour storm event which complies with the agreement between EHP and Teys Australia (Beenleigh) Pty Ltd in the TEP.

The Western Catchment collects water from the pen area on the western side of the property. Calculated runoff volume for a 1:20 year ARI 24-hour storm event for the Western Catchment (2.4 ha) is 4.9 ML. A redesigned western pond will have a maximum volume of 6.1 ML exceeding the minimum volume requirement. Water from the western pond will be pumped to the Covered Anaerobic Lagoon (CAL) for treatment. Dewatering of the western pond will begin during a storm event, and will be limited to a rate of 30 L/s as to not negatively affect anaerobic treatment performance at the CAL. Currently the CAL has a flow rate of 65 L/s according to the design specifications. The western pond complies with the EHP requirement to be able to capture a 1:20 year 24-hour ARI event, and will not overtop in such an event.

DOCUMENT STATUS RECORD

Client: Teys Australia (Beenleigh) Pty Ltd

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			Author	Checked	Approved
1	23rd June 2016	Draft	RWL/TJS	DNN	DNN
2	28th June 2016	Final	RWL/TJS	KEB	KEB

Notes:

Version 1 This is a draft report for client comment.
Version 2 This is the final version for the client.

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This document should be cited as follows:

FSA Consulting, 2016, Stormwater Upgrade Detailed Design, Teys Beenleigh Transitional Environmental Program (TEP), FSA Consulting Report 16TOO-0104 8500 160628, Toowoomba, QLD 4350.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

Teys Australia (Beenleigh) Pty Ltd (from here on referred to as Teys) are undertaking an upgrade of their stormwater management infrastructure at their Beenleigh meat processing facility which forms a part of the Transitional Environmental Program (TEP) for the site. The infrastructure upgrade will transition management of contaminated stormwater to compliance with the Department of Environment and Heritage Protection regulatory requirements, as well as industry best practice.

Teys are required to capture stormwater runoff from two catchments, that form the holding pens for the Abattoir and are defined as the 'Eastern Stormwater Catchment' and 'Western Stormwater Catchment' as shown on Figure 1. EHP have agreed with Teys that ponds are to be designed to capture stormwater runoff which is equivalent to a storm event with a 1:20 year ARI 24-hour storm intensity. This is in accordance with the current '*Establishment and Operation of Beef Cattle Feedlots in Queensland*' (Skerman 2000) and '*National Guidelines for Beef Cattle Feedlots*' (MLA 2012).

FSA Consulting has been engaged by Teys to address the stormwater design for the two catchments as follows:

Eastern Stormwater Catchment

- Review of structural integrity of the existing eastern stormwater catchment pond, and carry out design of rehabilitation works required;
- Design of weir and by-wash for the pond;
- Assess pipework options for above and/or below ground routing;
- Design catchment drains to the south of the holding pens;
- Design of the refurbishment of existing drain from south eastern corner of the cattle holding pens to stormwater pond; and
- Design of all drains, traps and hydraulic systems to meet the above mentioned requirements; and

Western Stormwater Catchment

- Design of a new / modified western stormwater pond to meet the revised operational requirements
- Design of all drains, traps and hydraulic systems to meet requirements;
- Confirmation of suitability of existing Covered Anaerobic Lagoon inlet works to meet additional load;
- Design of underground pipework to Covered Anaerobic Lagoon inlet works; and
- Ensure integration into the Wastewater Treatment System does not pose a risk to the operational performance.

2 CATCHMENTS AND POND DESIGN

The catchments for the holding pens has been divided into two distinct catchments that are defined as the Eastern and Western catchments. Both areas collect runoff from cattle holding pens. Each site provides runoff to a pond nearby. Currently the ponds collect as much runoff as possible before overflowing to the environment. The existing catchments and ponds are displayed in Figure 1.

2.1 EASTERN CATCHMENT

2.1.1 EASTERN CATCHMENT AND POND SIZING

The Eastern Stormwater Catchment currently consists of cattle holding yards and a hard catchment area between the cattle holding yards and the eastern pond (Figure 1). Presently all of this catchment drains into the eastern stormwater holding pond. The current eastern stormwater pond is approximately 1.27 ML see Appendix A for calculations. The current eastern ponds are too small to capture the runoff volume of a 1:20 year ARI 24-hour storm event. Banks of the eastern pond will require some works in order to ensure banks of the redesigned pond are stable.

The redesigned Eastern Stormwater Catchment has a pen surface area of 1.03 ha, soft catchment of 0.08 and a pond area of 0.14 ha, giving 1.25 ha total catchment area. The catchment area was determined using survey data provided by Teys and data collected by FSA Consulting.

To calculate pond sizing a runoff coefficient of 0.8 was used for the pen area; 0.4 for the soft catchment area; and 1 for the pond area. The 1:20 year ARI, 24-hour storm intensity, frequency duration was used to determine the volume of water which would fall on the catchment and require capture. Using these assumptions, a volume of runoff of 2.53 ML was required to be captured by the redesigned western stormwater pond.

2.1.2 EASTERN POND AND DRAIN DESIGN

Clean water will be excluded from the eastern stormwater pond. Water from the catchment area around the sheds between the eastern pond and holding pens will be diverted away from the pond using a diversion bank and routed underneath the drain which feeds the eastern pond using a drop box culvert capable of a flow rate of 0.116 m^3/s. Figure 2, displays the design of the diversion banks to exclude clean stormwater from the eastern stormwater pond.

Based on the assessment of the existing pond it is recommended that the existing pond and embankments are re-instated. Within the existing confines of the current pond location, the eastern pond has been designed to a maximum volume of 2.13 ML. Pond banks have been designed with Internal batters of 2.5:1 (H:V) and external batters of 2.5:1 (H:V) with a 3 to 4 m crest. Access to the pond for cleaning will be through the proposed by-wash. Clay lining of the pond is required, a minimum thinness of 600 mm of adequately compacted clay with a maximum permeability of 0.01 mm/day to mitigate contaminants entering the

groundwater. Figure 3 displays the eastern holding pond design and Figure 4 displays the cross-section of the pond.

2.1.3 Dewatering Eastern Pond

During and after a storm event an electric pump will operate to dewater the stormwater catchment pond. Details can be found in Section 3. The pump has been specified such that the required volume the pump will be able to dewater is a rate greater than the inflow generated by a 1:20 year 24-hour event ensuring the pond will not overtop. The pump will deliver water from the eastern stormwater holding pond at a rate of up to 40 L/s (3.46 ML per day) to the waste water storage lagoons on the eastern side of the property (pump details in Section 3). A conservative estimate of water holding capacity of these ponds is 31.9 ML, this estimate does not include the final waste water pond.

2.1.4 Pond Stability assessment

The adopted upstream and downstream batter slopes of 2.5:1 (H:V), for the pond embankment have been adopted for the preliminary design based on:

1. the availability on site of sufficient and suitable material of CL-CI classification in accordance with the Unified Soil Classification (UCS) System and
2. the recommended batter slopes published by the US Bureau of Reclamation and reproduced in the Farm Storage Design Manual, published by the Qld Water Resources Commission (Department of Primary Industries) for a homogenous embankment up to 3m height and not subject to rapid drawdown (Horton & Jobling 1992).

It is noted that the existing pond embankment and batter slope are approximately 2.5:1 (H:V) (as determined by the site survey). The existing embankment is considered (from observation), to be stable, but in places subject to erosion from water running down the face of the batter slope. The existing embankment and batter slope requires some work to ensure that the embankment is compacted to a stable and homogeneous embankment. The required compaction for the embankment and batter slope to be a minimum of 98% MDD (standard Compaction) at a moisture content between 0 to +2% of Optimum Moisture Content (OMC). Diversion banks are to be constructed around the high side of the pond to divert surface water away from the embankment to avoid any future erosion.

2.1.5 Compliance

The eastern catchment pond will achieve compliance as it will not overtop during a 1:20 year ARI 24-hour storm event. While the pond is smaller than the desired volume of 2.6 ML, the pump specified in Section 3 is capable of emptying the pond in less than 24 hours. The pump for the eastern stormwater pond has been specified so that it can dewater the pond at a rate of 3.46 ML per day, which exceeds a 1:20 year ARI 24-hour storm event volume for the eastern catchment. A combination of the redesigned eastern pond and pumping volumes gives an effective storage volume for the Eastern Catchment of 5.59 ML, which is more than double the 2.53 ML volume required.

The eastern pond will be managed so that dewatering is at a rate which ensures the eastern pond does not overtop. Management strategies of the pond will ensure that the pond is empty before a large storm event. Contingency measures will be in place to ensure the pond does not overtop in the event of power failure.

2.1.6 Limitations of Design

Teys Beenleigh site has limited land to use for the upgrade of the stormwater management system. When redesigning the eastern pond, the topography, current infrastructure, and land use limitations were taken into consideration.

It is not feasible for the eastern pond to be any deeper than what it has been designed to. Shape of the pond is also limited as there is a stream order to the south of the pond and buildings to the east and north none of which are able to be moved. In order to overcome the pond size a pump capable of dewatering the pond at a rate greater than input from a 1:20 year ARI 24-hour storm event has been incorporated in to the redesigned stormwater management system.

Pond design for the eastern catchment was based on the stormwater system being able to capture a 1:20 year ARI 24-hour storm event. Storm events larger than a 1:20 year ARI 24-hour event are beyond the scope of this design, and beyond the design parameters agreed to by EHP and Teys.

2.2 Western Catchment

2.2.1 Western Catchment and Pond Sizing

The Western Stormwater Catchment currently consists of cattle holding yards which drain into a stormwater pond to the north of the catchment area. The current stormwater holding pond is inadequately sized for catching the required volume of contaminated stormwater runoff. Current volume of the western stormwater holding pond is estimated at 0.557 ML. See Appendix A for calculations.

The redesigned Western Stormwater Catchment has a pen surface area of 1.52 ha, soft catchment area of 0.89 ha and a pond area of 0.34 ha, giving 2.75 ha total catchment area. The catchment area was determined using survey data provided by Teys and data collected by FSA Consulting.

To calculate pond sizing a runoff coefficient of 0.8 was used for the pen area, 0.4 for the soft catchment and 1 for the pond area. The 1:20 year ARI 24-hour storm intensity, frequency duration was used to determine the volume of water which would fall on the catchment and require capture. Using these assumptions, a volume of runoff of 4.9 ML is required to be captured by the redesigned western stormwater pond.

2.2.2 Western Pond and Drain Design

In order to limit the volume of water entering the storm water catchment during a storm event clean water will be excluded from the catchment. Water flow direction and diversion bank design for the western catchment is displayed in Figure 2.

The western stormwater holding pond has been designed to a volume of 6.1 ML, 0.5 ML greater than the design requirement determined by the 1:20 year ARI 24-hour storm event. The internal batters of the pond are 3:1 (H:V) with an 8:1 (H:V) access ramp to allow machinery access to the pond for cleaning. Designed wall height from the pond is 3.8 m, maximum water depth is 3.3 m with a 0.5 m freeboard. Figure 5 is the proposed design for the western catchment stormwater pond.

2.2.3 Dewatering Western Pond

Pond dewatering will be via a pump specified in Section 3. The pump is designed to be able to dewater the entire volume of the pond within a 2 to 4-day period, depending on the pumping rate. Water from the western stormwater pond will be pumped into the covered anaerobic lagoon for treatment. The flow will be limited to 30 L/s as to not detrimentally effect the treatment system in the covered anaerobic lagoon (CAL).

2.2.4 Compliance

The Western Catchment will deliver compliance with the 1:20 year ARI 24-hour stormwater event as the western pond is larger than the volume required to be captured during an event. Dewatering of the pond will happen during and after a storm event. Pumping of water from the western pond to the CAR at the lowest pumping rate of 20 L/s will allow approximately 1.7 ML of water to be removed from the pond in a 24-hour period. Removal of water from the pond as soon as it enters the pond give a safety buffer and will mitigate the risk of the pond overtopping.

The western pond will be managed so that dewatering is at a rate which does not negatively affect the CAR and will be done so that the western pond is emptied as soon as practical after a storm event.

Contingency measures will be in place to ensure the pond does not overtop in the event of power failure.

2.2.5 Limitations of Design

The current western pond is in the ideal place to capture any runoff from the pens as the landscape naturally drains toward the inlet of the current pond. If the pond were to be moved it would encroach on a mapped stream order. To avoid the stream order and make use of the topography the western pond was resized and shaped. It is not feasible to reposition the pond as it would be contradictory to the flow direction of runoff dictated by the topography of the holding pens.

Pond design for the Western Catchment was based on the stormwater system being able to capture a 1:20 year ARI 24-hour storm event. Storm events larger than a 1:20 year ARI 24-hour event are beyond the scope of this design, and beyond the design parameters agreed to be EHP and Teys.

3 PUMP DESIGN

Two pumps station have been proposed to handle the two separate catchments and ponds to assist with the dewatering of the dams. It is noted that this exceeds the requirements of the guidelines, but is provided to provide an additional level of security to avoid overtopping. It is proposed to install pump stations that can empty the dams within a suitable time frame in the event that there are further storms.

A pump station will be installed in the embankment of each of the two ponds. The pump stations will pump from the ponds to the covered anaerobic lagoon (CAL) treatment plant for the western pond and the lagoons to the south of the eastern pond. Each pump station will have a duty standby electrical pump arrangement. Operation will be provided by either level sensor in the pump stations or manually as may be the requirements at time of operation.

3.1 PUMP STATION

3.1.1 PUMP SPECIFICATION

The pump station proposed is a package pump station that is regularly used in the wastewater industry. For the purposes of this design, an Aquatec package concrete pump station has been used, but any package pump station may be suitable.

The pump well has been nominated in the preliminary design as 2.8 metres deep, to match the anticipated depth of the dam. If the dam is deeper, the pump station can be made deeper by additional concrete rings. The pump well diameter is 1.8 metres. The package pump station comes with all associated pumps, pipes, valve pit, electrical controls and covers.

For the purposes of standardising the design, both pump stations have been selected as the same. In undertaking the design, it was found that the requirements for each pump station was similar. To allow easier installation and maintenance the pump stations are therefore the same, including pumps, pipes and electrical requirements. The pump station design is preliminary and can be modified to suit any necessary changes identified in the dam sizing and design.

The nominated flows calculated were very similar. The western dam's discharge was requested to be between 20 and 40 L/s into the plant CAL. This would result in emptying of the dam between 2 and 4 days depending on the flow rate. Too much flow into the CAL could be detrimental to its treatment process which is why variable speed drives (VSD) pumps have been selected. Flow rate on the western pond will be limited to 30 L/s so as not to negatively affect the CAL.

The eastern dams discharge was calculated at 30 L/s to empty the dam in 24 hours. Therefore, to simplify the installation and maintenance, both pump stations will be fitted with VSD pumps capable of pumping at 20 to 40 L/s. This will also allow some flexibility with the eastern dam pump station when needed. Pump speed will be set by a potentiometer on the front of the control panel.

3.1.2 PIPE SPECIFICATION

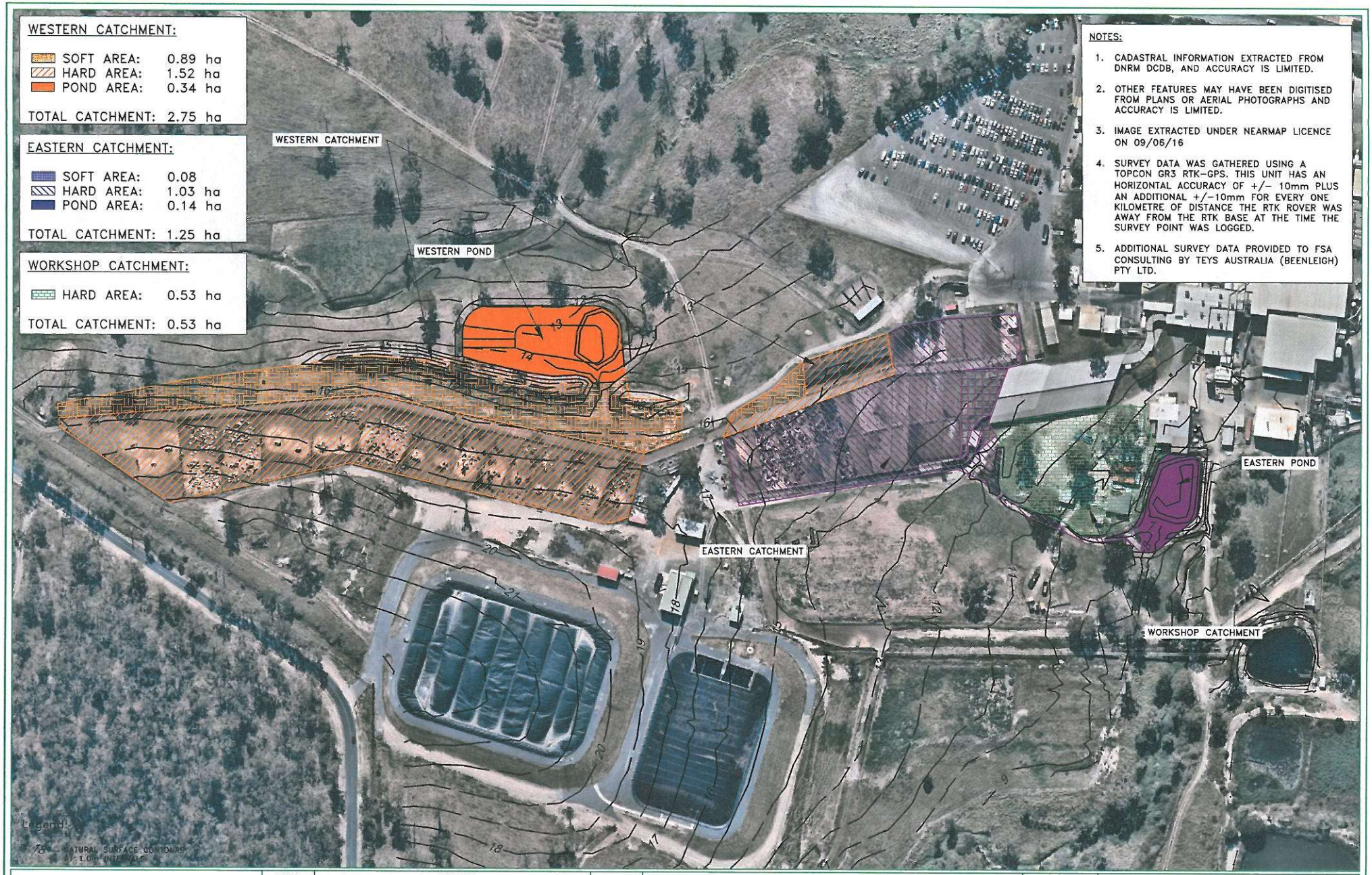
The outlet pipework will be the same size for each pump station. The length of pipe and change in elevation is similar between the two setups. Both pipelines are approximately 300 m in length with a 12 m head on the eastern pipeline and an 18 m head on the western pipeline. Head difference is not enough to make a substantial difference in the design of the two pump stations. The pipe nominated is Polyethylene, DN160mm, PE100 PN8. The pipeline will need to be poly welded on site, with only fittings at the pump station and the western inlet to the CAL.

3.1.3 POWER SUPPLY

Each pump station will have its own switchboard and power supply. The switchboard will be supplied by the pump station manufacturer, as part of the package pump station. The board will be required to accommodate the VSD pumps, duty standby arrangement for pumps and manual override. Operation of the pumps will be managed by the pump station level switches.

To provide sufficient power to each of the pump stations, the onsite supply should be able to provide 60 amps per phase (3 phase). This assumes the pumps are duty standby and do not run together, and allows for the use of VSD's.

Contingencies will be in place for both pumps to ensure if mains power is lost both the Eastern and Western Catchments will continue to be dewatered.



FSA Consulting

TOOWOOMBA OFFICE

DATE	REVISION	DRAWN
28.06.2016	ISSUE TO CLIENT	TJS

PROJECT:
TEYS AUSTRALIA (BEENLEIGH) PTY LTD
BEENLEIGH QLD 4207

DRAWING TITLE:
TEYS AUSTRALIA BEENLEIGH STORMWATER TEP PROJECT
CONCEPTUAL CATCHMENT AREAS

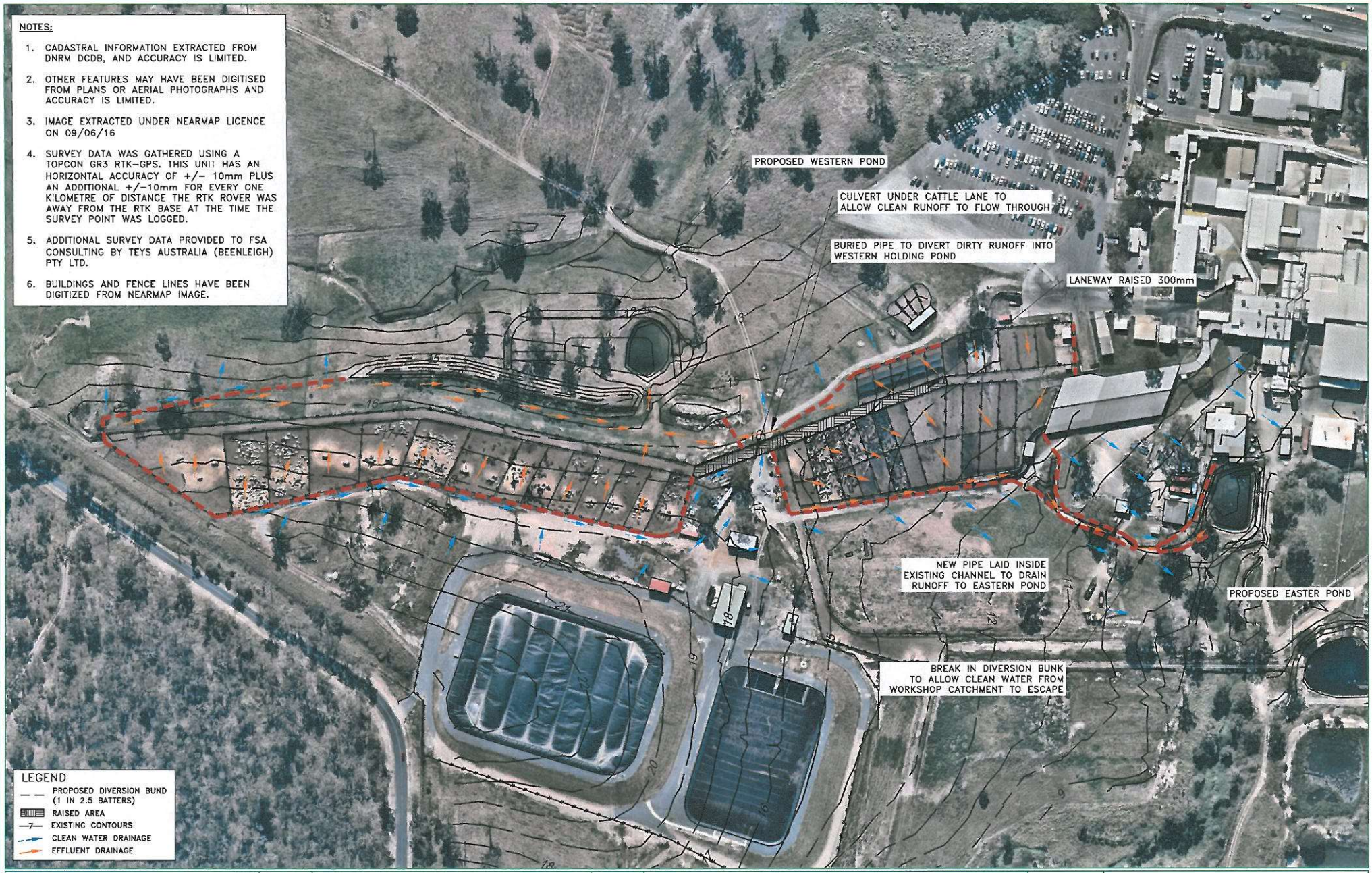
SCALE: 1:2,000 (A3)
DRAWN: TJS
CHECKED:
DATE: 28.06.2016

SCALES :
0 50m 100m

DRAWING NUMBER: 16100-8500-01
REVISION A

NOTES:

1. CADASTRAL INFORMATION EXTRACTED FROM DNRM DCDB, AND ACCURACY IS LIMITED.
2. OTHER FEATURES MAY HAVE BEEN DIGITISED FROM PLANS OR AERIAL PHOTOGRAPHS AND ACCURACY IS LIMITED.
3. IMAGE EXTRACTED UNDER NEARMAP LICENCE ON 09/06/16
4. SURVEY DATA WAS GATHERED USING A TOPCON GR3 RTK-GPS. THIS UNIT HAS AN HORIZONTAL ACCURACY OF +/- 10mm PLUS AN ADDITIONAL +/-10mm FOR EVERY ONE KILOMETRE OF DISTANCE THE RTK ROVER WAS AWAY FROM THE RTK BASE AT THE TIME THE SURVEY POINT WAS LOGGED.
5. ADDITIONAL SURVEY DATA PROVIDED TO FSA CONSULTING BY TEYS AUSTRALIA (BEENLEIGH) PTY LTD.
6. BUILDINGS AND FENCE LINES HAVE BEEN DIGITIZED FROM NEARMAP IMAGE.



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DATE	REVISION	DRAWN
28.06.2016	ISSUE TO CLIENT	TJS

PROJECT:
TEYS AUSTRALIA (BEENLEIGH) PTY LTD
BEENLEIGH QLD 4207

DRAWING TITLE:
TEYS AUSTRALIA BEENLEIGH STORMWATER TEP PROJECT
CONCEPTUAL DIVERSION BANK DESIGN

SCALE: (A3) 1:2,000
DRAWN: TJS
CHECKED:
DATE: 28.06.2016

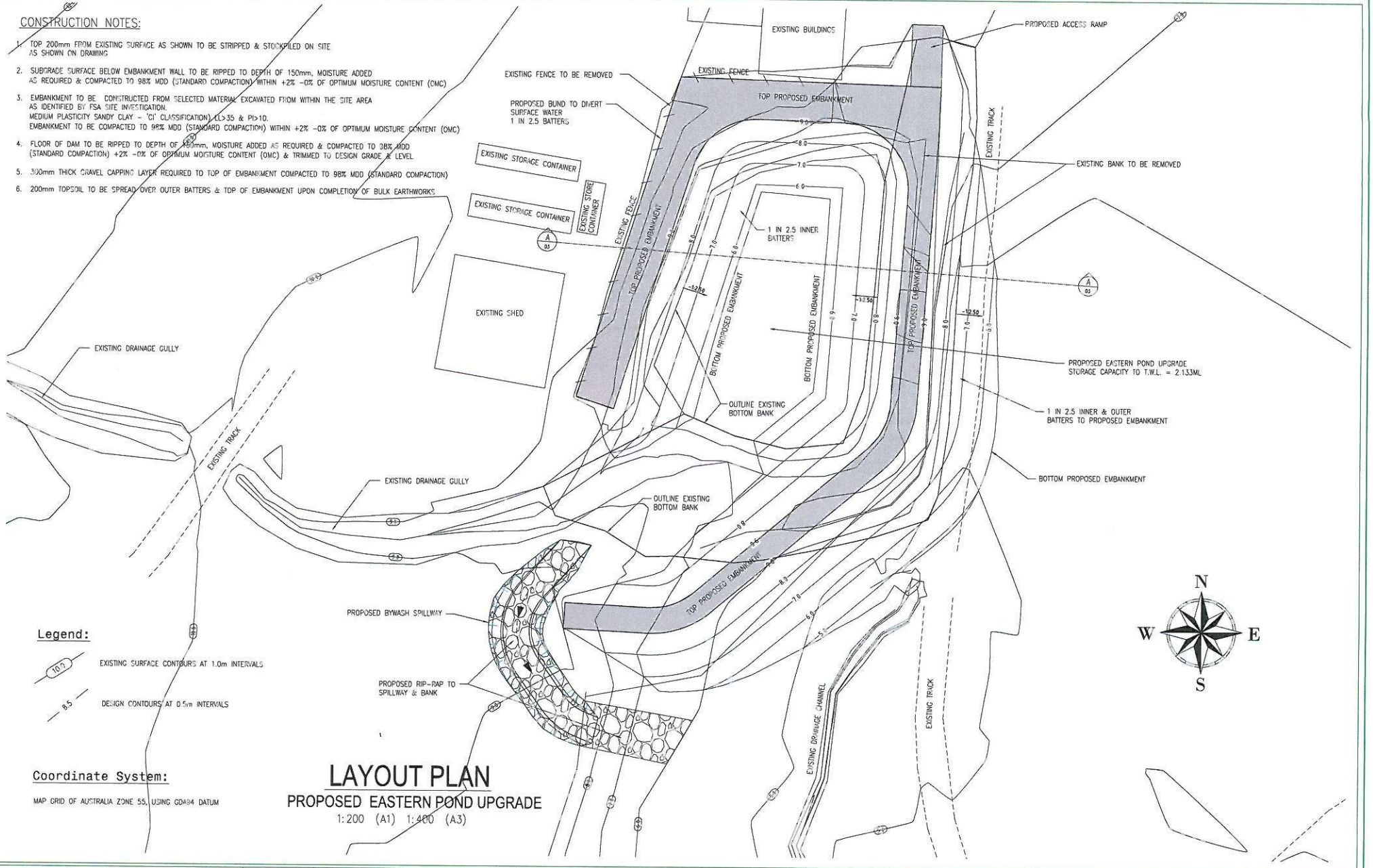
SCALES : 0 50m 100m

DRAWING NUMBER: 18T00-8500-02

REVISION A

CONSTRUCTION NOTES:

1. TOP 200mm FROM EXISTING SURFACE AS SHOWN TO BE STRIPPED & STOCKPILED ON SITE AS SHOWN ON DRAWING
2. SUBGRADE SURFACE BELOW EMBANKMENT WALL TO BE RIPPED TO DEPTH OF 150mm, MOISTURE ADDED AS REQUIRED & COMPACTED TO 98% MDD (STANDARD COMPACTION) WITHIN +2% -0% OF OPTIMUM MOISTURE CONTENT (OMC)
3. EMBANKMENT TO BE CONSTRUCTED FROM SELECTED MATERIAL EXCAVATED FROM WITHIN THE SITE AREA AS IDENTIFIED BY FSA SITE INVESTIGATION.
   MEDIUM PLASTICITY SANDY CLAY - 'CI' CLASSIFICATION, LL>35 & PI>10.
   EMBANKMENT TO BE COMPACTED TO 98% MDD (STANDARD COMPACTION) WITHIN +2% -0% OF OPTIMUM MOISTURE CONTENT (OMC)
4. FLOOR OF DAM TO BE RIPPED TO DEPTH OF 150mm, MOISTURE ADDED AS REQUIRED & COMPACTED TO 98% MDD (STANDARD COMPACTION) +2% -0% OF OPTIMUM MOISTURE CONTENT (OMC) & TRIMMED TO DESIGN GRADE & LEVEL
5. 300mm THICK GRAVEL CAPPING LAYER REQUIRED TO TOP OF EMBANKMENT COMPACTED TO 98% MDD (STANDARD COMPACTION)
6. 200mm TOPSOIL TO BE SPREAD OVER OUTER BATTERS & TOP OF EMBANKMENT UPON COMPLETION OF BULK EARTHWORKS



Legend:

- 10.0 — EXISTING SURFACE CONTOURS AT 1.0m INTERVALS
- 8.5 — DESIGN CONTOURS AT 0.5m INTERVALS

Coordinate System:

MAP GRID OF AUSTRALIA ZONE 55, USING GDA94 DATUM

LAYOUT PLAN

PROPOSED EASTERN POND UPGRADE

1:200 (A1) 1:400 (A3)

FSA Consulting
TOOWOOMBA OFFICE
PO BOX 2175
TOOWOOMBA QLD 4350
TELEPHONE (07) 4632 4240
FACSIMILE (07) 4632 8057

DATE	REVISION	DRAWN
21.06.16	ISSUE TO CLIENT	A

PROJECT: TEYS AUSTRALIA (BEENLEIGH) PTY. LTD.

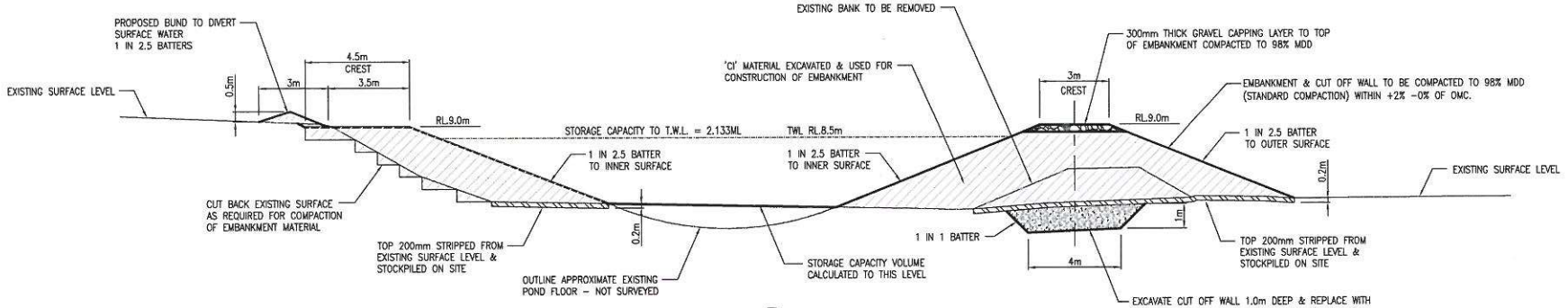
DRAWING TITLE: TEYS AUSTRALIA BEENLEIGH STORMWATER TEP PROJECT
LAYOUT PLAN - PROPOSED EASTERN POND UPGRADE

SCALE: 1=200 (A1)
DRAWN: P.G.
CHECKED: R.S.
DATE: 20.06.16

SCALES : 0 10 20

DRAWING NUMBER: F0117-00-02

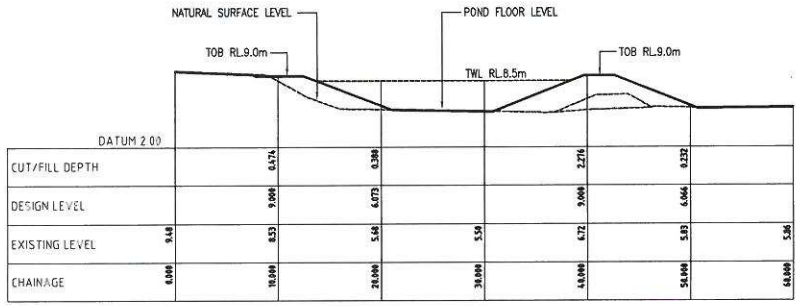
REVISION A



SECTION A/02

TYPICAL THROUGH POND EMBANKMENTS

SCALE: 1=100 (A1)



SECTION A/02

HORIZONTAL SCALE: 1=250 (A1); 1=500 (A3)
VERTICAL SCALE: 1=250 (A1); 1=500 (A3)

CONSTRUCTION NOTES:

1. TOP 200mm FROM EXISTING SURFACE AS SHOWN TO BE STRIPPED & STOCKPILED ON SITE AS SHOWN ON DRAWING
2. SUBGRADE SURFACE BELOW EMBANKMENT WALL TO BE RIPPED TO DEPTH OF 150mm, MOISTURE ADDED AS REQUIRED & COMPACTED TO 98% MDD (STANDARD COMPACTION) WITHIN +2% –0% OF OPTIMUM MOISTURE CONTENT (OMC)
3. EMBANKMENT TO BE CONSTRUCTED FROM SELECTED MATERIAL EXCAVATED FROM WITHIN THE SITE AREA AS IDENTIFIED BY FSA SITE INVESTIGATION.
   MEDIUM PLASTICITY SANDY CLAY – 'CI' CLASSIFICATION) LL>35 & PI>10.
   EMBANKMENT TO BE COMPACTED TO 98% MDD (STANDARD COMPACTION) WITHIN +2% –0% OF OPTIMUM MOISTURE CONTENT (OMC)
4. FLOOR OF DAM TO BE RIPPED TO DEPTH OF 150mm, MOISTURE ADDED AS REQUIRED & COMPACTED TO 98% MDD (STANDARD COMPACTION) +2% –0% OF OPTIMUM MOISTURE CONTENT (OMC) & TRIMMED TO DESIGN GRADE & LEVEL
5. 300mm THICK GRAVEL CAPPING LAYER REQUIRED TO TOP OF EMBANKMENT COMPACTED TO 98% MDD (STANDARD COMPACTION)
6. 200mm TOPSOIL TO BE SPREAD OVER OUTER BATTERS & TOP OF EMBANKMENT UPON COMPLETION OF BULK EARTHWORKS

SECTION DETAILS

PROPOSED EASTERN POND UPGRADE

FSA Consulting
TOOWOOMBA OFFICE
PO BOX 2175
TOOWOOMBA QLD 4350
TELEPHONE (07) 4032 8230
FACSIMILE (07) 4632 8057

DATE	REVISION	DRAWN
21.06.16	ISSUE TO CLIENT	A

PROJECT: TEYS AUSTRALIA (BEENLEIGH) PTY. LTD.

DRAWING TITLE: TEYS AUSTRALIA BEENLEIGH STORMWATER TEP PROJECT
SECTION DETAILS – PROPOSED EASTERN POND UPGRADE

SCALE: (A1) 1=100
DRAWN: P.G.
CHECKED: R.S.
DATE: 20.06.16

SCALES : 0 5 10

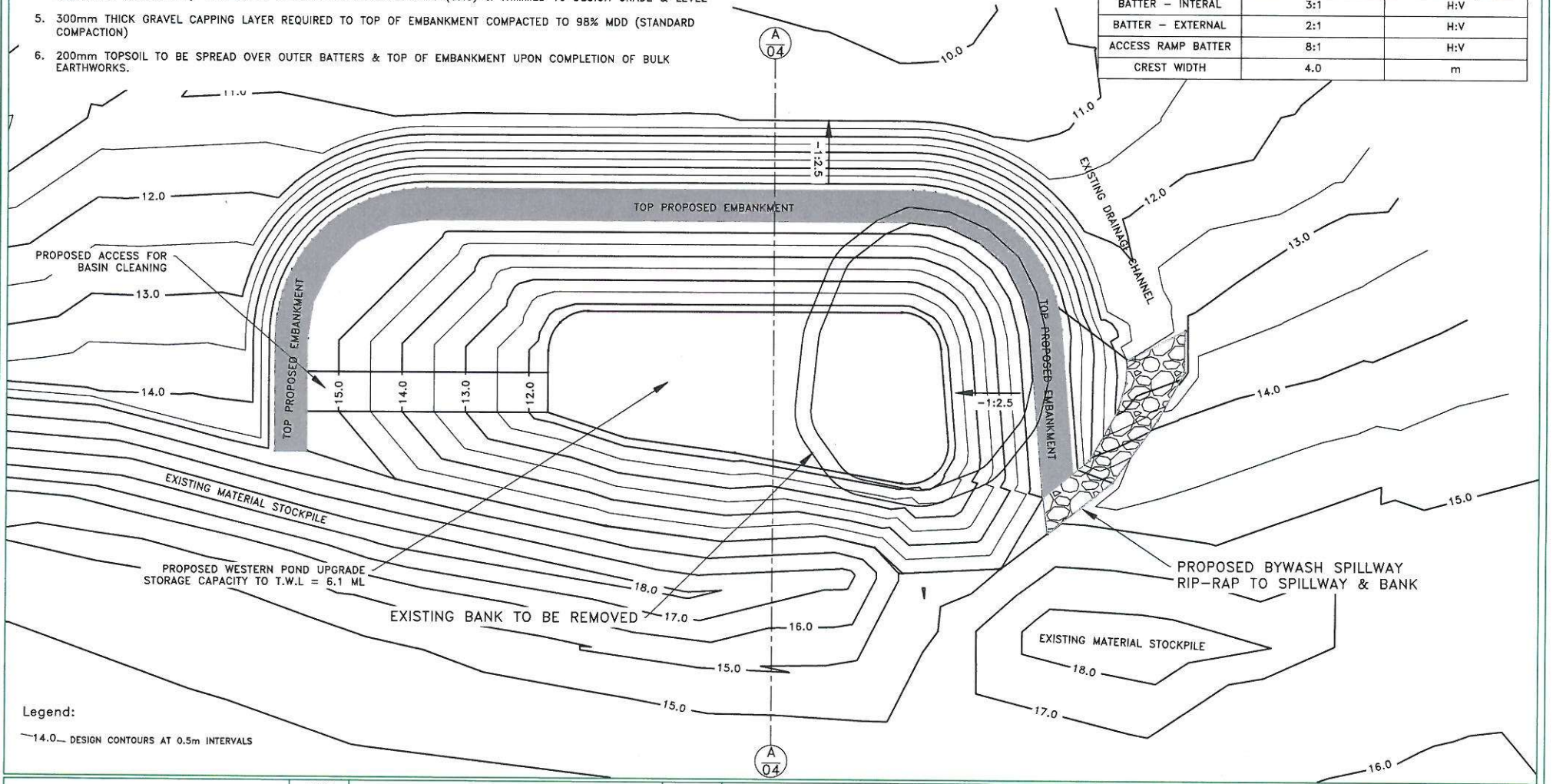
DRAWING NUMBER: F0117–00–03

REVISION A

CONSTRUCTION NOTES:

1. TOP 200mm FROM EXISTING SURFACE AS SHOWN TO BE STRIPPED & STOCKPILED ON SITE
2. SUBGRADE SURFACE BELOW EMBANKMENT WALL TO BE RIPPED TO DEPTH OF 150mm, MOISTURE ADDED AS REQUIRED & COMPACTED TO 98% MDD (STANDARD COMPACTION) WITHIN +2%–0% OF OPTIMUM MOISTURE CONTENT (OMC)
3. EMBANKMENT TO BE CONSTRUCTED FROM SELECTED MATERIAL EXCAVATED FROM WITHIN THE SITE AREA AS IDENTIFIED BY FSA SITE INVESTIGATION.
   MEDIUM PLASTICITY SANDY CAY – 'CI' CLASSIFICATION LL>35 & PI>10.
   EMBANKMENT TO BE COMPACTED TO 98% MDD (STANDARD COMPACTION) WITHIN 2%–0% OF OPTIMUM MOISTURE CONTENT (OMC)
4. FLOOR OF DAM TO BE RIPPED TO DEPTH OF 150mm, MOISTURE ADDED AS REQUIRED & COMPACTED TO 98% MDD (STANDARD COMPACTION) +2%–0% OF OPTIMUM MOISTURE CONTENT (OMC) & TRIMMED TO DESIGN GRADE & LEVEL
5. 300mm THICK GRAVEL CAPPING LAYER REQUIRED TO TOP OF EMBANKMENT COMPACTED TO 98% MDD (STANDARD COMPACTION)
6. 200mm TOPSOIL TO BE SPREAD OVER OUTER BATTERS & TOP OF EMBANKMENT UPON COMPLETION OF BULK EARTHWORKS.

PROPOSED WESTERN POND UPGRADE		
REQUIRED VOLUME	4.9	ML
PROPOSED VOLUME	6.1	ML
BASE LEVEL	11.7	m
TOP WATER LEVEL	15.0	m
FREEBOARD	0.5	m
CREST LEVEL	15.5	m
MAXIMUM WATER DEPTH	3.3	m
BATTER – INTERAL	3:1	H:V
BATTER – EXTERNAL	2:1	H:V
ACCESS RAMP BATTER	8:1	H:V
CREST WIDTH	4.0	m



Legend:

—14.0— DESIGN CONTOURS AT 0.5m INTERVALS

FSA Consulting
TOOWOOMBA OFFICE
PO BOX 2173
TOOWOOMBA QLD 4350
TELEPHONE (07) 4617 8230
FACSIMILE (07) 4632 8057
FSA CONSULTING
www.fsaconsulting.com.au

DATE	REVISION	DRAWN
28.06.2016	ISSUE TO CLIENT	TJS

PROJECT:
TEYS AUSTRALIA (BEENLEIGH) PTY LTD
BEENLEIGH QLD 4207

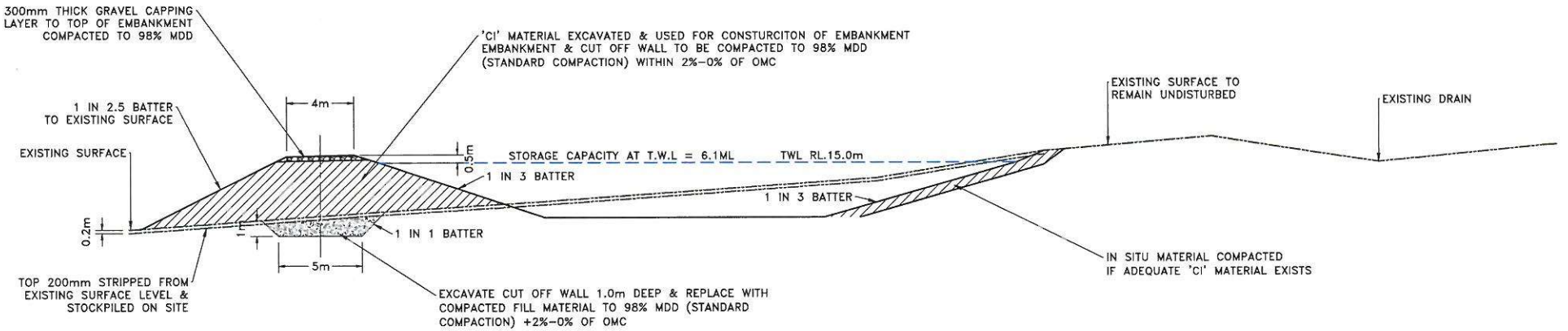
DRAWING TITLE:
TEYS AUSTRALIA BEENLEIGH STORMWATER TEP PROJECT
LAYOUT PLAN – PROPOSED WESTERN POND UPGRADE

SCALE: 1:500 (A3)
DRAWN: TJS
CHECKED:
DATE: 28.06.2016

SCALES : 0 12.5m 25m

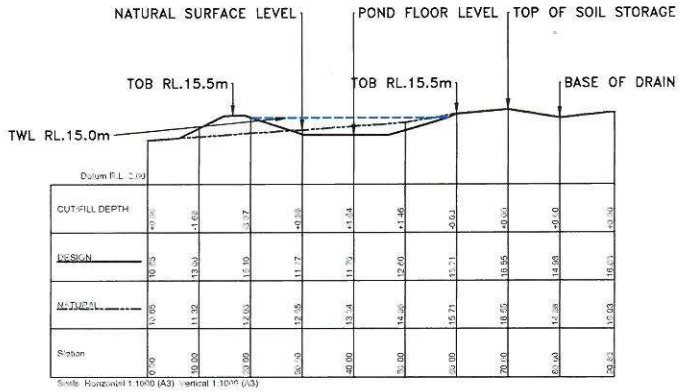
DRAWING NUMBER: 16T00-8500-03

REVISION A



SECTION A 04

TYPICAL THROUGH POND EMBANKMENTS



SECTION A 04

CONSTRUCTION NOTES:

1. TOP 200mm FROM EXISTING SURFACE AS SHOWN TO BE STRIPPED & STOCKPILED ON SITE
2. SUBGRADE SURFACE BELOW EMBANKMENT WALL TO BE RIPPED TO DEPTH OF 150mm, MOISTURE ADDED AS REQUIRED & COMPACTED TO 98% MDD (STANDARD COMPACTION) WITHIN +2%–0% OF OPTIMUM MOISTURE CONTENT (OMC)
3. EMBANKMENT TO BE CONSTRUCTED FROM SELECTED MATERIAL EXCAVATED FROM WITHIN THE SITE AREA AS IDENTIFIED BY FSA SITE INVESTIGATION.
   MEDIUM PLASTICITY SANDY CAY – 'CI' CLASSIFICATION LL>35 & PI>10.
   EMBANKMENT TO BE COMPACTED TO 98% MDD (STANDARD COMPACTION) WITHIN 2%–0% OF OPTIMUM MOISTURE CONTENT (OMC)
4. FLOOR OF DAM TO BE RIPPED TO DEPTH OF 150mm, MOISTURE ADDED AS REQUIRED & COMPACTED TO 98% MDD (STANDARD COMPACTION) +2%–0% OF OPTIMUM MOISTURE CONTENT (OMC) & TRIMMED TO DESIGN GRADE & LEVEL
5. 300mm THICK GRAVEL CAPPING LAYER REQUIRED TO TOP OF EMBANKMENT COMPACTED TO 98% MDD (STANDARD COMPACTION)
6. 200mm TOPSOIL TO BE SPREAD OVER OUTER BATTERS & TOP OF EMBANKMENT UPON COMPLETION OF BULK EARTHWORKS.

SECTION DETAILS

PROPOSED WESTERN POND UPGRADE

FSA Consulting
TOOWOOMBA OFFICE
FSA CONSULTING

DATE	REVISION	DRAWN
28.06.2016	ISSUE TO CLIENT	TJS

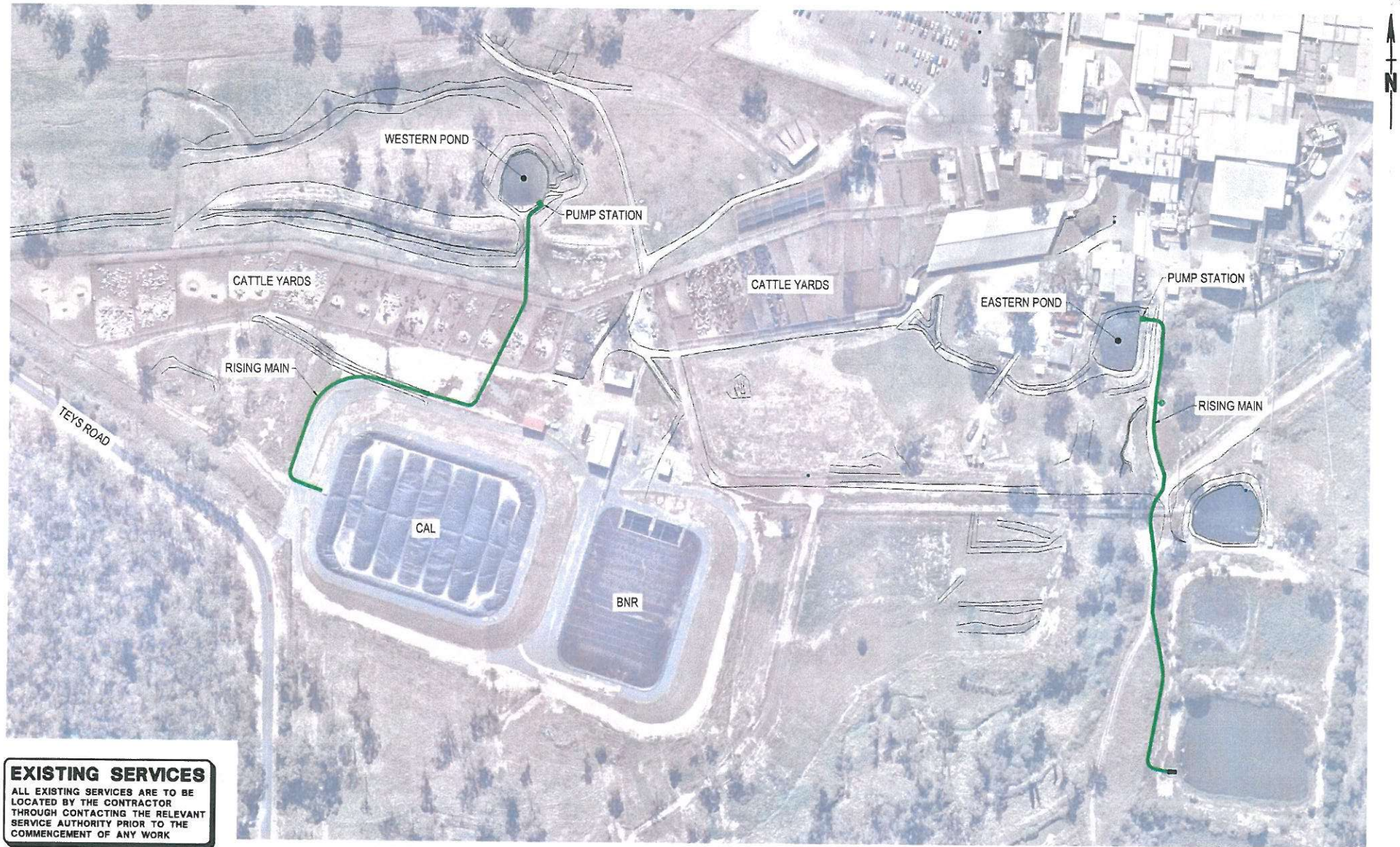
PROJECT: TEYS AUSTRALIA (BEENLEIGH) PTY LTD
BEENLEIGH QLD 4207

DRAWING TITLE: TEYS AUSTRALIA BEENLEIGH STORMWATER TEP PROJECT
SECTION DETAILS – PROPOSED WESTERN POND UPGRADE

SCALE: (A3) 1:500
DRAWN: TJS
CHECKED:
DATE: 28.06.2016

SCALES : 0 12.5m 25m

DRAWING NUMBER: 18T00-8500-04
REVISION A



EXISTING SERVICES

ALL EXISTING SERVICES ARE TO BE LOCATED BY THE CONTRACTOR THROUGH CONTACTING THE RELEVANT SERVICE AUTHORITY PRIOR TO THE COMMENCEMENT OF ANY WORK

SITE PLAN
SCALE 1:1000

0 20.0 40.0 60.0m
SCALE 1:1000

PRELIMINARY ISSUE NOT FOR CONSTRUCTION

REV.	DATE	REVISIONS
1	28/06/16	ISSUED FOR APPROVAL

JAS-ANZ ISO 9001

REAL PROPERTY DESCRIPTION:

DRAWN: G.CAMPBELL
DESIGNED: R.STAER
CHECKED: R.STAER
PROJECT MANAGER: M.BOSCHEN
DATUM:
PROJECT DIRECTOR: M.BOSCHEN RPEQ 8523

UDP
Excellence Through Partnerships

DALGETY PLACE
84 DENHAM STREET
PO BOX 1110
TOWNSVILLE QLD 4810

Phone: (07) 4772 0666
Fax (07) 4772 0566
Email. mail@udpgroup.com.au
Web. www.udpgroup.com.au

02 GROUP

TEYS BEENLEIGH
PUMP STATIONS AND RISING MAINS
SITE PLAN

DRAWING SIZE	SCALE	1:1000	DRAWING No.	REV
A1	XREF	ETS-0015-XR-SKETCH	ETS-0015-SKC02	1

EXISTING SERVICES

ALL EXISTING SERVICES ARE TO BE LOCATED BY THE CONTRACTOR THROUGH CONTACTING THE RELEVANT SERVICE AUTHORITY PRIOR TO THE COMMENCEMENT OF ANY WORK

PRELIMINARY ISSUE NOT FOR CONSTRUCTION

REV.	DATE	REVISIONS
1	28/06/16	ISSUED FOR APPROVAL

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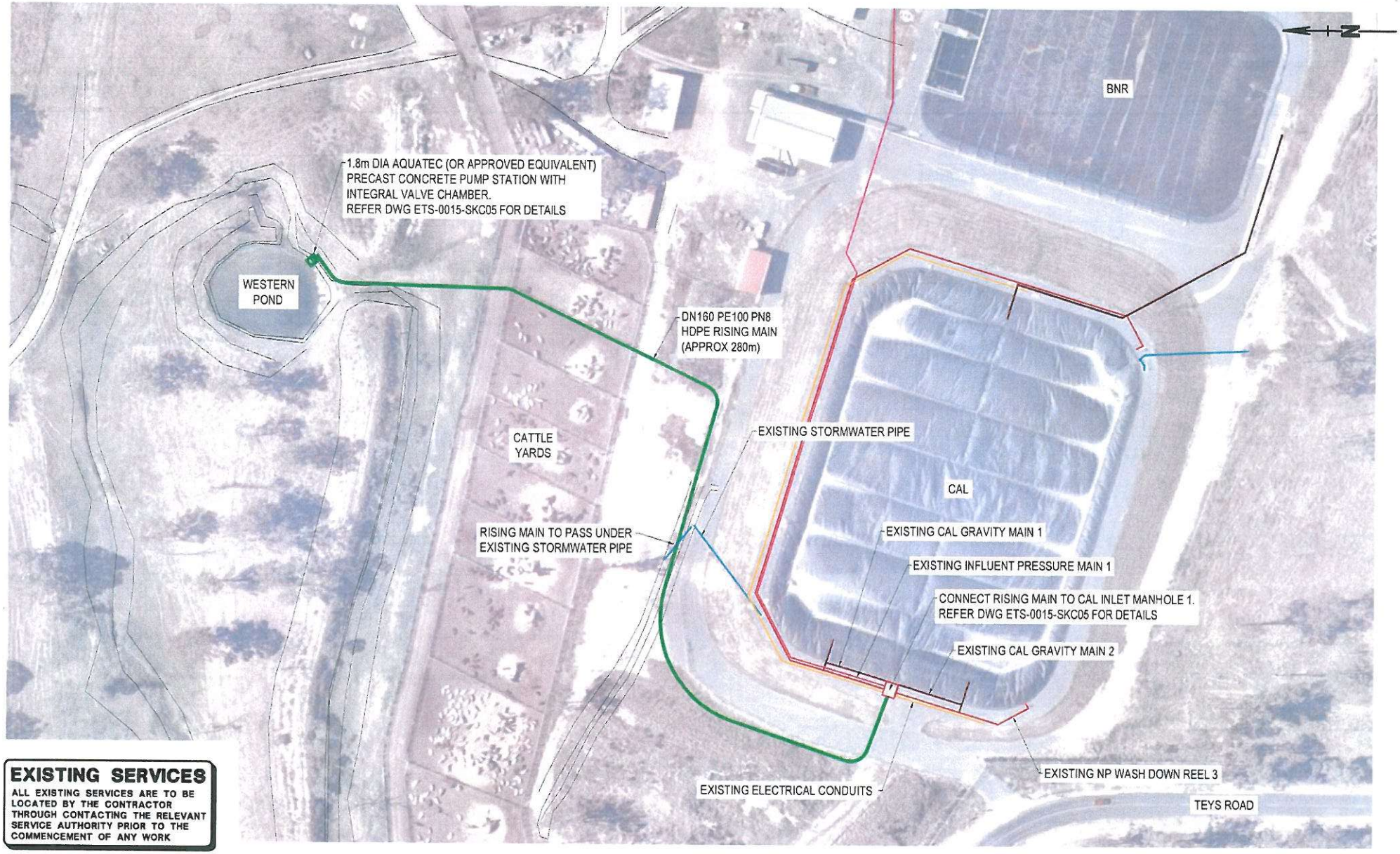
UDP
Excellence Through Partnerships
DALGETY PLACE
84 DENHAM STREET
PO BOX 1110
TOWNSVILLE QLD 4810
Phone: (07) 4772 0888
Fax (07) 4772 0566
Email: main@udpgroup.com.au
Web www.udpgroup.com.au

02 GROUP

TEYS BEENLEIGH
PUMP STATIONS AND RISING MAINS
EASTERN POND PUMP STATION AND RISING MAIN LAYOUT PLAN

DRAWING SIZE	SCALE		DRAWING No.	REV
A1	1:500		ETS-0015-SKC04	1
	XREF	ETS-0015-XR-SKETCH		



EXISTING SERVICES

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PRELIMINARY ISSUE NOT FOR CONSTRUCTION

REV.	DATE	REVISIONS
1	28/06/16	ISSUED FOR APPROVAL

JAS-ANZ ISO 9001

REAL PROPERTY DESCRIPTION:

DATUM:

DRAWN:	G.CAMPBELL
DESIGNED:	R.STAER
CHECKED:	R.STAER
PROJECT MANAGER:	H.BOSCHEN
PROJECT DIRECTOR:	H.BOSCHEN RPEQ 8523

UDP
Excellence Through Partnerships
DALGETY PLACE
84 DENHAM STREET
PO BOX 1110
TOWNSVILLE QLD 4810
Phone. (07) 4772 0666
Fax. (07) 4772 0566
Email: mail@udpgroup.com.au
Web. www.udpgroup.com.au

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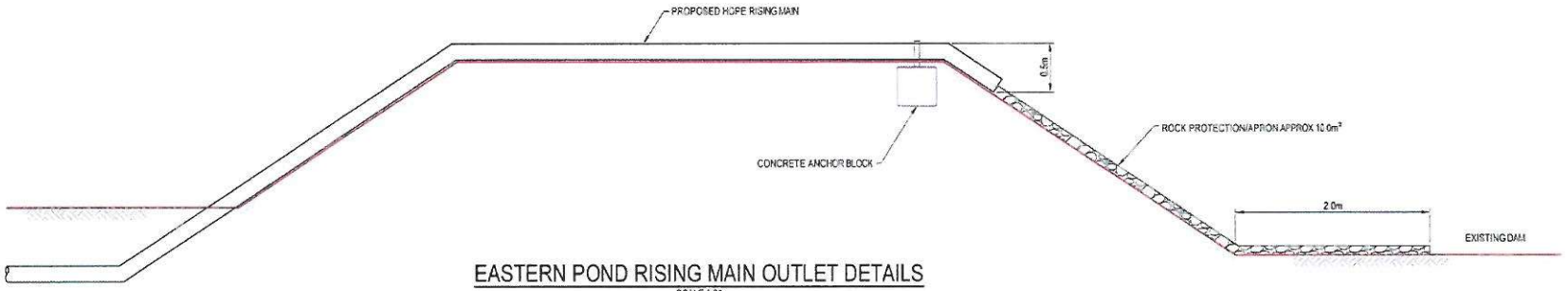
TEYS BEENLEIGH

PUMP STATIONS AND RISING MAINS

WESTERN POND PUMP STATION AND RISING MAIN LAYOUT PLAN

DRAWING SIZE	SCALE	DRAWING No.	REV
A1	1:500	ETS-0015-SKC03	1
	XREF: ETS-0015-XR-SKETCH		

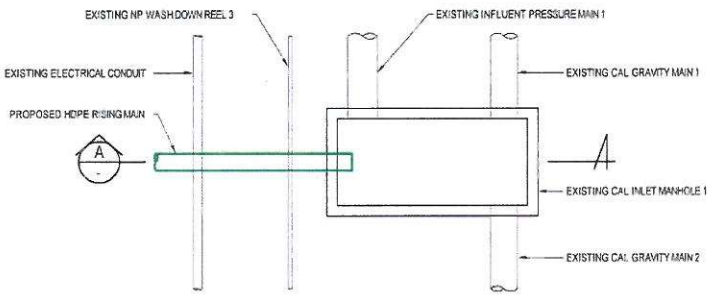


EASTERN POND RISING MAIN OUTLET DETAILS

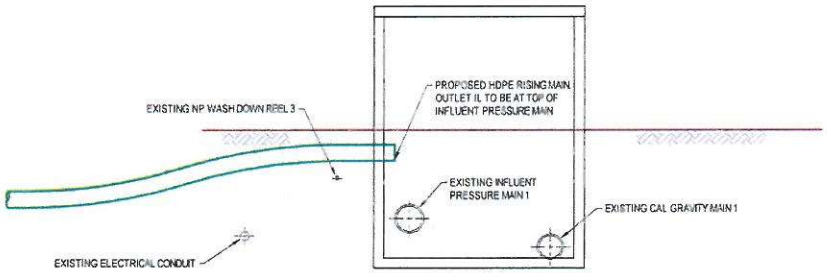
SCALE 1:25

EXISTING SERVICES

ALL EXISTING SERVICES ARE TO BE LOCATED BY THE CONTRACTOR THROUGH CONTACTING THE RELEVANT SERVICE AUTHORITY PRIOR TO THE COMMENCEMENT OF ANY WORK



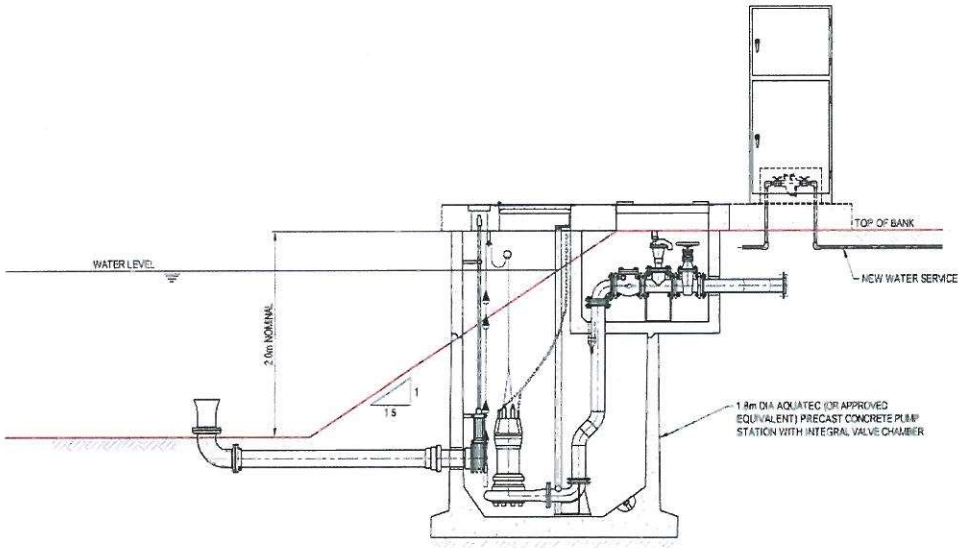
PLAN



SECTION A

WESTERN POND RISING MAIN OUTLET DETAILS

SCALE 1:25



TYPICAL PUMP STATION DETAIL

SCALE 1:25

0 0.5 1.0 1.5m

SCALE 1:25

PRELIMINARY ISSUE NOT FOR CONSTRUCTION

REV.	DATE	REVISIONS
1	28/06/16	ISSUED FOR APPROVAL

JAS-ANZ ISO 9001

REAL PROPERTY DESCRIPTION:

DATUM:

DRAWN: G.CAMPBELL	
DESIGNED: R.STAER	RJS
CHECKED: R.STAER	RJS
PROJECT MANAGER: M.BOSCHEN	MJ
PROJECT DIRECTOR: M.BOSCHEN RPEQ 8523	MJB

UDP
Excellence Through Partnerships

DALGETY PLACE
84 DENHAM STREET
PO BOX 1110
TOWNSVILLE QLD 4810

Phone: (07) 4772 0688
Fax. (07) 4772 0566
Email. main@udpgroup.com.au
Web. www.udpgroup.com.au

O2 GROUP

TEYS BEENLEIGH
PUMP STATIONS AND RISING MAINS
DETAILS SHEET 1

DRAWING SIZE	SCALE	DRAWING No.	REV
A1	1:25	ETS-0015-SKC05	1
	XREF: ETS-0015-XR-SKETCH		

J:\JOB DATA\ETS\0015\ENGINEERING DESIGN\DRAWINGS\ETS-0015-SKC05 - SKETCH.DWG

4 SUMMARY

Stormwater holding pond details have been summarised below. Table 1 provides a summary of the physical demotions of the stormwater ponds.

- Both stormwater ponds have been designed to capture runoff from the cattle holding pen areas assuming a 1:20 year ARI 24-hour storm event;
- With the aid of the electrically controlled pumps neither pond will over top during or after a 1:20 year ARI 24-hour storm event;
- No runoff from the cattle holding pens will be released to the environment in accordance with the guidelines;
- All clean stormwater will be excluded from the cattle holding pen catchments;
- Event considered greater than a 1:20 year ARI 24-hour storm even are beyond the scope of this design.

TABLE 1 – SUMMARY OF STORMWATER PONDS

Detail	Eastern Pond	Western Pond
Catchment Size (ha)	1.25	2.75
Required Volume (ML)	2.53	4.9
Prposed Volume (ML)	2.1	6.1
Base Level (m RL)	5.5	11.7
Top Water Level (m RL)	8.5	15.0
Freeboard (m)	0.5	0.5
Crest Level (m RL)	9.0	15.5
Maximum Water Depth (m)	3.0	3.3
Batter-Internal (H:V)	2.5:1	3:1
Batter-External (H:V)	2:1	2:1
Crest Width (m)	4.0	4.0
Pump Model	Aquatech Package	Aquatech Package
Flow Rate (L/s)	20 – 40	20 – 40 (Limited to 30 L/S max)
Power supply	3 Phase	3 Phase

5 REFERENCES

Horton, AJ & Jobling, GA (eds.) 1992, *Farm water supplies design manual - farm storages*, vol. 1, Second edn, Water Resources Commission, Department of Primary Industries.

MLA 2012, *National Guidelines for Beef Cattle Feedlots in Australia*, 3rd edition 16 June 2016, Meat and Livestock Australia, Sydney, NSW, < http://www.mla.com.au/CustomControls/PaymentGateway/ViewFile.aspx?QcyElgTQngTm70Ea6OZR/MDZg3dm+mO3vWCcz9tYt1wX46/4IEqi/3wVtYwQ+L1k3EYMKKAfsht7d1Tnt3BqiA== >.

Skerman, A 2000, *Reference manual for the establishment and operation of beef cattle feedlots in Queensland*, Queensland Department of Primary Industries, Toowoomba, QLD.

APPENDIX A – CURRENT HOLDING POND VOLUMES

□□□□COMPUTATION VIA PRISMS

SURFACES:
Design:□□ 6.700 (m)
Natural:□□ 8500-DESIGN - DTM-03

REGION:
Boundary: BND-02-EX-E

SURFACE AREAS:
Design: 1028.3 (square meters)
Natural: 1067.7 (square meters)

PLAN AREAS:
Boundary: 1028.3 (square meters) within the boundary
Design: 1028.3 (square meters) within the boundary and within design surface
Natural: 1028.3 (square meters)

Factor:
Swell: 1.000
Shrink: 1.000

CUT/FILL/MATCHING AREAS:
Natural: 1028.3 (square meters) 56.3 (square meters)
Fill: 972.0 (square meters)
Matching: 0.0 (square meters)
Total Area: 1028.3 (square meters)

VOLUMES:
Cut to Fill Ratio: 0.008

Cut: 10.032 (cubic meters)
Fill: 1281.005 (cubic meters)
Net: 1270.972 (cubic meters) [fill]

Cut: 0.178 (cubic meters) / (square meters)
Fill: 1.318 (cubic meters) / (square meters)

Average Cut Depth: 0.178 (m)
Maximum Cut Depth: 0.700 (m)
Average Fill Depth: 1.318 (m)
Maximum Fill Depth: 1.880 (m)

□□□□COMPUTATION VIA SLICED PRISMS

REGION:
Boundary: BND-02-EX-E

SLICES PARAMETERS:
Slices Interval: 0.100 (m)
Number of Slices: 26

VOLUMES SLICE-BY-SLICE:

From RI	To RI	Cut Vol	Cumulative Cut	Fill Vol	Cumulative Fill	Net Vol	Cumulative Net	Slice	Cut Area	Slice Fill Area
4.82	4.90	0.0	0.0	2.1	2.1	2.1F	2.1F		0.0	111.4
4.90	5.00	0.0	0.0	20.3	22.4	20.3F	22.4F		0.0	285.5
5.00	5.10	0.0	0.0	35.8	58.2	35.8F	58.2F		0.0	425.9
5.10	5.20	0.0	0.0	48.5	106.7	48.5F	106.7F		0.0	537.7
5.20	5.30	0.0	0.0	57.5	164.1	57.5F	164.1F		0.0	601.9
5.30	5.40	0.0	0.0	62.2	226.3	62.2F	226.3F		0.0	639.8
5.40	5.50	0.0	0.0	65.4	291.7	65.4F	291.7F		0.0	668.1
5.50	5.60	0.0	0.0	68.2	359.9	68.2F	359.9F		0.0	695.7
5.60	5.70	0.0	0.0	70.9	430.8	70.9F	430.8F		0.0	722.9
5.70	5.80	0.0	0.0	73.6	504.5	73.6F	504.5F		0.0	749.4
5.80	5.90	0.0	0.0	76.2	580.7	76.2F	580.7F		0.0	775.2
5.90	6.00	0.0	0.0	78.8	659.5	78.8F	659.5F		0.0	800.9
6.00	6.10	0.0	0.0	81.4	740.9	81.4F	740.9F		0.0	826.2
6.10	6.20	0.0	0.0	83.9	824.7	83.9F	824.7F		0.0	851.2

6.20	6.30	0.0	0.0	86.4	911.1	86.4F	911.1F	0.0	876.0
6.30	6.40	0.0	0.0	88.8	999.9	88.8F	999.9F	0.0	900.6
6.40	6.50	0.0	0.0	91.3	1091.2	91.3F	1091.2F	0.0	925.1
6.50	6.60	0.0	0.0	93.7	1184.9	93.7F	1184.9F	0.0	949.1
6.60	6.70	0.0	0.0	96.1	1281.0	96.1F	1281.0F	0.0	972.0
6.70	6.80	4.6	4.6	0.0	1281.0	4.6C	1276.4F	36.3	0.0
6.80	6.90	2.8	7.4	0.0	1281.0	2.8C	1273.6F	21.1	0.0
6.90	7.00	1.6	9.0	0.0	1281.0	1.6C	1272.0F	11.8	0.0
7.00	7.10	0.8	9.8	0.0	1281.0	0.8C	1271.2F	3.9	0.0
7.10	7.20	0.2	10.0	0.0	1281.0	0.2C	1271.0F	0.6	0.0
7.20	7.30	0.0	10.0	0.0	1281.0	0.0C	1271.0F	0.1	0.0
7.30	7.40	0.0	10.0	0.0	1281.0	0.0C	1271.0F	0.0	0.0

TOTAL VOLUMES:

Cut:	10.032	(cubic meters)
Fill:	1281.005	(cubic meters)
Net:	1270.972	(cubic meters) [fill]

□□□□COMPUTATION VIA PRISMS

SURFACES:
==========
Design:□□ 12.800 (m)
Natural:□□ 8500-DESIGN - DTM-03

REGION:
======
Boundary: BND-01-EX-W

SURFACE AREAS:
============
Design: 760.8 (square meters)
Natural: 794.9 (square meters)

PLAN AREAS:
============
Boundary: 760.8 (square meters) within the boundary
Design: 760.8 (square meters) within the boundary and within design surface
Natural: 760.8 (square meters)

Factor:
=======================
Swell: 1.000
Shrink: 1.000

CUT/FILL/MATCHING AREAS:
=======================
Natural: 760.8 (square meters) 94.3 (square meters)
Fill: 666.5 (square meters)
Matching: 0.0 (square meters)
Total Area: 760.8 (square meters)

VOLUMES:
==========
Cut to Fill Ratio: 0.043

Cut: 25.250 (cubic meters)
Fill: 582.487 (cubic meters)
Net: 557.237 (cubic meters) [fill]

Cut: 0.268 (cubic meters) / (square meters)
Fill: 0.874 (cubic meters) / (square meters)

Average Cut Depth: 0.268 (m)
Maximum Cut Depth: 0.790 (m)
Average Fill Depth: 0.874 (m)
Maximum Fill Depth: 1.059 (m)

□□□□COMPUTATION VIA SLICED PRISMS

REGION:
=========
Boundary: BND-01-EX-W

SLICES PARAMETERS:
==================
Slices Interval: 0.100 (m)
Number of Slices: 19

VOLUMES SLICE-BY-SLICE:
=======================

From RI	To RI	Cut Vol	Cumulative Cut	Fill Vol	Cumulative Fill	Net Vol	Cumulative Net	Slice Cut Area	Slice Fill Area
11.74	11.80	0.0	0.0	8.4	8.4	8.4F	8.4F	0.0	392.9
11.80	11.90	0.0	0.0	48.1	56.5	48.1F	56.5F	0.0	505.5
11.90	12.00	0.0	0.0	51.4	107.9	51.4F	107.9F	0.0	522.3
12.00	12.10	0.0	0.0	53.1	161.0	53.1F	161.0F	0.0	539.5
12.10	12.20	0.0	0.0	54.8	215.8	54.8F	215.8F	0.0	556.9
12.20	12.30	0.0	0.0	56.6	272.4	56.6F	272.4F	0.0	574.6
12.30	12.40	0.0	0.0	58.4	330.7	58.4F	330.7F	0.0	592.6
12.40	12.50	0.0	0.0	60.2	390.9	60.2F	390.9F	0.0	610.8
12.50	12.60	0.0	0.0	62.0	452.9	62.0F	452.9F	0.0	629.4
12.60	12.70	0.0	0.0	63.9	516.8	63.9F	516.8F	0.0	648.1
12.70	12.80	0.0	0.0	65.7	582.5	65.7F	582.5F	0.0	666.5
12.80	12.90	8.5	8.5	0.0	582.5	8.5C	573.9F	76.2	0.0
12.90	13.00	6.7	15.2	0.0	582.5	6.7C	567.3F	57.4	0.0
13.00	13.10	4.9	20.1	0.0	582.5	4.9C	562.4F	39.7	0.0

13.10	13.20	3.1	23.2	0.0	582.5	3.1C	559.3F	22.6	0.0
13.20	13.30	1.5	24.6	0.0	582.5	1.5C	557.8F	8.2	0.0
13.30	13.40	0.5	25.1	0.0	582.5	0.5C	557.4F	2.4	0.0
13.40	13.50	0.1	25.2	0.0	582.5	0.1C	557.3F	0.4	0.0
13.50	13.59	0.0	25.3	0.0	582.5	0.0C	557.2F	0.0	0.0

TOTAL VOLUMES:

Cut:	25.250	(cubic meters)
Fill:	582.487	(cubic meters)
Net:	557.237	(cubic meters) [fill]