Enclosure 11

Gravity Sewer Assessment prepared by Willow and Sparrow, Revision 3, dated 25 May 2022

Willow + Sparrow

Gravity Sewer Assessment

James Creek Development

for

WM Developments Pty Ltd

Document Control

Revision number	Description	Prepared	Reviewed	Issued	Issue date
0	Draft Report	GC	MC	GC	19/10/2021
1	Final Report	GC	MC	GC	21/10/2021
2	Updated design flows	GC	RY	GC	20/5/22
3	Updated Attachments	GC	RY	GC	25/5/22

Document Title: Gravity Sewer Assessment – WM Developments Pty Ltd

Author: Garon Clough, *BEng*

Client name: WM Developments Pty Ltd

Client's representative: Mike Willoughby

Approved for use by:

Name: Michael Chamberlain **Signature:**  **Date: 19/10/2021**

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INTRODUCTION

This Gravity Sewer Assessment report was developed for the purpose of determining the best infrastructure outcomes for the servicing of sewer infrastructure for a residential development (The Development), located at Lot 104 DP 751388 James Creek Rd, James Creek NSW. This report summarises the preferred sewer supply of gravity reticulation and a transfer pump station to the designated connection point. Gravity sewer reticulation is suitable for the development based on the site characteristics and lot layout configuration. Gravity sewer preference for this development aligns with Northern Rivers Local Government Development and Design Manual, section D12.05, "All lots shall be serviced by gravity sewers wherever possible", which has been achieved.

1 GRAVITY DESIGN

The Development is proposed to service an area of 33ha and provide development of 327 residential lots. In order to complete the gravity sewer assessment, including calculation of design flows in accordance with WSAA 02 Part 1 the following site-specific information was utilised and included in appendixes.

Appendix A - Water and Sewer Servicing Plan – Geolink
Provision of concept layout and number of residential lots to be serviced. Includes provision to reduce the average dry weather flow from the WSAA value of 180L/EP/day to 150L/EP/day on the advice provided by Council.

Appendix B - Preliminary Geotechnical Report – Regional Geotechnical Solutions
Provision of preliminary ground conditions indicating silty/sandy clay overlaid with weathered sandstone. Groundwater was not encountered within any boreholes drilled during the investigation. Given the topography of the site and minimised depth of sewers ground water infiltration is not anticipated to be a major contribution to sewer flows.

Appendix C – Gravity vs Pressure Sewer Submission – WM Developments
Comparison of gravity versus pressure sewer systems for servicing the development. The costs and comparisons were developed in consideration for sites specific attributes, whilst Willow and Sparrow have not developed the comparison it is generally agreed that the costs are reflective of the developer's intention to build and construct a cost-effective sewer system for the development.

1.1 GRAVITY CONCEPT DESIGN FLOWS

Design flow from the development is 20.8L/s with gravity sewer servicing. This value is calculated in accordance with Sewerage Development and Design Manual and WSA02 Part 1. The Design flow includes provision for Peak Dry Weather Flow, Ground Water Infiltration and rainfall dependant inflow and infiltration.

WSAA			
Design flow = PDWF + GWI + IIF		**20.8**	**L/s**
IIF			
IIF = 0.028 * A_{EFF} *C * I		**11.5**	**L/s**
Residential - A_{EFF} = A x (Density/150)$^{0.5}$ for Density<150EP/Ha		13.35	
Com/Ind - A_{EFF} = A x (1-0.75 x Portion $_{Impervious}$)		0.25	
C = S aspect + N aspect		0.9	
	Soil Aspect	0.4	
	Network defect	0.5	
$I_{1,39.38\%}$		40.88	
Factor $_{Size}$ = (40/A)0.12		1.02	
Factor $_{Containment}$		0.8	in 1 year
I = $I_{1,2}$ x Factor$_{Size}$ x Factor$_{Containment}$		**33.5**	
PDWF			
PDWF = d * ADWF		**9.1**	**L/s**
ADWF = 0.0028 * EP		2.9	L/s
d = 0.01(log A)4 − 0.19(log A)3 + 1.4(log A)2 − 4.66log A + 7.57		3.1	
GWI			
GWI = 0.025 * A * Portion wet		**0.2**	**L/s**
Assumed (Portion wet)		30%	

Figure 1 Design flow calculation

1.2 DISCUSSION OF LOADING RATES APPLIED FOR RESIDENTIAL DEVELOPMENT

A design loading of 240L/EP/day was used for design loads for this development. This loading rate for a residential development is the amount of water, in litres, that each person discharges to the sewer network each day. This is also combined with a factor of 3.2 people in each and every house, which is significantly higher than the previous census information for Clarence Valley, which indicated an average household occupancy of 2.3 people.

Considering not all water consumed is discharged to sewer, the value of 240L/EP/day represents a significant increase above the actual and realistic load generated by residential development. WSA02 Part 1 generally recommends 180L/EP/day, and Council had previously indicated a design loading of 150L/EP/day. These values more accurately reflect the residential water consumption and subsequent sewer discharges in the northern rivers of NSW. Designing for loading above and beyond the anticipated realistic loading from the catchment increases residence time for sewerage to reach the discharge location during dry weather, creating potential for odour.

1.3 WET WEATHER RESPONSE

The design flow rates for the development include a provision for wet weather response. This considers both ground water infiltration and inflow to the sewer network. The calculation of these flows has been undertaken in accordance with Sewerage Development and Design Manual and WSA02 Part 1 and represents a 7 times average dry weather flow increase for wet weather response. The topography of the site being a gentle slope, and the preliminary geotechnical investigations identifying no ground water observed, may indicate the conservative allocation of wet weather response to be overestimated for this catchment.

1.4 SPS AND RISING MAIN CONCEPT DESIGN SIZING

To determine the required duty of the sewer pump station the alignment and sizing of the rising main was reviewed and assessed. A DN200 PE100 SDR11, 5.1km main has been determined to be the most suitable for transfer of all sewerage flows generated from the site. The rising main has been sized to accommodate the required 20.8L/s. The resultant flow velocity and approximate head loss due to friction through the main is 1.01m/s and 49m respectively. The rising main preliminary design is included in **Appendix D.**

2 ALTERNATE SERVICING OPTIONS

It is understood that Clarence Valley Council prefers low pressure sewer servicing option of the development as outlined in Clarence Valley Council Pressure Sewer Policy V6. The Policy includes the following statements which have been extracted in totality and subsequent comments provided:

> **1. Policy Statement**
> Clarence Valley Council will permit the installation of pressure sewerage systems to provide sewerage services where other forms of sewerage cannot be effectively or economically used, or where pressure systems have particular environmental, economic or social benefits. While pressure systems are an internationally recognised sewerage system, they are sufficiently different to gravity reticulation systems to require a separate policy statement.

Gravity Sewer servicing can effectively be used for the development based on the gently sloping site topography and favourable geological conditions. The benefits of pressure system for the development of James Creek in relation to environmental, economic or social factors have not been provided by Council and as such gravity system remains suitable and preferred option from the developer.

> **4. Use of Pressure Sewerage Systems in Clarence Valley**
> Pressure sewerage systems may be permitted where they represent a more appropriate or cost-effective method of sewerage than conventional gravity systems. Their adoption should not be assumed in any application.
> **4.1 Where Can Pressure Sewerage Systems be used in Clarence Valley?**
> As a general principle, pressure sewerage systems may be permitted either:
> a) In sewerage catchments where Council has resolved that pressure sewerage is to be the method of providing reticulated sewerage,
>
> b) Within developments where pressure sewerage is demonstrated to be a significantly lower overall life cycle cost option for Council than gravity sewerage.

WSA 07 Pressure Sewerage code of Australia, Section 1.2.4 Advantages and Disadvantages – provides some general commentary on pressure sewer systems.

"*Life-cycle costs for pressure sewer systems may be higher than conventional gravity systems because of the life expectancy of the mechanical and electrical items and higher operation and maintenance costs. However, conventional gravity systems that incorporate traditional pumping stations or vacuum pumping stations can reverse this situation.*"

The construction and operational costs have been prepared by WM developments and indicates that pressure sewer will not contribute a significantly lower overall life cycle cost option.

4.2 Likely General Applications of the Pressure Sewerage Systems

The most common applications for pressure sewerage in the Clarence Valley area are likely to be:

- Areas where Council has resolved that pressure sewerage will provide the centralised reticulation. This currently includes Lawrence, Iluka, and the West Yamba, Gulmarrad and James Creek urban release areas,

Although Council has resolved that pressure sewerage will provide the centralised reticulation for James Creek, it conflicts with the Pressure Sewer Policy Statement as gravity sewer servicing can effectively be utilised for the catchment.

3 SEVICING FUTURE GROWTH

The connection of the development to the sewer discharge location facilitates opportunity to concurrently consider future growth in James Creek. In reference to the Maclean Urban Growth Local Growth Management Plan 2011, a total area of approximately 100 ha is potentially available with indicative lot yields of 290 to 1000 dwellings. In consideration of potential servicing options, the following scenario is considered.

Development	Total Area (ha)	Residential Area	Residential Lots (ET)	Commercial	Commercial Lots (ET)
James Creek Development	33	32	326	1	1
Future Growth James Creek	67	50	500		
Total	100	82	826	1	1

Assessing the demand under this scenario results in the following design flows in accordance with WSA 02 Part 1

Development	Design Flow L/s
James Creek Development	20.8
Future Growth James Creek	26
Total	46.8

The proposed sewer pump station and rising main for the development proposal is not currently, however, can be sized for future growth options. A viable option is dual rising mains which facilitates staging and servicing of the entire growth area when considered with staged pump capacity. Installation of the rising mains concurrently provides cost and amenity benefits with reduced disruption to the community and consideration of growth option is recommended in further development of the sewer servicing of James Creek.

4 RECEIVING SEWER IMPACTS

James Creek Development can be effectively serviced by gravity sewer. Design flows from the development are 20.8L/s inclusive of allowance for inflow and infiltration in accordance with WSA 02 and the design flow of 240L/EP/day from Council. In comparison, a low pressure sewer for the same EP loading would have a design flow of 9.1L/s as calculated by WSA 07, thus resulting in an increased peak discharge of 11.7L/s from the gravity system.

Consideration of the impacts on downstream sewer infrastructure of this development is estimated due to limited information available to assess the capacity of the existing system. It is understood the current downstream pump stations have capacity as outlined below:

Pump Station	Design Flow Capacity L/s
SPS 9	92.5
SPS 8	153.7

It is assumed the downstream pump station capacity is sufficient to service the entirety of James Creek Growth Area under a pressure sewer regime. Thus, the only potential increased demand from this development under gravity servicing is 11.7L/s. The increase in peak discharge is not expected to be significant to require substantial downstream upgrades.

In the event the downstream pump stations are fully constrained, alternate pumping regimes may offer the small increase in capacity. Alternatively, detention storage may be considered either at the development or downstream pump station to limit peak instantaneous flows if required.

Consideration of these options, if required can be further developed given more accurate information from Council on downstream sewer capacity however at this stage the determination of the most appropriate strategy, if required, is not known. Indicative costs for implementation of pumping strategy and minor upgrades are in the order of $100,000 up to $500,000 for detention storage if applicable.

5 RISING MAIN ALIGNMENT

Attached as Appendix C is the DRAFT rising main design. This alignment has been developed in consultation with Council and follows detailed survey of the alignment.

6 CONCLUSION

James Creek Development can be serviced by gravity sewer which remains a suitable and effective servicing option. The required infrastructure has been designed and sized in accordance with concept layout and offers a reasonable cost comparison between the developer preferred gravity option and the pressure sewer servicing option proposed by Council.

7 APPENDIX A

Water and Sewer Servicing Plan – Geolink

Preliminary Water and Sewer Servicing Plan

Lot 104 DP 751388, James Creek Road

GeoLINK
environmental management and design

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PO Box 1446
Coffs Harbour NSW 2450
T 02 6651 7666

PO Box 1267
Armidale NSW 2350
T 02 6772 0454

PO Box 229
Lismore NSW 2480
T 02 6621 6677

info@geolink.net.au

Prepared for: Garrard Building Pty Ltd

UPR	*Description*	*Date Issued*	*Issued By*
3204-1014	First issue	6/09/2019	Michelle Erwin
3204-1041	Second issue	1/10/2020	Michelle Erwin
3204-1077	Third issue	15/10/2021	Michelle Erwin
3204-1105	Fourth issue	24/05/2022	Michelle Erwin

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Illustrations

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1. Introduction

1.1 Background

GeoLINK has been engaged by MPD Investments to prepare a preliminary water and sewer servicing plan for a proposed residential subdivision at Lot 104 DP 751388 James Creek Road, James Creek. This report summarises the water supply and sewerage servicing strategy for the proposed development and should be read in conjunction with the Statement of Environmental Effects and the associated design drawings.

1.2 Site Description

Lot 104 DP 751388 (the Site) is rectangular in shape and has an area of approximately 33 ha. It is situated mid-way along James Creek Road in James Creek, bounded by James Creek Road to the east and Austons Lane to the south, with large rural lots to the north and west. The lot to the north is densely vegetated. Approximately 650 m further to the west flows James Creek and approximately 1.3 km to the east flows Palmers Channel. Both waterways flow north, discharging into the Clarence River approximately 1.7 km north of the site.

James Creek is a small, rural locality on the north coast of NSW. The nearest townships are Maclean, Gulmarrad and Yamba, all within 10-15 minutes' drive of the site. Grafton is the nearest larger centre, located 45 minutes' drive southwest.

The Site has been historically cleared and modified for agriculture, sugar cane production and cattle grazing. It is currently essentially clear of vegetation other than grass. The crest of a small hill is located slightly to the north-west of the centre of the site. From this crest, the land falls away in all directions with slopes on the site typically in the range of 3% to 10%.

The Site is predominantly zoned R1 General Residential, with a portion zoned R3 Medium Density Residential. There is also a small area approximately 2,100 m² zoned B1 Neighbourhood Centre. This area has the potential to include a neighbourhood shop or similar commercial development.

Refer to **Illustration 1.1 Locality Plan**.

1.3 Proposed Development

The proposal is for subdivision of the site resulting in approximately 330 residential lots and associated infrastructure (e.g. roads, services). At the time of writing, the subdivision is proposed to occur in five stages, however it is noted that the number of stages, the number of lots in each stage and the sequence of staging will be influenced by the market at the time and possibly by the provision of services.

Refer to **Illustration 1.2 Site Plan.**

0 1 Km

Locality Plan - Illustration 1.1

GeoLINK environmental management and design

Water and Sewer Servicing Plan - Lot 104 DP 751388, James Creek Road.
3204-1047

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: MVE
Source of base data: Open Street Map
Date: 06/10/2020
Revision: A

GDA 1994 MGA Zone 56

LEGEND

- Site boundary
- Cadastre
- Lot layout

0 150 Metres

Site Plan - Illustration 1.2

Water and Sewer Servicing Plan - Lot 104 DP 751388, James Creek Road.
3204-1079

Information shown is for illustrative purposes only
Drawn by: AB Checked by: RE Reviewed by: MVE
Source of base data: ESRI World Imagery
Date: 23/05/2022
Revision: B

2. Water Supply

2.1 Water Supply Demand

The Site is proposed to consist of approximately 330 residential lots over an area of 33 ha. There is no suitable water supply available within close proximity to the Site, so a water supply main is required to be constructed from Yamba Road, James Creek to the Site.

The below information pertains to the proposed water supply main. In accordance with the Northern Rivers Development Design Manual, Section D11, the water supply design requirements are as follows:

- Minimum 200 kPa to each lot – D11.05.1
- Peak instantaneous demand of 0.15 L/s/tenement – D11.05.2
- Desirable maximum pressure of 780 kPa – D11.05.4
- Firefighting pressure shall be 118 kPa at 11L/s – D11.05.5
- Demand per person is 850 L/day – D11.06.1
- Each lot is assumed to have 3.2 equivalent persons – D11.06.1

With the above criteria considered, the following minimum requirements will need to be met:

- Peak instantaneous demand of 49.5 L/s
- Daily demand of approximately 900 kL

2.2 Water Supply Proposal

In order to fulfil the criteria in **Section 2.1**, the Site will need to be serviced by approximately 1,500 meters of DN225 PVC main that connects to the new DN250 water main along James Creek Road. The connection point to this new main is approximately 1 km from the intersection with Yamba Road. The trunk water main that will be connected to the new DN250 water main runs along Yamba Road and is serviced by the Maclean 21 ML Reservoir, which is reported to have 55 m head at the connection point. Refer to **Figure 2.1** for the proposed water main alignment extent. This will adequately service the minimum flow and pressure requirements of the Site whilst accounting for system pressure losses.

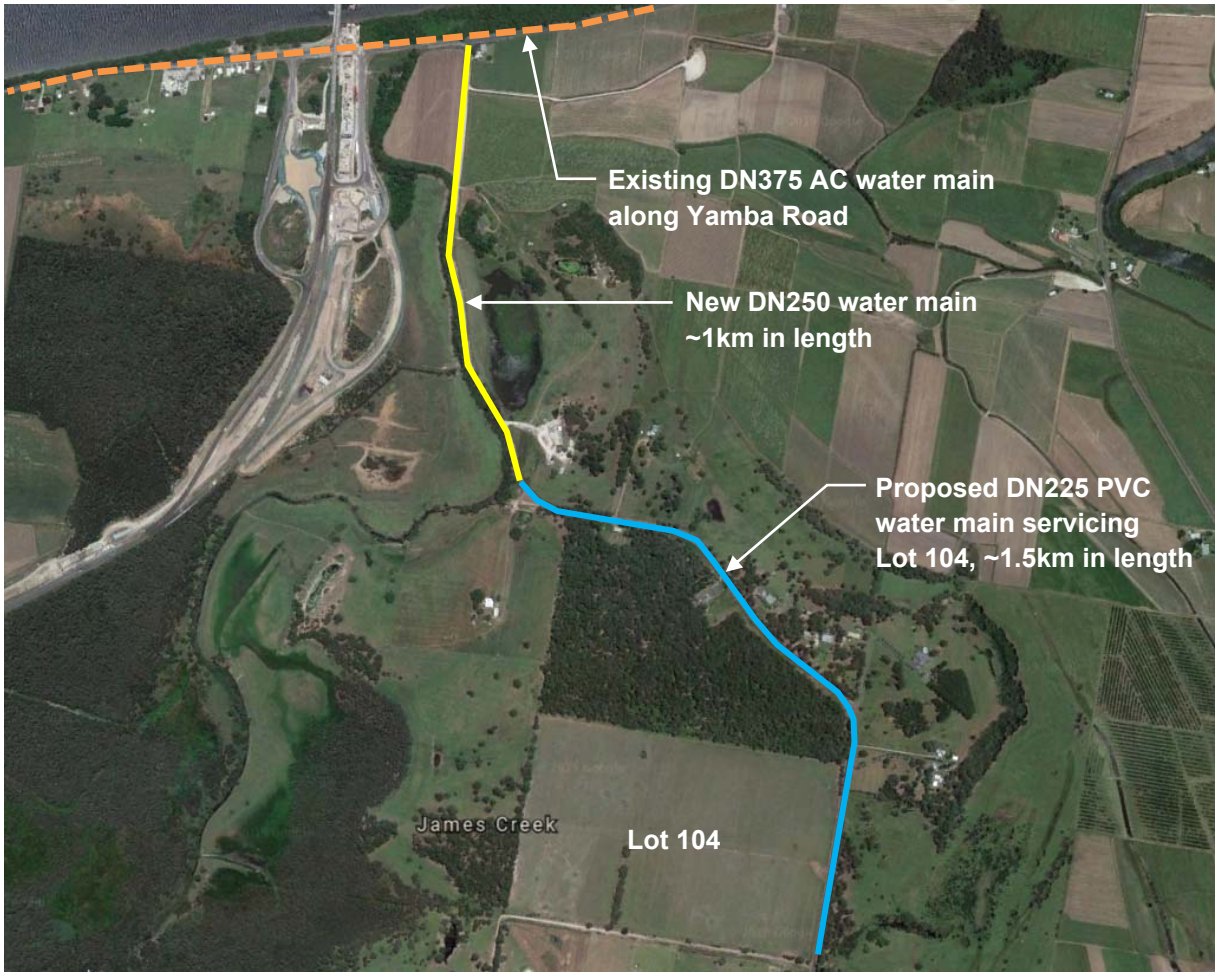


Figure 2.1 Proposed water main alignment extent

3. Sewerage

3.1 Sewage Generation

Sewerage infrastructure for the Site is required to service the same catchment as the water supply. The Site will be serviced by a conventional gravity sewerage system supported by two sewerage pump stations (SPS). The larger SPS will be located close to the James Creek Road frontage and will transfer the sewage via 4.9km of new DN200 PE100 SDR 11 sewer rising main (SRM) to the proposed discharge point along Diamond Street, Townsend.

The below information pertains to the proposed pressure sewer main. In accordance with the Northern Rivers Development Design Manual, Section D12, the sewerage system design requirements are as follows:

- Demand is 240 L/EP/day – D12.06.2 and verbal guidance from Clarence Valley
- Each lot is assumed to have 3.2 equivalent persons – D12.06.1
- Minimum velocity is 0.6 m/sec (1.0 m/sec is preferred) – D12.28
- Maximum velocity 3.0 m/sec – D12.28

With the above criteria considered, the design flow rate has been calculated at 20.8L/s in accordance with WSA 02 Part 1. Refer Willow and Sparrow report for further information.

3.2 Sewerage Rising Main Proposal

In order to fulfil the criteria in **Section 3.1**, a DN200 PE100 SDR11 (PN16) main has been determined to be the most suitable for the transfer of all sewage generated from the Site. The 4.9 km rising main has been sized to accommodate 20.8 L/s, which allows for a volume equal to approximately 8 pump starts per hour per pump. The resultant flow velocity and approximate head loss through the main is 1.01 m/s and 49 m respectively. The estimated pump duty at this stage is 20.8 L/s at 49 m. This accounts for both system and static losses. The above design assumptions will need to be confirmed during subsequent SPS design. Refer to **Figure 3.1** for the proposed SRM alignment extent.

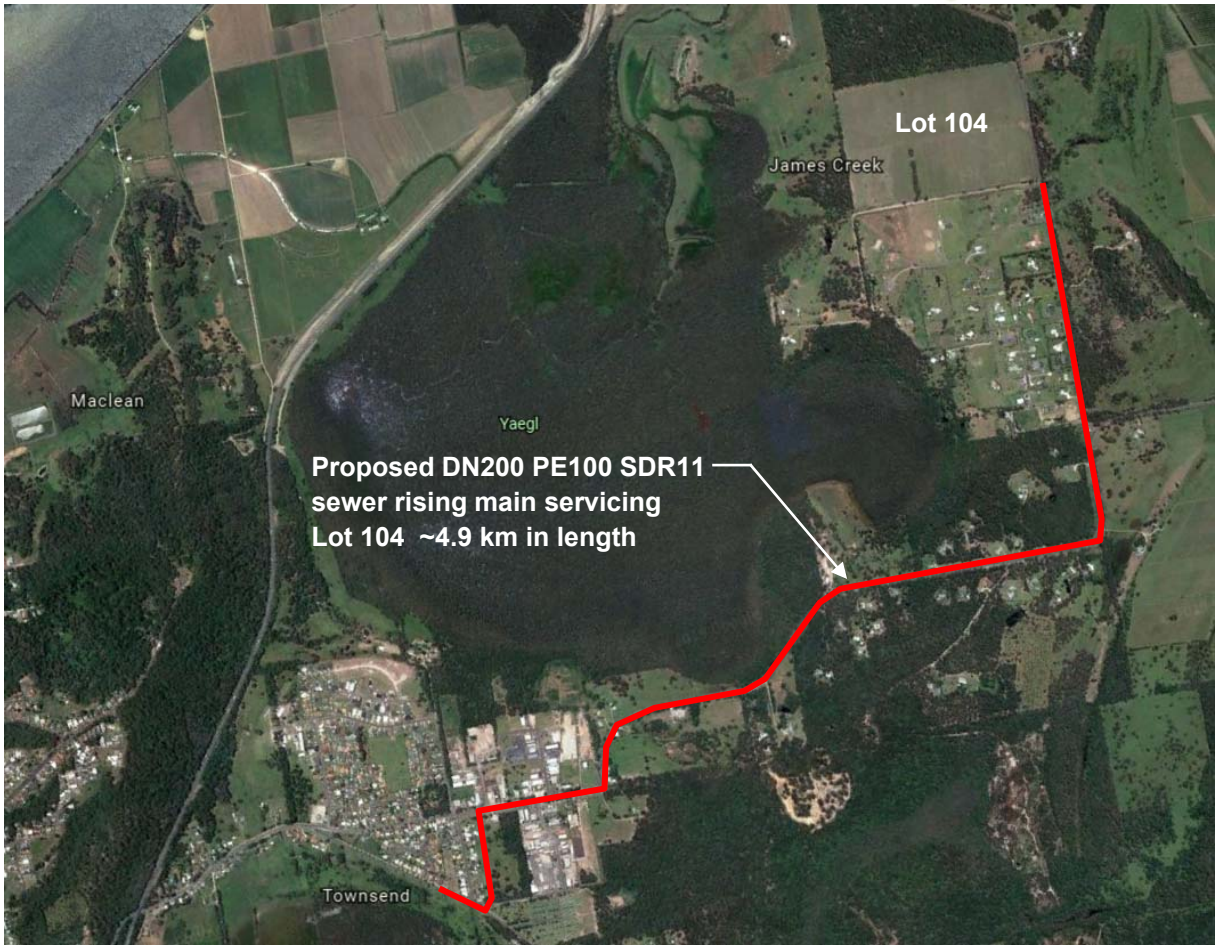


Figure 3.1 Proposed sewer rising main alignment extent

Copyright and Usage

8 APPENDIX B

Preliminary Geotechnical Report – Regional Geotechnical Solutions

REGIONAL GEOTECHNICAL SOLUTIONS

Manning-Great Lakes
Port Macquarie
Coffs Harbour

RGS32811.1 - AB

29 July 2021

MPD Investments
19 Yamanie Court
NERANG QLD 4211

Attention: Mike Willoughby

Dear Mike

RE: Proposed Residential Subdivision – Lot 104 DP 751388, James Creek Road James Creek

Preliminary Geotechnical Assessment

1 INTRODUCTION

Regional Geotechnical Solutions Pty Ltd have undertaken a preliminary geotechnical assessment of Lot 104 DP751388, James Creek Road James Creek.

It is proposed to subdivide the existing lot into 342 residential lots. The site encompasses approximately 33.5ha. The development will include internal roads off James Creek Road and the allocation of building envelops for future residential construction. The development is in the preliminary planning stages at this point. At this stage bulk earthworks with cuttings up to 5m are anticipated.

The purpose of the assessment was to provide comments and recommendations on the following:

- Subsurface conditions including – Soil origins, soil types, thickness of topsoil, presence of fill, and groundwater conditions;
- Excavatability of subsurface profile; and
- Suitability of material as reuse for fill.

2 METHODOLOGY

Fieldwork for the assessment was undertaken by an engineering geologist from RGS on 12 July 2021 and included the following:

- Observation of site features and surrounding features relevant to the geotechnical conditions of the site;
- The drilling of five (5) boreholes to depths of up to 5m with a ute mounted drill rig; and

- Dynamic Cone Penetrometer (DCP) testing adjacent to each of the boreholes to refusal encountered at depths ranging from 1.2m to 1.7m.

Engineering logs of the boreholes are attached. Test locations are shown on the attached Figure 1 and were obtained by taped measurements to prominent site features.

3 SITE CONDITIONS

3.1 Surface Conditions

The site is located on a hill within undulating residual topography. Site slopes are gentle and range from about 2-8°. Site boundaries are delineated by James Creek Road to the east, Austons Lane to the south and dense vegetation to the west and north. Vegetation across the site comprises of grass. James Creek is located approximately 500m to the west.

An aerial photograph that shows the location of the site and the site setting is reproduced below.

Aerial photograph obtained from Google Earth that illustrates the site location and setting. The site boundaries are shown by a red box.

Site photographs are presented below.

Looking southwest across the site. The site is grassed with gentle slopes.

The cuttings from BH5 encountered topsoil, overlying alluvial and residual soils

3.2 Subsurface Conditions

The 1:100,000 Grafton Area Coastal Quaternary Geology map indicates that there is a small quaternary valley fill deposit at the eastern boundary of the site. The 1:250,000 Maclean Geology Map indicates that the site is underlain by the Marbury Formation comprising sandstone and siltstone with some coal.

The materials encountered within the boreholes undertaken during the investigation are summarised in Table 1. Further details are presented on the attached engineering logs.

Table 1: Summary of Subsurface Materials

Material Name	Material Description	Depth to Base of Material Layer (m)				
		BH1	BH2	BH3	BH4	BH5
Topsoil	Silty CLAY, medium plasticity	0.15	0.3	0.2	0.2	0.2
Alluvial Soil	Silty CLAY, medium plasticity, firm to stiff	--	--	1.0	--	0.5
Residual Soil	Silty CLAY, and Sandy CLAY, medium to high plasticity, fine to medium grained sand, stiff to hard.	≥ 5.0	2.8	≥ 5.0	1.5	≥ 5.0
Extremely Weathered Sandstone	SILTSTONE/SANDSTONE, fine to medium grained, hard/friable	--	≥ 5.0	--	≥1.8*	--

Note: ≥ Indicates that base of material layer was not encountered
* Indicates that the test was terminated due to practical refusal of auger drill
-- Indicates that the material was not encountered at the test location

Groundwater not encountered within any of the boreholes drilled. Groundwater levels do fluctuate due to inclement weather, seasonal variations, or due to reasons that may not have been apparent at the time of the site investigation.

4 GEOTECHNICAL CONSTRAINTS AND CONSIDERATION

The site is generally underlain by stiff to hard residual clays overlying weathered siltstone/sandstone. Some alluvial soils were encountered in the southwestern and north-eastern corners of the site. Weathered rock was encountered in BH2 (northwest corner) at a depth of 2.8m and in BH4 (southeast corner) at a depth of 1.5m.

The alluvial soils encountered in BH3 and BH5 were assessed to be of firm to stiff strength. An allowance may need to be made for these areas to be over excavated.

4.1 Excavation Conditions

Based on the concept drawings it is understood that excavations of up to 5m generally over the western half of the site will be required as part of the proposed bulk earthworks. Some localised deeper excavations may be required for the installation of services.

These excavations will encounter stiff to hard residual clays. Extremely weathered siltstone may be encountered around the northwest corner of the site from a depth of about 3m. The weathered rock encountered was very low strength as such excavations of these materials are likely be achievable with medium sized excavators. Ripping tynes may be required where higher strength rock is encountered.

Auger refusal was encountered in the weathered sandstone within BH4 (southeast corner), is it understood that deep excavations may also be required in this area, ripping tynes or rock hammers may be required in this area.

Groundwater seepage is not anticipated based on the conditions encountered within the boreholes.

Excavation work must be undertaken in accordance with the Safe Work Australia '*Excavation Code of Practice (January 2020)*'

4.2 Fill Materials and Offsite Disposal

Materials recommended for use as engineered fill include good quality well graded granular materials free of deleterious materials and having a maximum particle size of 200mm. Locally sourced or site won ripped weathered rock would also be suitable.

Site won residual clay and weathered rock may be reused as controlled fill at the site. However, the use of reactive clay soils will result in higher foundation costs due to the shrink-swell potential and subsequent increase in characteristic free surface movement (ys) values. No testing on soil reactivity has been undertaken at this stage. Shrink swell issues can be managed by using site won clays in the lower layers and using a granular fill in the upper 1.0m to 1.5m.

Where offsite disposal of material, or reuse of material at an alternative site is proposed it should be assessed in accordance with the requirements of the '*Department of Environment and Climate Change NSW Waste Classification* Guidelines *Part 1 Classifying Waste*' (July 2009) and / or the EPA Resource Recovery Order under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014. As a preliminary guide the alluvial/residual and weathered rock profile is likely to be classified as Virgin Excavated Natural Material. Some testing would have to be undertaken once materials have been stockpiled to assess this. It is recommended that following topsoil stripping that a Geotechnical Engineer be engaged to confirm that the material across the site has not previously been disturbed.

5 LIMITATIONS

This report comprises the results of an investigation carried out for a specific purpose and client as defined in the document. The report should not be used by other parties or for purposes or projects other than those assumed and stated within the report, as it may not contain adequate or appropriate information for applications other than those assumed or advised at the time of its preparation. The contents of the report are for the sole use of the client and no responsibility or liability will be accepted to any third party. The report should not be reproduced either in part or in full, without the express permission of Regional Geotechnical Solutions Pty Ltd.

Geotechnical site investigation is based on data collection, judgment, experience, and opinion. By its nature, it is less exact than other engineering disciplines. The findings presented in this report and used as the basis for the recommendations presented herein were obtained using normal, industry accepted geotechnical design practises and standards. To our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, however, can it be considered that these findings represent the actual state of the site at all points.

The recommended depth and properties of any soil, rock, groundwater, or other material referred to in this report is an engineering estimate based on the information available at the time of its writing. The estimate is influenced and limited by the fieldwork method and testing carried out in the site investigation, and other relevant information as has been made available. In cases where information has been provided to Regional Geotechnical Solutions for the purposes of preparing this report it has been assumed that the information is accurate and appropriate for such use. No responsibility is accepted by Regional Geotechnical Solutions for inaccuracies within any data supplied by others.

If site conditions encountered during construction vary significantly from those discussed in this report, Regional Geotechnical Solutions Pty Ltd should be contacted for further advice.

This report alone should not be used by contractors as the basis for preparation of tender documents or project estimates. Contractors using this report as a basis for preparation of tender documents should avail themselves of all relevant background information regarding the site before deciding on selection of construction materials and equipment.

If you have any questions regarding this project, or require any additional consultations, please contact the undersigned.

For and on behalf of **Regional Geotechnical Solutions Pty Ltd**

Prepared by

Louis Davison

Geotechnical Engineer

Reviewed by

Adam Holzhauser

Associate Geotechnical Engineer

Attachments: Figure 1
Borehole Logs

REGIONAL GEOTECHNICAL SOLUTIONS	**Client:**	MPD Investments	Job No.	RGS32811.1
	Project:	Proposed Residential Subdivision	Drawn By:	LD
		Lot 104 DP 751388, James Creek Road JamesCreek	Date:	30-Jul-21
	Title:	Borehole Location Plan	Drawing No.	**Figure 1**

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH1

CLIENT: Mike Willoughby | **PAGE:** 1 of 1

PROJECT NAME: Proposed Subdivision | **JOB NO:** RGS32811.1

SITE LOCATION: Lot 104 DP 7511388 James Creek Road, James Creek | **LOGGED BY:** DR

TEST LOCATION: Refer to Site Plan | **DATE:** 12/7/21

DRILL TYPE: RGS Drill Rig | **EASTING:** | **SURFACE RL:**

BOREHOLE DIAMETER: 100 mm | **INCLINATION:** 90° | **NORTHING:** | **DATUM:** AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
AD/T	Not Encountered					CL	0.15m **TOPSOIL:** Silty CLAY, medium plasticity, dark brown.	M		DCP (0-m)	4	TOPSOIL
						CH	**Silty CLAY:** medium to high plasticity, grey/pale brown mottled, trace of fine grained sand.	M < w_P	VSt		3 3 3 4 3 3 3 4	RESIDUAL HP=250kPa
				1.0			Iron stained bands, grey				12 10 19 20	HP=250kPa
		1.50m					1.50m		H / Fb			
		DS				CH	**Sandy CLAY:** medium plasticity, grey/white, ironstaining bands, sand is fine to medium grained.	M < w_P				
		2.00m		2.0			Orange/red					
							2.50m					
						CH	**Silty CLAY:** medium plasticity, grey and trace of some fine grained sand.	M < w_P	VSt / H			
				3.0			Hard siltstone layer @3.1m, dark brown, very low strength.					
							3.50m					
						ML	**Clayey SILT:** low plasticity, brown, returned as powdery silty gravel.		H / Fb			
				4.0								HP=200kPa
							4.50m					
						CL	**Silty CLAY:** medium plasticity, grey with ironstainined bands.	M < w_P	VSt / H			
				5.0			5.00m					
							Hole Terminated at 5.00 m					

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

ENGINEERING LOG - BOREHOLE

REGIONAL GEOTECHNICAL SOLUTIONS

BOREHOLE NO: BH2

CLIENT: Mike Willoughby | **PAGE:** 1 of 1

PROJECT NAME: Proposed Subdivision | **JOB NO:** RGS32811.1

SITE LOCATION: Lot 104 DP 7511388 James Creek Road, James Creek | **LOGGED BY:** DR

TEST LOCATION: Refer to Site Plan | **DATE:** 12/7/21

DRILL TYPE: RGS Drill Rig | **EASTING:** | **SURFACE RL:**

BOREHOLE DIAMETER: 100 mm | **INCLINATION:** 90° | **NORTHING:** | **DATUM:** AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
AD/T	Not Encountered					CH	**TOPSOIL:** Silty CLAY, medium plasticity, dark brown, some organics.	M		DCP (0-m)	2	TOPSOIL
							0.30m				2	
						CH	**Silty CLAY:** medium to high plasticity, dark grey/dark brown.	M < w_P	St		3	RESIDUAL HP=200kPa
											2	
											2	
									VSt		4	HP=300-350kPa
							Grey with red ironstaining				4	
				1.0			1.00m				5	
						ML	**Sandy SILT:** low plasticity, grey, sand is fine to medium grained, trace of gravel.	D	H / Fb		4	
											6	
							Dark brown, returned as gravelly silt with some sand from 1.5m - 2.5m				6	
				2.0							7	
											10	
							Grey silty clay band	M < w_P			16	
							2.80m				20	
		3.00m		3.0		ML	**Gravelly SILT:** low plasticity, dark brown, trace of fine grained sand.	D	H / Fb			EXTREMELY WEATHERED SILTSTONE
		DS 3.20m					Some carbonacious siltstone gravels throughout					
				4.0								
				5.0			5.00m					
							Hole Terminated at 5.00 m					

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH3

CLIENT: Mike Willoughby | **PAGE:** 1 of 1

PROJECT NAME: Proposed Subdivision | **JOB NO:** RGS32811.1

SITE LOCATION: Lot 104 DP 7511388 James Creek Road, James Creek | **LOGGED BY:** DR

TEST LOCATION: Refer to Site Plan | **DATE:** 12/7/21

DRILL TYPE: RGS Drill Rig | **EASTING:** | **SURFACE RL:**

BOREHOLE DIAMETER: 100 mm | **INCLINATION:** 90° | **NORTHING:** | **DATUM:** AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
AD/T	Not Encountered			0		CL	**TOPSOIL:** Silty CLAY, medium plasticity, dark brown, some organics.	M		DCP (0-m)	2	TOPSOIL
				0.20m		CL	**Silty CLAY:** medium plasticity, brown/grey mottled.	M ~ w_P	St		2 2 2 2 2 2 2 2 2 2 3	ALLUVIAL/SLOPEWASH HP=120kPa
				1.0								
				1.00m		CH	**Silty CLAY:** medium to high plasticity, grey, red mottled.	M < w_P	St		2 3 5 6 12 18 20	RESIDUAL HP=150kPa
							Some weathered sandy ironstone bands					
				2.0					VSt			HP=250kPa
							Some ironstone gravels					
				3.0								
				4.0								
							Dark red	M < w_P	VSt			RESIDUAL
							Becoming silty					
				5.0								
				5.00m			Hole Terminated at 5.00 m					

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH4

CLIENT: Mike Willoughby | **PAGE:** 1 of 1

PROJECT NAME: Proposed Subdivision | **JOB NO:** RGS32811.1

SITE LOCATION: Lot 104 DP 7511388 James Creek Road, James Creek | **LOGGED BY:** DR

TEST LOCATION: Refer to Site Plan | **DATE:** 12/7/21

DRILL TYPE: RGS Drill Rig | **EASTING:** | **SURFACE RL:**

BOREHOLE DIAMETER: 100 mm | **INCLINATION:** 90° | **NORTHING:** | **DATUM:** AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
AD/T	Not Encountered					CL	**TOPSOIL:** Silty CLAY, medium plasticity, dark brown, organics.	M				TOPSOIL
						CL	0.20m **Silty CLAY:** medium plasticity, dark brown/brown.	M ~ w_P	St	HP	120	RESIDUAL
						CL	0.40m **Silty CLAY:** medium plasticity, pale brown/yellow mottled, trace of ironstone gravel.	M < w_P	St	HP	150	
				1.0		CL	0.80m **Sandy CLAY:** medium plasticity, brown/orange/red.	M < w_P	VSt / Fb			
							1.50m **SANDSTONE:** extremely weathered, fine to medium grained, orange grey, very low strength.	M	H			EXTREMELY WEATHERED SANDSTONE
				2.0			1.80m Auger refusal on extremely weathered sandstone Hole Terminated at 1.80 m					
				3.0								
				4.0								
				5.0								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH5

CLIENT: Mike Willoughby | **PAGE:** 1 of 1

PROJECT NAME: Proposed Subdivision | **JOB NO:** RGS32811.1

SITE LOCATION: Lot 104 DP 7511388 James Creek Road, James Creek | **LOGGED BY:** DR

TEST LOCATION: Refer to Site Plan | **DATE:** 12/7/21

DRILL TYPE: RGS Drill Rig | **EASTING:** | **SURFACE RL:**

BOREHOLE DIAMETER: 100 mm | **INCLINATION:** 90° | **NORTHING:** | **DATUM:** AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
AD/T	Not Encountered	0.50m DS 0.70m		0.0		CL	**TOPSOIL:** Silty CLAY, medium plasticity, dark brown, some organics. 0.20m	M		DCP (0-m)	1 1 2 2 3 2 4 6 10 12 16 20	TOPSOIL
						CL	**Silty CLAY:** medium plasticity, grey, brown. 0.50m	M ~ w_P	St			ALLUVIAL
				1.0		CL	**Silty CLAY:** medium to high plasticity, pale brown/pale grey mottling.	M ~ w_P	St / VSt			RESIDUAL HP=150-200kPa
							Pale grey with ironstone banding		VSt / H			HP=200-350kPa
				2.0			Pale grey					
				3.0								HP=400kPa
												HP=400-450kPa
				4.0				M < w_P	H / Fb			
												HP=450kPa
				5.0			5.00m					
							Hole Terminated at 5.00 m					

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

9 APPENDIX C

Gravity vs Pressure Sewer Submission – WM Developments

JAMES CREEK ROAD SUBDIVISIONAL DEVELOPMENT (328 Lots Residential Lots), on Lot 104 DP 751388

GRAVITY SEWER VS LOW PRESSURE SEWER SUBMISSION.

1. Submission of a Gravity Sewerage System Alternative to the Clarence Valley Council's Nominated Pressure Sewer System: -

This submission is provided to demonstrate that a Low-Pressure Sewer System is in our view is not the correct system to be installed for sewer reticulation on the Proposed James Creek Road subdivision and that a gravity system should be the preferred infrastructure. We acknowledge that this is contrary to Council's Policy determination for the proposed residential development on Lot 4 DP 751388 in that James Creek has been nominated by Council as a location where a pressure sewer system will provide centralised reticulation [Section 4.2 of Council Policy].

In addition to the policy nominating specific catchments, it also notes that pressure systems are supported where it can be demonstrated that it has a significantly lower overall life cycle cost option for Council than gravity sewerage.

We outline below the difference between the two options and put forward that the benefits of a gravity system prevail to the extent that Council should revisit its policy settings.

This policy for the pressure system is contested based on Council's Policy Statement (Section 1.0) which states that "Council will permit the installation of pressure sewer systems to provide sewerage services where other forms of sewerage cannot be effectively or economically used or where pressure systems have a particular environmental, economic, or social benefit."

Refer to the Clarence Valley Council Pressure Sewer Policy (Ref No. 1767965 V 6.0) - extracts of which are included in Attachment 1.

Council's determination for the James Creek Area to be reticulated by a pressure sewer system is contested on economic, environmental, or social benefit as set out below.

2. Background: -

There are numerous sewer systems used for the delivery of sewer reticulation for subdivisional developments, generally categorised as either, conventional gravity or various pressure systems (positive and negative (vacuum)).

The two (2) systems under consideration for the James Creek Road subdivision are: -

- Gravity System - these systems comprise house connection (HC) points for the collection of sewerage waste from households, delivering the sewerage via a network of pits and pipes to Sewerage Pump Stations.
- Pressure Systems – these systems comprise household reticulation, tanks and grinder pumps which deliver the sewerage via a network of pipes (pressurised) and controls by the collective of household pumps to Sewerage Pump Stations.

Gravity systems are generally constructed in undulating terrain where gravity is the main delivery force, whilst pressurised systems are used where the terrain is either flat or there are shallow/hard ground conditions which render the gravity system uneconomical.

For this comparison of systems, it should be noted that a major pump station a is only required for the gravity systems in the SE corner of the site and an additional pump station (minor) is required due to terrain level differential constraints in the SW corner servicing the western. This is two (2) pump stations for the gravity system. This compares with 328 pressure pumps (327 residential lots and 1 commercial lot). This assumes that the 12 duplex lots and the 12 townhouse dwellings the R3 zoning have single micro pressure pump units. This is a significant difference in infrastructure (and componentry) requirements.

System layouts for each alternative are included in Attachment 2. Note that the Pressure System layout [which has a different lot arrangement] is included although it was for an earlier application (which was withdrawn). It does, however, provide a layout for comparison of systems.

3. **Economic Viability: -**

3.1 System Costs - both the Capital Cost and Operational and Maintenance Costs of the respective Systems are detailed below (and further detailed in Attachment 3).

Capital Cost Comparison:

- Gravity Sewer = $ 2,977,500 [$ 9,078 / lot]
- Pressure System = $ 4,764,600 [$ 14,526 / lot]

Cost Differential = ($ 1,787,100) [$ 5,488 / lot]

Note that the purchaser of the lot or home must fund the additional cost of $5,488 at the time of purchase as the developer will pass on the development costs of the land.

Operational and Maintenance Cost Comparison:

5 Year Planned Maintenance Costs [Council costs]

- Gravity Sewer = $ 42,160
- Pressure System = $ 183,483

Cost Differential = ($ 140,923)

Note these costs are an accumulation over 5 years but are repeated every 5 years indefinitely except for the 20 year unit replacement. Additionally, the power cost to the home owner is assessed at $50 per annum and the Council operator attendance costs with a 6 monthly inspection or call out is $300 per annum.

20 Year Life Cycle – Replacement Costs: [Council costs]

- Gravity Sewer (pumps + controls) = $ 55,200 life cycle replacement
- Pressure System (pumps + controls) = $ 1,580,304 life cycle replacement

Cost Differential = ($ 1,525,104)

The cost comparisons speak for themselves, showing that a pressure sewer system, if installed, will be operated, maintained, and replaced at the end of the life cycles at a significant additional cost to Council (homeowners) in comparison to a gravity system in this case. And this is in addition to the initial capital cost which is borne by the homeowner.

Council may argument that there is an anticipated increase in design inflows between the two systems due the potential ingress of groundwater into the gravity system. Given the terrain and geology of the site this ingress is expected to be minimal.

Obviously, the ratepayer will be the one who pays. Our concern is that the pressure system is clearly not economically supportable for a large-scale development on land which is topographically and geotechnically suited to a gravity sewer system, particularly when there is a technically sound cost effective alternative available.

Surely this is contrary to the public interest.

As noted earlier there is a total or 328 allotments (327 residential lots and 1 commercial lot), 12 of which are duplex and one lot 116 contains 12 Unit (R3 zoning). The duplex and townhouse sites are anticipated to have single pressure system for comparison.

3.2 Lifestyle Costs –

The lifestyle costs are significantly prejudiced by a householder having to install a private sewerage system in an area that is ideally suited for a conventional gravity sewerage system.

Private responsibility for maintenance awareness (and cost) should never be imposed on the public where other viable (no-risk systems) are available. Additionally with the pressure pump located on each lot there is a heightened risk of damage to the system from a range of factors together with the unnecessary unsightliness of the units.

Not only will the cost of the system be seen as a lifestyle impediment, but there will also be an significant environmental footprint and the changing environmentally awareness of the general public in relation to 'material use excesses'.

For a development location where there is no physical or environmental advantage of a pressure system, and regardless of this fact, an uneconomical sewerage system is being imposed on the development which will have a significant detrimental effect on the lifestyle viability and lifestyle credibility of the development.

4. Environmental Benefit (Sustainability): -

The 'material hungry' pressure system is environmentally unsustainable in terms of the excessive use of materials alone; the gravity sewer alternative presents a clearly significant environmental benefit, which can be realised in terms of a more efficient use of valuable materials.

These issues are obviously reflected via the comparative system economics highlighted earlier.

5. **General Social Benefit (Risk Aversion)** - there is a clear social benefit of the Gravity System vs the Pressure System in terms of risk aversion as highlighted below: -

   - ✓ There is no risk of failure and overflow in the management of the gravity pit and pipe, and pump station reticulation system.
   - ✓ Fail-safe pump duplication systems within the gravity pump station system manages risk compared to a multitude (328 No.) of single unit micro sewerage systems.
   - ✓ Larger reticulation lines minimise the risk of blockages.
   - ✓ The risk of a micro system spill onto a neighbour property is averted.
   - ✓ Pressure pipes present a higher failure risk spill risk if the pipework is damaged.

Given the favourable topography and the proven low-maintenance advantages of gravity pipe, pit, and pump station reticulation systems for this type of landform type, the case for the use of pressure system for this development cannot be supported on economic, environment nor social grounds.

Mike Willoughby
MIE Aust CPEng NER APEC Engineer Int PE (Aust) RPEQ
October 2021

Attachment 1

1. Policy Statement

Clarence Valley Council will permit the installation of pressure sewerage systems to provide sewerage services where other forms of sewerage cannot be effectively or economically used, or where pressure systems have particular environmental, economic or social benefits. While pressure systems are an internationally recognised sewerage system, they are sufficiently different to gravity reticulation systems to require a separate policy statement.

2. Definitions and Glossary

Accredited Installer – an installer accredited by the Period Supply Contractor for undertaking on-property works in accordance with Section 11.4 of this policy

Actual Pump Head – This is the actual static head plus the frictional losses that the pump has to meet in discharging the collection tank's contents. The final or actual pump head is determined from field measurement, to confirm previous design calculations of the pump head.

Alarm Volume – This is the volume that is stored in the on-property collection tank, before the collection tank alarm activities.

As constructed drawings – see work as executed drawings

Backlog area - existing residential areas that do not currently have a centralised (or reticulated) sewerage system

Boundary kit – see Property Boundary Assembly

Collection/Pump unit – a collection tank and associated pumping equipment including grinder pump, level switches, pipework and valves

Collection/Pump unit supplier – a company that supplies collection/pump units, technology (primarily Grinder pumps) and knowledge and guarantees the performance of the individual items within the collection/pumping unit

Collection Tank – that part of a collection/pump unit which collects and stores flows from sanitary drains

Control/Alarm Panel – The power and control panel which controls operation of the Grinder pump and which contains audible and visual alarm components. The panel also contains a dedicated circuit breaker for power disconnection.

Council – This term should be interpreted to mean Clarence Valley Council and its successors.

Designer – This is the individual responsible for the design of either the pressure sewerage reticulation system or the on-property works (or both).

D&C – Design and Construction Tender/ Contract.

Eligible to Connect to Sewer – Council's *Sewer and Water Connection* policy defines whether a property is eligible to connect to sewer.

Although pressure sewerage may, in some locations, have a lower construction cost, this will not necessarily mandate its use. Accordingly Developers proposing to use pressure sewerage will need to justify why Council should permit these systems in their particular application.

4.2 Likely General Applications of the Pressure Sewerage Systems

The most common applications for pressure sewerage in the Clarence Valley area are likely to be:

- Areas where Council has resolved that pressure sewerage will provide the centralised reticulation. This currently includes Lawrence, Iluka, and the West Yamba, Gulmarrad and James Creek urban release areas,
- New subdivisions that can be more economically serviced with a pressure sewerage system than gravity sewerage systems,
- For individual homes (or small clusters of homes) that are currently in close proximity to or are part of a sewered urban area but have not been serviced by that area's current sewerage scheme and connection would involve one or more pump stations and/or site conditions are such that construction of a gravity sewerage system would compromise sensitive environmental areas. This also includes existing vacant urban blocks of land under the same circumstances. These properties will be subject to an application for connection to the sewerage system and subsequent investigation that confirms that this connection is possible and viable.

4.3 Ownership of "On-Property" Works

Conditions of connection to Council's pressure sewerage systems under Clause 18(1) of the Local Government (General) Regulation 2005 are that:

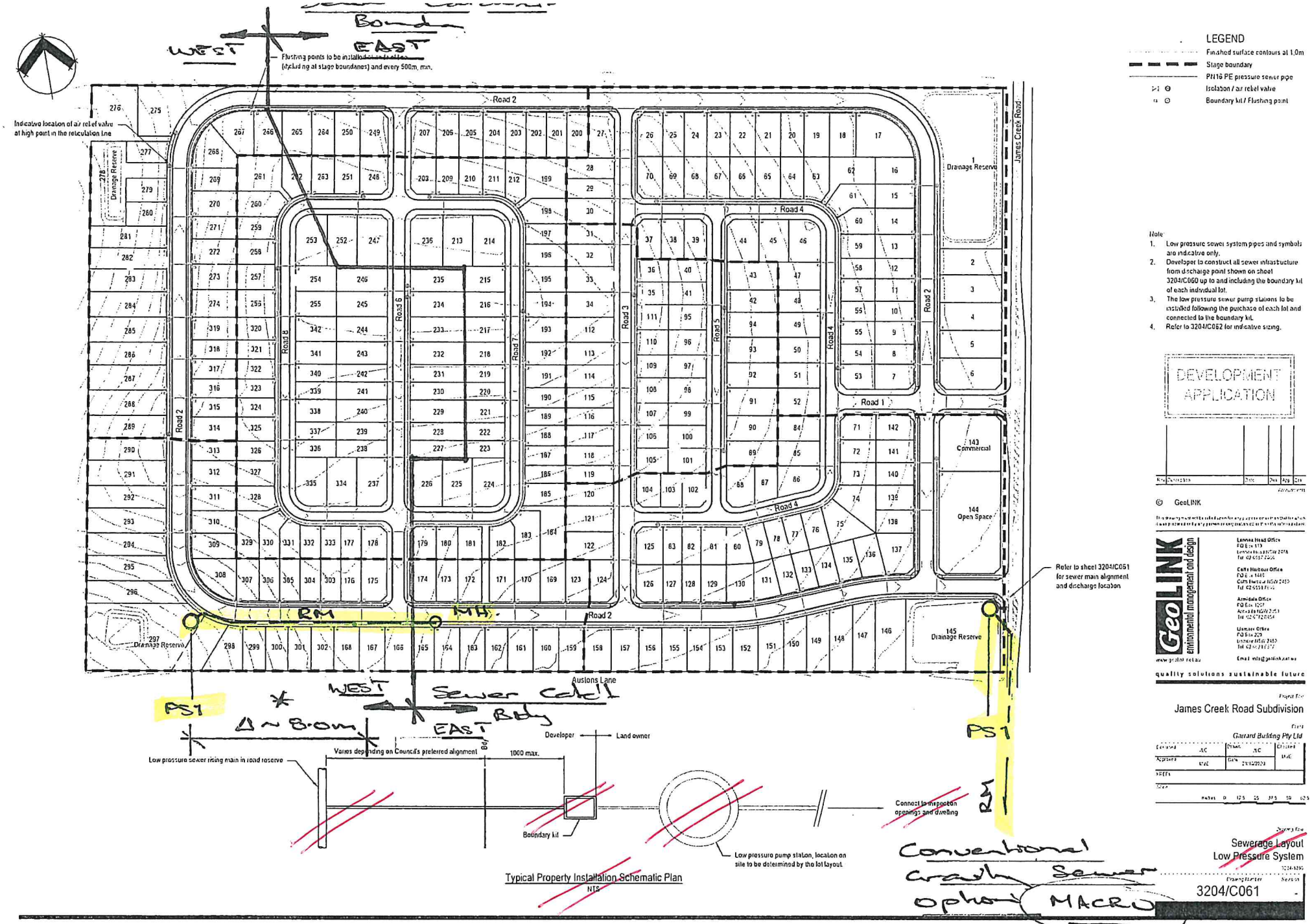
a) Ownership of "On Property" works, which include the following components (as defined in WSAA 05) shall reside with Council:
   - Collection/Pump unit
   - Property discharge line/s from the pump to the property boundary assembly
   - Control/Alarm panel
   - Property boundary assembly
   - Pump control/power cable
   - A one (1) metre stub of sanitary drain extending outside the pressure sewerage collection tank.

b) Collection/pumping units installed within the system shall be compatible with the collection/pumping units supplied under Council's period supply contract.

Pressure sewerage systems do not have any resident serviceable parts, and under Section 635 of the Local Government Act it is an offence to wilfully or negligently remove, damage, destroy or interfere with a sewer system. Property owners should note that the property discharge line is also defined as part of the system. In particular, property owners/residents should locate the property discharge line before commencing any excavation works which may damage the line. Council may attempt to recover costs for any wilful or negligent damage to pressure sewerage systems.

4.3.1 Requirements for Easements over On Property Works

Easements will generally not be required over any part of the "on property" works, so as to enable property owners to subsequently relocate on property works (normally the property discharge line) as required to accommodate future property modifications etc. However, an easement will be required if the property discharge line is required to pass through a neighbouring property.



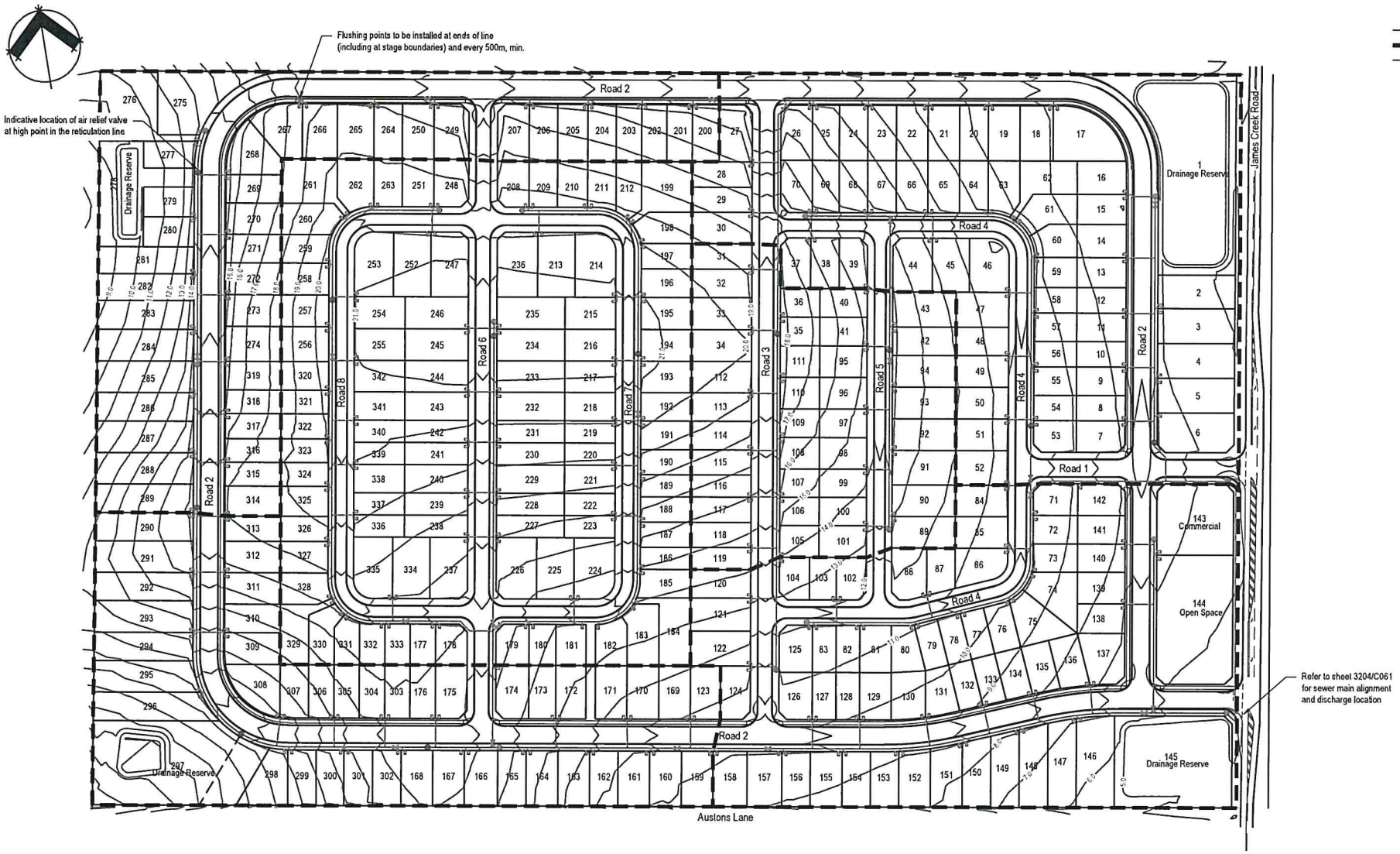
Attachment 2:

* GeoLink to complete!

(To be completed) Gravity Sewer

Conventional gravity sewer option

MACRO



LEGEND

- Finished surface contours at 1.0m
- Stage boundary
- PN16 PE pressure sewer pipe
- Isolation / air relief valve
- Boundary kit / Flushing point

Note:

1. Low pressure sewer system pipes and symbols are indicative only.
2. Developer to construct all sewer infrastructure from discharge point shown on sheet 3204/C060 up to and including the boundary kit of each individual lot.
3. The low pressure sewer pump stations to be installed following the purchase of each lot and connected to the boundary kit.
4. Refer to 3204/C062 for indicative sizing.

DEVELOPMENT APPLICATION

Rev	Description	Date	Des.	App.	Chk.

Amendments

GeoLINK environmental management and design

Lennox Head Office
PO Box 119
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quality solutions sustainable future

Project Title
James Creek Road Subdivision

Client
Garrard Building Pty Ltd

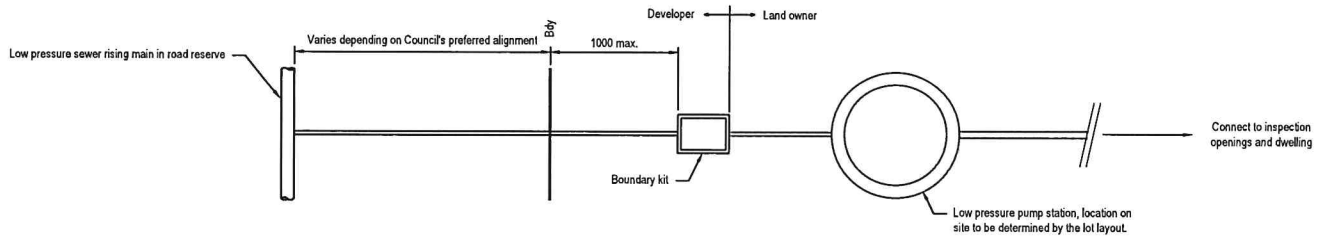
Designed	JLC	Drawn	JLC	Checked	MVE
Approved	MVE	Date	21/10/2020		

XREFs

Scale
metres 0 12.5 25 37.5 50 62.5

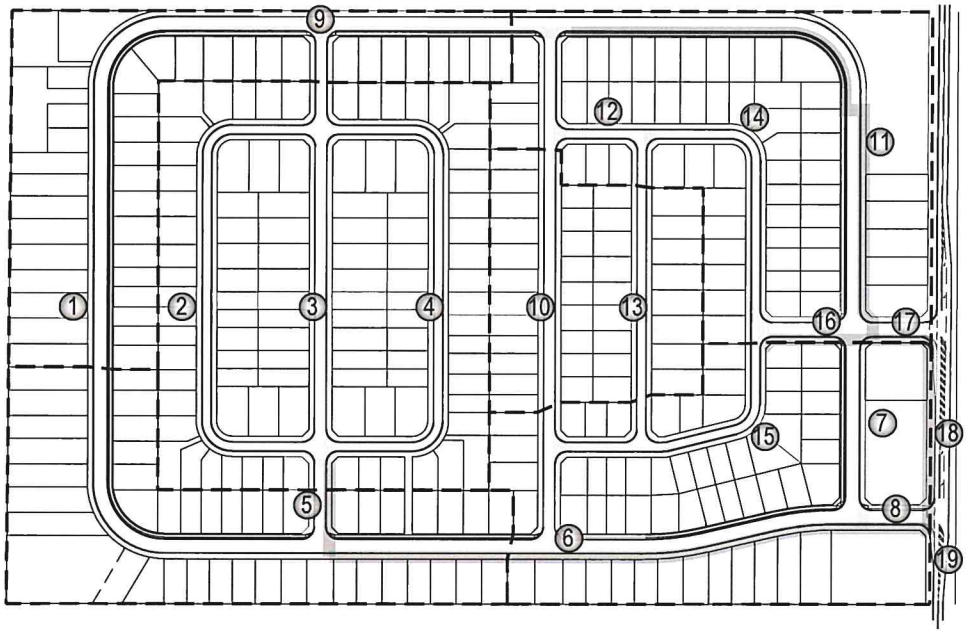
Drawing Title
Sewerage Layout
Low Pressure System

Drawing Number	Revision
3204/C061	3204-1030 -



Typical Property Installation Schematic Plan
NTS

Attachment 2.2



LEGEND

- Stage boundary
- PN16 PE OD50 mm
- PN16 PE OD63 mm
- PN16 PE OD75 mm

CALCULATION TABLE

(Excludes laterals)	
Pipe Size	Total Length (m)
16	0
20	0
25	0
32	0
40	0
50	2970
63	575
75	665
90	0
110	4900
125	0
140	0
160	0
180	0
200	0
225	0
250	0
280	0
315	0
355	0

PRELIMINARY SIZING ONLY
NOT FOR CONSTRUCTION

1. This Design Aid has been prepared for the development of preliminary pipe sizing only.
2. Designers should satisfy themselves as to the adequacy & application of results from use of this Design Aid
3. Aquatec Fluid Systems does not represent that this Design Aid contains sufficient analysis for the preparation of Designs for Construction of works.

PIPE CLASS & MATERIAL : PN 16 PE 100

Legend
- Data Input Cells
- Optional Data Input Cells
- Data Reference from Data Sheet

Project Location: James Creek
Project Name: James Creek Rd - rev 2

SIMPLIFIED METHOD: AN + B = Q
A = 0.00700
B = 0.80
Peaking Factor = 1.10

Litres/Tenement/Day = 550

Weighted Average HRS to Discharge = 4.55

Haz W Const
130.0

PIPE SEGMENT NUMBER	FLOWS INTO SEGMENT	NUMBER OF (ET)	ACCUM ET CONNECTED	LOW PUMP or U/S in Segment	CONTROL DATUM of Segment	PIPE LENGTH (METRE)	DESIGN FLOW (L/S)	PIPE SIZE (Nom. Bore)	PIPE ID (MM)	DESIGN VELOCITY (M/S)	FRICTION FACTOR (M/100M)	FR LOSS THIS PIPE (METRE)	DS HGL (METRE)	US HGL (METRE)	PUMP HEAD (METRE)	PIPE SEGMENT NUMBER	SEGMENT RETENTION TIME	Max HRS TO DISCHARGE	AVE HRS TO DISCHARGE	AIR WALKSI P
1	6	55	55	10.0	15.0	550.0	1.19	90	40.0	0.94	3.09	17.02	29.66	46.68	36.68	1	0.55	4.79	4.51	OK
2	5	40	40	19.0	15.0	420.0	1.08	90	40.0	0.86	2.61	10.95	30.77	41.71	22.71	2	0.58	4.88	4.59	7.35
3	5	20	20	21.0	15.0	190.0	0.94	90	40.0	0.75	2.02	3.83	30.77	34.59	13.59	3	0.52	4.83	4.57	3.79
4	5	40	40	18.0	15.0	400.0	1.08	90	40.0	0.86	2.61	10.42	30.77	41.19	23.19	4	0.55	4.85	4.58	7.03
5	6	1	101	16.0	15.0	75.0	1.51	63	51.0	0.74	1.48	1.11	29.66	30.77	14.77	5	0.07	4.31	4.27	3.81
6	8	38	194	15.0	6.0	405.0	2.16	75	61.0	0.74	1.20	4.87	24.78	29.66	14.66	6	0.27	4.24	4.11	2.71
7	8	6	6	8.0	6.0	100.0	0.84	50	40.0	0.67	1.64	1.64	24.78	26.43	18.43	7	0.91	4.89	4.43	3.52
8	19	0	200	6.0	5.0	60.0	2.20	75	61.0	0.75	1.25	0.75	24.04	24.78	16.78	8	0.04	3.97	3.95	3.09
9	11	14	14	17.0	13.0	300.0	0.90	50	40.0	0.71	1.85	5.55	30.31	35.86	18.86	9	1.18	5.84	5.25	4.56
10	11	30	30	13.0	13.0	350.0	1.01	50	40.0	0.80	2.30	8.06	30.31	38.36	25.36	10	0.64	5.30	4.98	OK
11	17	25	69	13.0	7.0	420.0	1.28	63	51.0	0.63	1.10	4.61	25.70	30.31	17.31	11	0.54	4.66	4.39	2.70
12	14	6	6	16.0	13.0	50.0	0.84	50	40.0	0.67	1.64	0.82	32.87	33.69	17.69	12	0.46	4.93	4.70	2.48
13	14	18	18	12.0	13.0	190.0	0.93	50	40.0	0.74	1.96	3.72	32.87	36.59	24.59	13	0.58	5.05	4.76	OK
14	16	24	48	13.0	9.0	220.0	1.14	50	40.0	0.90	2.86	6.30	26.57	32.87	19.87	14	0.25	4.47	4.35	6.61
15	16	20	20	9.0	9.0	200.0	0.94	50	40.0	0.75	2.02	4.03	26.57	30.60	21.60	15	0.55	4.77	4.50	OK
16	17	1	69	9.0	7.0	80.0	1.28	63	51.0	0.63	1.10	0.88	25.70	26.57	17.57	16	0.10	4.22	4.17	2.26
17	18	0	138	7.0	6.0	50.0	1.77	75	61.0	0.60	0.83	0.41	25.28	25.70	18.70	17	0.05	4.12	4.10	1.88
18	19	0	138	6.0	5.0	150.0	1.77	75	61.0	0.60	0.83	1.24	24.04	25.28	19.28	18	0.14	4.07	4.00	2.67
19	0	0	338	5.0	5.0	4900.0	3.17	110	89.0	0.51	0.39	19.04	5.00	24.04	19.04	19	3.94	3.94	1.97	OK

DEVELOPMENT APPLICATION

Rev	Description	Date	Des.	App.	Chk.

Amendments

GeoLINK environmental management and design

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Tel: 02 6621 6677

www.geolink.net.au
Email: info@geolink.net.au

quality solutions sustainable future

Project Title
James Creek Road Subdivision

Client
Garrard Building Pty Ltd

Designed	Aquatec	Drawn	MVE	Checked	MVE
Approved	MVE	Date	21/10/2020		

XREFs

Scale
metres 0 12.5 25 37.5 50 62.5

Drawing Title
Indicative Pipe Sizing
Low Pressure System

Drawing Number	Revision
3204/C062	3204-1030 -

JAMES CREEK ROAD RESIDENTIAL ESTATE, James Creek, NSW.

20/10/2021 13:05

LOW PRESSURE SEWER RETICULATION SYSTEM - Capital Costs Estimate.

Item	Description		Quantity	Unit	Rate	Amount	Comment
Low Pressure Sewer Reticulation System							
1	On-Property Works (per Household)						
1	Collection/Pump Unit	$ 9,000					
a)	Supply	60%	1	No.	$ 5,400	$ 5,400	
b)	Install	20%	1	No.	$ 1,800	$ 1,800	
2	Control/Alarm panel	10%	1	No.	$ 900	$ 900	
3	Property boundary assembly	10%	1	No.	$ 900	$ 900	
		100%				$ 9,000	
	Total Number of Households		328		Sub-total	$ 2,952,000	
2	Reticulaton System						
1	Design		-	Item	-	$ 25,000	
2	Pit and Pipe System		8000	m	$ 115	$ 920,000	
3	Pump Stations						
1	No Pump Station Requirement for the Low-Pressure System.		-	Item	-	$ -	
					Total	$ 3,897,000	

CONVENTIONAL GRAVITY SEWER RETICULATION SYSTEM - Capital Costs Estimate

Conventional Gravity Sewer System							
1	On-Property Works (per Household)		NA				
2	Reticulaton System						
1	Design		-	Item	-	$ 35,000	Two (2) Pump Station Designs required.
2	Pit and Pipe System		8000	m	$ 200	$ 1,600,000	
3	Pump Stations						It should be noted that the linework lengths of pressure and gravity sewer will vary internally, we have use the same lengths for because layout alternatives remain preliminary.
1	Major Pump Station		-	Item	-	$ 400,000	
2	Minor Pump Station		-	Item	-	$ 400,000	
					Total	$ 2,435,000	
					Delta	**$ 1,462,000**	**in favour of Conventional Gravity Sewer System**

Attachment 3.1

JAMES CREEK ROAD RESIDENTIAL ESTATE, James Creek, NSW.

20/10/2021 13:09

LOW PRESSURE SEWER RETICULATION SYSTEM - Annual Operational and Maintenance Costs Estimate(Mechanical and Electrical Components)

Item	Description		Quantity per Year	Unit	Rate	Amount	Comment
Household Grinder Units							
Annual Running Costs & Maintenance							
1	Pumping	Annual Pump Operation Costs	1	No.	$ 50	$ 50	Householde Electricity Costs.
2	Operator Attendance	Once every 6 months (2 No. per year)?	2	No.	$ 120	$ 240	1 x Maintenance Technician in attendance.
		Annual Operational Costs				$ 290	
Planned Maintenance Costs for the First 5 year Period							
1	Pump Maintenance	Replacement of worn parts, maintenance as required - est. at 30% of new pump costs.	-	Item	$ 933	$ 933	Pump Cost $ 2,980 - add 20% for installation.
2	Valve Maintenance	Replacement of worn parts, maintenance as required - est. at 30% of mechanical fit-out.	-	Item	$ 414	$ 414	Controller Cost (& assoc works) $1,035 - add 20% for install.
						$ 1,347	Five Year Total
		Annual Maintenance Costs				$ 269	
		Annual Combined Costs per Household Unit.				**$ 559**	
		Total Costs	**No. Lots**		**$ 328**	**$ 183,483**	
Planned 20 Year Life Cycle - Replacement Costs							
1	Pump Units	Replacement of Pump Units	-	Item	$ 3,576	$ 3,576	Pump Cost $ 2,980 - add 20% for installation.
2	Controller Units	Replacement of Controller Units	-	Item	$ 1,242	$ 1,242	Controller Cost $ 1,035 - add 20% for installation.
		20 Year Replacement Costs				$ 4,818	Twenty Year Total
		Total Costs	**No. Lots**		**328**	**$ 1,580,304**	

Attachment 3.2

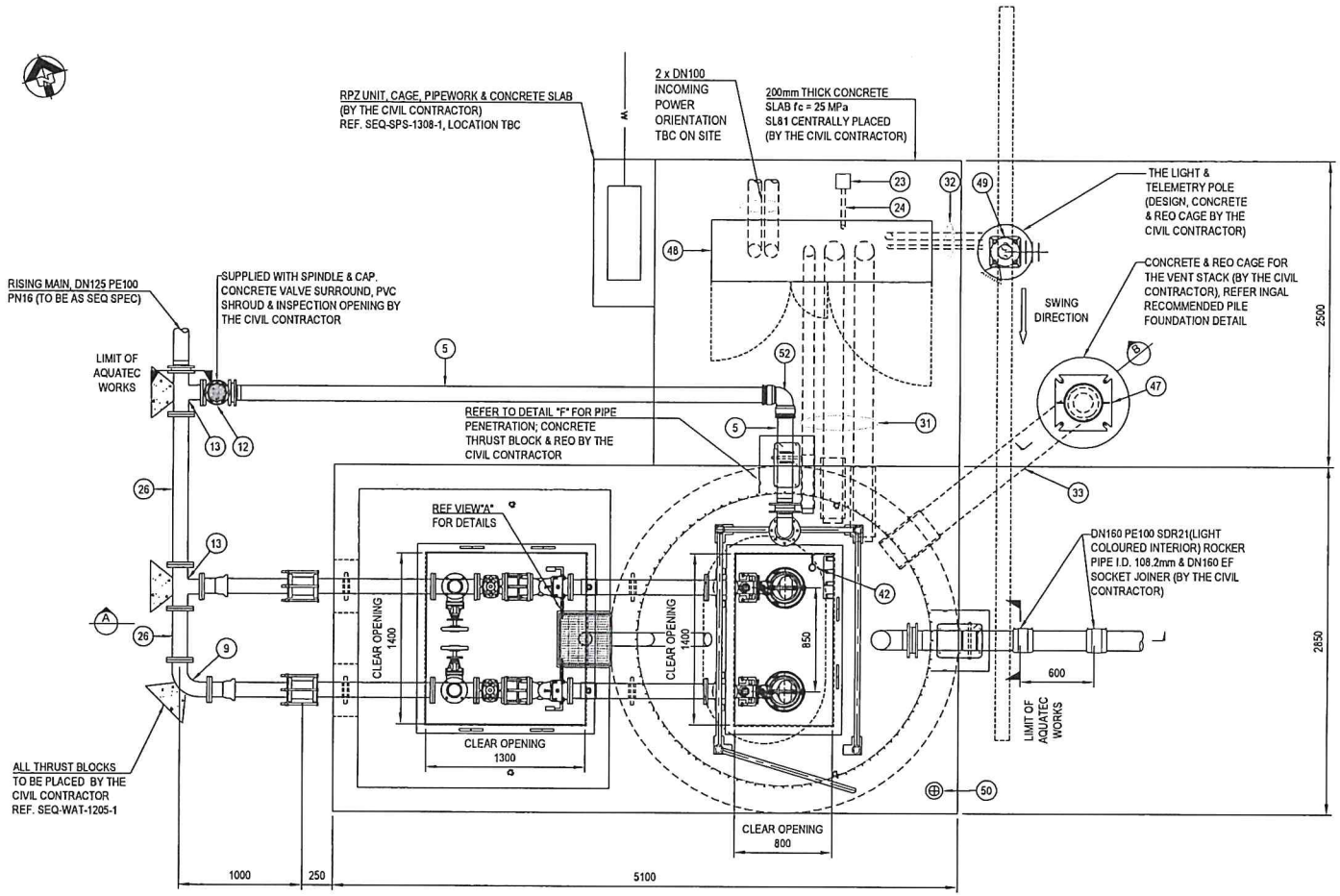
JAMES CREEK ROAD RESIDENTIAL ESTATE, James Creek, NSW.

CONVENTIONAL GRAVITY SEWER RETICULATION SYSTEM - Annual Operational and Maintenance Costs Estimate (Mechanical and Electrical Components).

Item	Description		Quantity per Year	Unit	Rate	Amount	Comment
Two (2) Conventional Small Sewer Pump Stations							
Annual Running Costs & Maintenance			1 x Pump				
1	Pumping	7.5kW 1-2 hours per day operation for 365 days plus 15 days of 20 hours per day operation for one pumps = 750kWh.	5,475	kW-h	$ 0.37	$ 2,000	
2	Operator Attendance	Twice a month for 2 - 4 hours each attendance.	144	MHr/Yr	$ 120.00	$ 17,280	2 x Maintenance Technicians 24 Visits for 3Hr av./Yr.
		Annual Operational Costs				$ 19,280	
Planned Maintenance Costs for the First 5 year Period							
1	Pump Maintenance	Replacement of worn parts, maintenance as required - est. at 30% of new pump costs	-	Item	$ 6,000.00	$ 6,000	Pump Cost $ 16,000.
2	Valve Maintenance	Replacement of worn parts, maintenance as required - est. at 30% of mechanical fit-out.	-	Item	$ 4,000.00	$ 4,000	Mechanical Fit-out $ 12,000
						$ 10,000	Five Year Total
		Annual Maintenance Costs				$ 2,000	
		Annual Combined Costs for the Additional Pump Station		1		**$ 21,280**	
		Two (2) Pump Stations CostAnnual Combined Costs.		2		**$ 42,560**	
Planned 20 Year Life Cycle - Replacement Costs							
1	Pump Units	Replacement of Pump Units	-	Item	$ 3,576.00	$ 19,200	Pump Cost $ 8,000 each x 2 = $ 16,000 - add 20% for install.
2	Controller Units	Replacement of Controller Units	-	Item	$ 2,400.00	$ 8,400	Level Sensors and Electronics - $ 7,000 - add 20% for install.
		20 Year Replacement Costs		1		**$ 27,600**	Twenty Year Total
		Two (2) Pump Stations CostAnnual Combined Costs.		2		**$ 55,200**	

COST DIFFERENTIALS (in favour of the Conventional Gravity System)

Planned Maintenance Costs for the First 5 year Period	**Delta**	**$ 140,923**	**in favour of Conventional Gravity System Alternative.**
Planned 20 Year Replacement Costs	**Delta**	**$ 1,525,104**	**in favour of Conventional Gravity System Alternative.**



PLAN
(COVERS & GRILLE REMOVED FOR CLARITY)
1:20 @ A1

PUMP STATION CONTROL LEVELS	
ITEM	LEVEL (m AHD)
TOP OF SLAB	8.546
INLET SEWER INVERT LEVEL	3.785
DUTY START	2.620
PUMP STOP	2.340
WET FLOOR LEVEL	1.746
FINISHED SURFACE LEVEL	8.546
STAND-BY START	2.920
HIGH LEVEL ALARM	3.220
OVERFLOW LEVEL	6.064 (APPROX.)
PRE-OVERFLOW ALARM	5.764
Q100 / STORM SURGE LEVEL	7.500 (APPROX.)
RISING MAIN INVERT LEVEL DN125 PE100 AT LIMIT OF WORK POSITION)	7.400

PUMP INFORMATION	
PUMP MANUFACTURER	SULZER
PUMP MODEL No.	XFP 80E CB1 50Hz
IMPELLER TYPE	CONTRABLOC IMPELLER, 1 VAN
PUMP CURVE No.	XFP 80E CB1 50Hz
IMPELLER DIA	180 mm
DUTY POINT (FLOW @ HEAD)	14 L/S @ 29.63m
MOTOR SIZE	11 kW

GRAPHIC SCALE 1:20MTS

REV	AMENDMENT	BY	APP	DATE
P0	ISSUED FOR REVIEW	SL		24/05/19

Aquatec Fluid Systems PTY LTD / ABN - 94 114 544 026
2 Provincial Crescent, Shepparton VIC 3630
T 1300 068 555 / E info@aquatecenviro.com.au

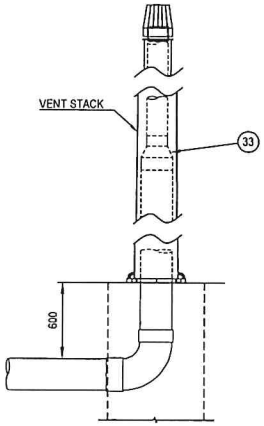
ISSUED FOR REVIEW

Designed - IMS
Drawn - SL
Checked - IMS
Approved -
Scale - AS SHOWN @ A1

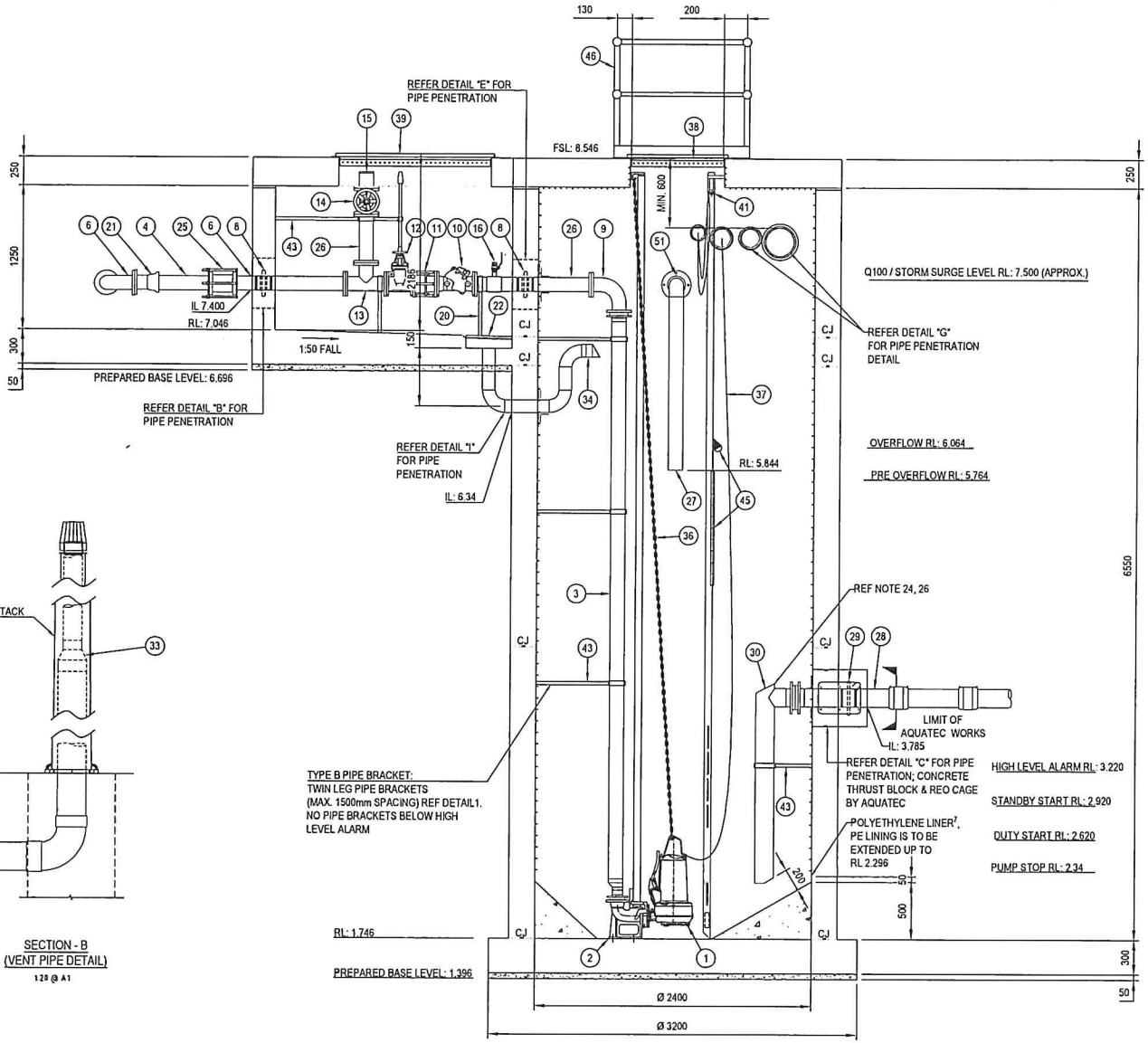
CITY OF GOLD COAST
YAWALPAH ROAD, PIMPAMA
CAST IN-SITU SEWER PUMP STATION - Ø2400
PLAN

Drawing No. D2019.02.08.02 | Revision P0 | File Location / Name AQT

Attachment 4.1



SECTION - B
(VENT PIPE DETAIL)
1:20 @ A1



SECTION - A
(REFER PLAN VIEW FOR ORIENTATION)
1:20 @ A1

GENERAL NOTES:

1. PUMP STATION TO BE AQUATEC MODEL: PPM2 / 6800 (CAST IN-SITU)
2. CONCRETE TYPE - SULPHATE RESISTANT (USE CALCAROUS AGGREGATE FOR SEWAGE OR EFFLUENT
3. CONCRETE STRENGTH - S50 MPa
4. INTERNAL FINISH SMOOTH TO MEET AS1510 CLASS 2
5. BLANK
6. REINFORCEMENT TO COMPLY WITH AS 1302 & AS 1304
7. ALL INTERNAL VERTICAL & COVER OPENING WET WELL SURFACES SHALL HAVE AN APPROVED LIGHT COLORED POLYETHYLENE LINER (MIN. 2.5mm THICK) MECHANICALLY BONDED TO WALL VIA ANCHORS CAST INTO CONCRETE. THE INTERNAL WALLS OF INTEGRAL VALVE CHAMBER TO BE COATED WITH MC EPOXY (2 COATS)
8. ALL HOLES TO BE PRE-CORED
9. BLANK
10. WELL WASHER, LADDERS, HANDGRIPS, INLET VALVE ETC. NOT INCLUDED AS PER SEQ SPEC.
11. PROVIDE "HYDROTITE" HYDROPHILIC PROFILE 25 x 7 SEAL CJ-0725-3K ON ALL WALL PENETRATIONS AND ALSO ON INSIDE & OUTSIDE FACE OF ALL WEEP FLANGES
12. LEVEL SWITCHES TO BE PROVIDED FOR OVERFLOW LEVEL AND EMERGENCY BACKUP (PRE OVERFLOW) START LEVEL AS PER SEQ-SPS-1300-6 & COUNCIL REQUIREMENT (BOTH OF THEM TO BE STAND ALONE ITEMS).
13. ALL FIXINGS TO PE LINER SHOULD BE STAINLESS STEEL CHEM ANCHORS WITH 12mm THICK SPONGE NEOPRENE GASKETS (REF. SEQ-SPS-1407-1)
14. CAPS TO BE PROVIDED OVER CONDUITS, NOT TO BE FOAM FILLED.
15. INSIDE OF WETWELL COVERS TO BE MARKED "P1" & "P2".
16. THE PUMP CLOSEST TO THE SWITCHBOARD TO BE LABELLED "P1".
17. CONFINED SPACE SIGNS TO BE PLACED ON THE UNDERSIDE OF THE ACCESS COVERS (NOT ON WETWELL WALLS).
18. WETWELL WATER TIGHTNESS TEST TO BE PERFORMED AS PER SEQ REQUIREMENTS.
19. ALL FLANGES AND VALVES TO BE DRILLED TO PN16 AS4087 UNO
20. SWITCHBOARD, HINGED TELEMETRY POLE & VENT STACK TO BE POWDER COATED TO MIST GREEN
21. AQUATEC TO INCLUDE 316 SS EYEBOLT INTO THE WALL ABOVE INLET
22. ELECTRICAL SWITCHBOARD DOORS TO HAVE MIN. 600mm CLEARANCE TO ANY SURROUNDING ABOVE GROUND STRUCTURE AS PER AS3000
23. FOR ALL PIPEWORK EXTERNAL TO THE VALVE CHAMBER AND WET WELL PROVIDE SEWER MARKER TAPE AND 5~7mm SCREENINGS/ DRAINAGE GRAVEL
24. PE PIPEWORK SPECIFIC REQUIREMENT AS FOLLOWING TABLE:

	GRAVITY SEWER	PRESSURE SEWER
PRESSURE RATING	PE100 SDR21 PN8	PE100 SDR11 PN16
EXTERNAL COLOR	LIGHT GREY SOLID OR BLACK WITH GREY STRIPS	CREAM SOLID OR BLACK WITH CREAM STRIPS
INTERNAL COLOR	WHITE OR LIGHT COLORS	WHITE OR LIGHT COLORS

25. ANY DI PIPE EXTERNAL TO THE VALVE CHAMBER AND WET WELL TO BE PE SLEEVED SEWER WRAP.
26. ITEM 28 & 30 ARE PE100 PN8 SDR21 TO ENSURE TRANSITION TO DROPPER IS INVERT TO INVERT.

0 0.1 0.2 0.5 1.0 1.5 2.0
GRAPHIC SCALE 1:20MTS
0 0.1 0.2 0.3 0.4 0.5 0.75 1.0 1.25 1.5
GRAPHIC SCALE 1:15MTS

REV	AMENDMENT	BY	APP	DATE
P0	ISSUED FOR REVIEW	SL		04/05/19

Aquatec Fluid Systems PTY LTD / ABN - 94 114 944 026
2 Provincial Crescent, Shepparton VIC 3630
T 1300 068 555 / E info@aquatecenvco.com.au

ISSUED FOR REVIEW

Designed	IMS
Drawn	SL
Checked	IMS
Approved	-
Scale	AS SHOWN @ A1

CITY OF GOLD COAST

YAWALPAH ROAD, PIMPAMA

CAST IN-SITU SEWER PUMP STATION - Ø2400

SECTIONS

Drawing No.	Revision	File Location / Name
D2019 02 08 03	P0	AQT

Attachment 4.2

PRESSURE SEWER SOLUTIONS P/L

*Refer to Property Data Base for confirmation of pressure sewer system type: e.g. Simplex, Duplex or Quadruplex.

RVC pressure sewer policy defines their assets as indicated in Figure 4

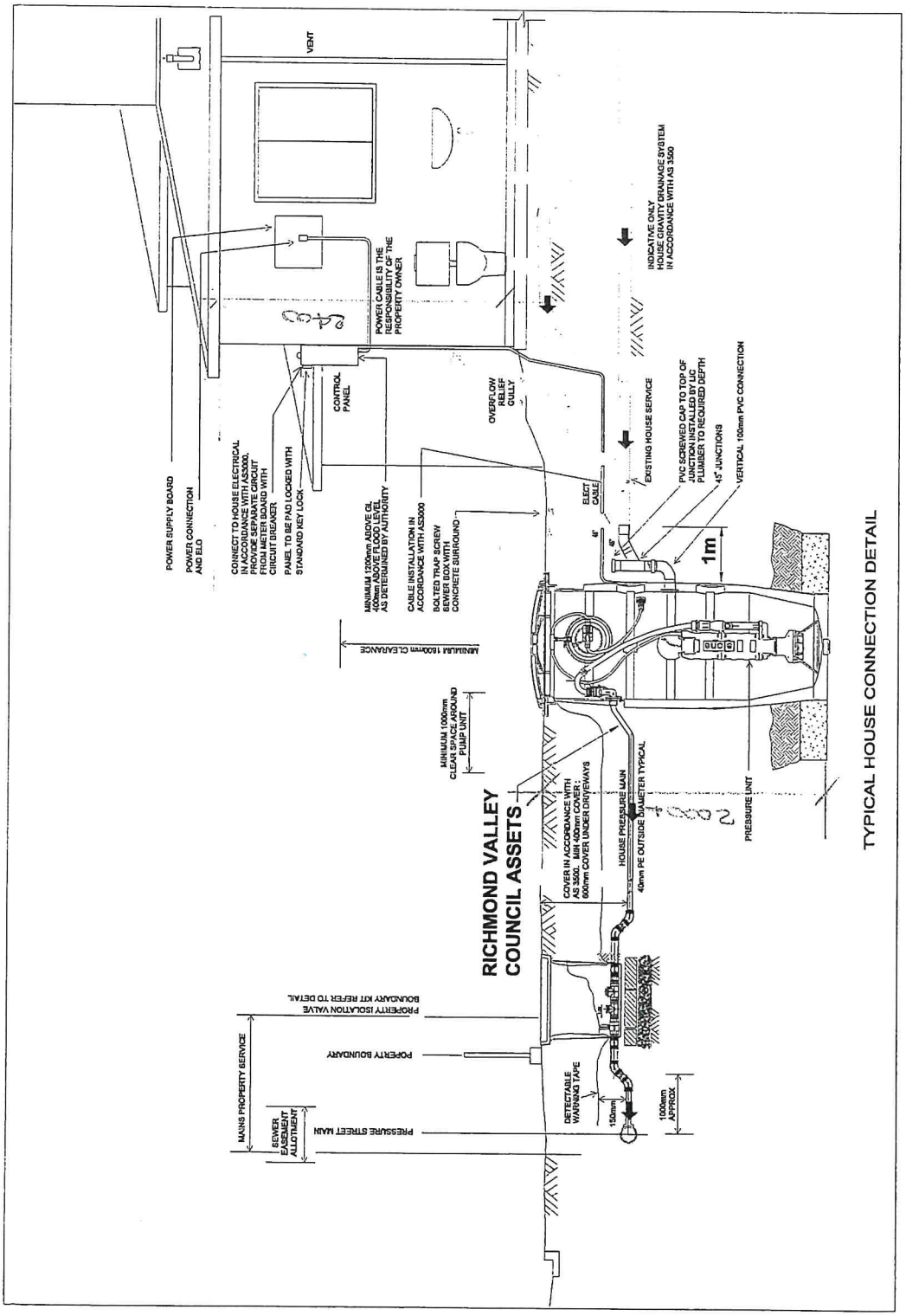


Figure 4: RVC On-Property Pressure Sewer Assets

10 APPENDIX D

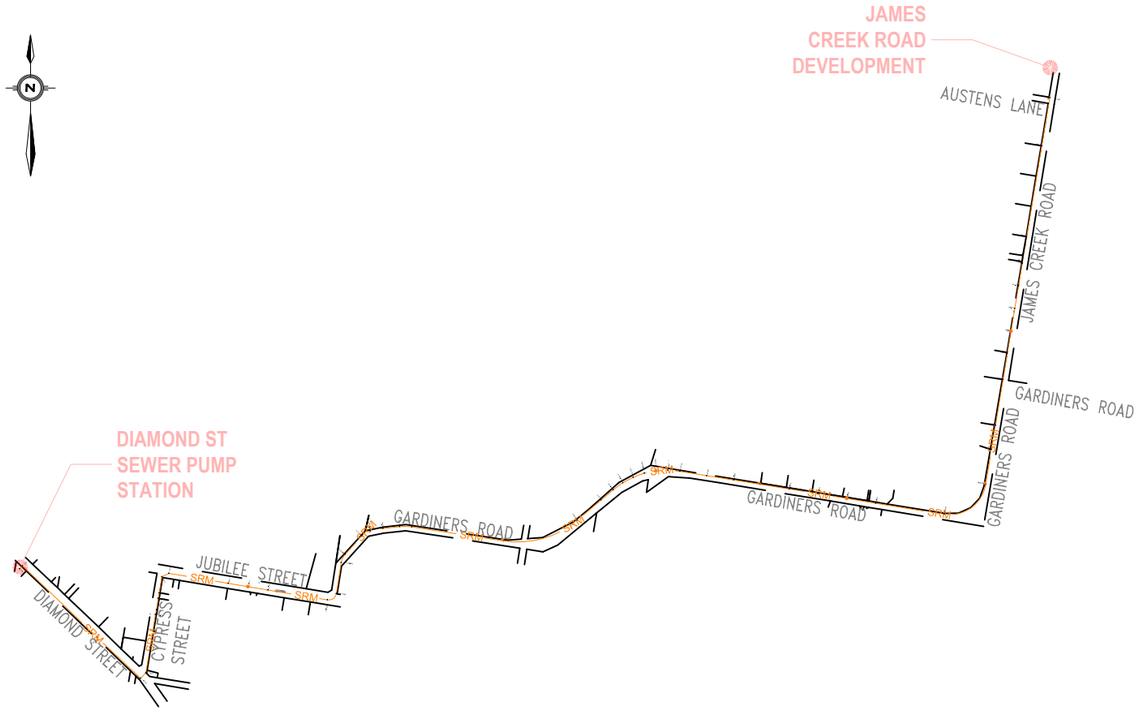
Preliminary Rising Main Design

EXTERNAL SEWER RISING MAIN FROM JAMES CRK ROAD DEVELOPMENT TO DIAMOND STREET SEWER PUMP STATION

CONSULTANT: WILLOW & SPARROW PTY LTD
CONTACT: MICHAEL CHAMBERLAIN
TELEPHONE: 0401415220

DRAWING INDEX	
DWG. No.	DESCRIPTION
C000	COVER SHEET & SEWER LOCALITY PLAN
C001	GENERAL NOTES - SHEET 1 OF 2
C002	GENERAL NOTES - SHEET 2 OF 2
C003	SEWER RISING MAIN OVERALL LAYOUT PLAN - SHEET 1 OF 2
C004	SEWER RISING MAIN OVERALL LAYOUT PLAN - SHEET 2 OF 2
C005	SEWER LONGITUDINAL SECTIONS SHEET 1 OF 10
C006	SEWER LONGITUDINAL SECTIONS SHEET 2 OF 10
C007	SEWER LONGITUDINAL SECTIONS SHEET 3 OF 10
C008	SEWER LONGITUDINAL SECTIONS SHEET 4 OF 10
C009	SEWER LONGITUDINAL SECTIONS SHEET 5 OF 10
C010	SEWER LONGITUDINAL SECTIONS SHEET 6 OF 10
C011	SEWER LONGITUDINAL SECTIONS SHEET 7 OF 10
C012	SEWER LONGITUDINAL SECTIONS SHEET 8 OF 10
C013	SEWER LONGITUDINAL SECTIONS SHEET 9 OF 10
C014	SEWER LONGITUDINAL SECTIONS SHEET 10 OF 10
C020	SEWER RISING MAIN DETAILS - SHEET 1 OF 2
C021	SEWER RISING MAIN DETAILS - SHEET 2 OF 2

SEWER SPECIFICATIONS & STANDARD DRAWING LIST	
DWG. No.	DESCRIPTION
	SPECIFICATIONS
	PRESSURE SEWAGE CODE OF AUSTRALIA (WSA 07-2007-1.1)
	THE CLARENCE VALLEY COUNCIL D12 SEWERAGE SYSTEM SPECIFICATION AND DEVELOPMENT CONSTRUCTION SPECIFICATION (SEWER SUPPLY-C402)
	NSW CODE OF PRACTICE FOR PLUMBING AND DRAINAGE AND AS/NZ3500
	PRESSURE SEWERAGE CODE OF AUSTRALIA STANDARD DRAWINGS
PSS-1000	EMBEDMENT & TRENCH FILL TYPICAL ARRANGEMENT
PSS-1006	TYPICAL ARRANGEMENTS VALVE AND VENT SHAFT DETAILS
PSS-1007	TYPICAL APPURTENANCE DETAILS - FLUSHING POINT
PSS-1005	TYPICAL VALVE INSTALLATION SHROULD PIPE AND FITTINGS ASSEMBLY
	WATER SUPPLY CODE OF AUSTRALIA STANDARD DRAWINGS
WAT1205	THRUST BLOCK DETAILS CONCRETE BLOCKS
WAT-1207-V	THRUST AND ANCHOR BLOCK GATE VALVES AND VERTICAL BENDS
WAT-1307	TYPICAL APPURTENANCE INSTALLATION SCOUR ARRANGEMENTS



LOCALITY PLAN
SCALE 1:10000

CAUTION

EXISTING SERVICES ALLOCATED IN FOOTPATH RESERVE ARE SUBJECT TO VARIABLE PLACEMENT.
THE CONTRACTOR IS REQUIRED TO ACQUIRE LATEST SEARCH INFORMATION AND FIELD CHECK AT TIME OF WORKS.

DIAL BEFORE YOU DIG

DIAL BEFORE YOU DIG www.1100.com.au

IMPORTANT: THE CONTRACTOR IS TO MAINTAIN A CURRENT SET OF "DIAL BEFORE YOU DIG" DRAWINGS ON SITE AT ALL TIMES.

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Scale: SCALE 100 0 100 200 300 400 500 1:10,000
Certifier

Issue: ISSUE FOR APPROVAL

Designed	Drawn
GC	GC
Checked	Date
MC	01/04/22

Issue	Description	Date	By
A	ISSUE FOR APPROVAL	01/04/22	

CLIENT
MPD INVESTMENTS PTY LTD

PROJECT
JAMES CREEK ROAD SUBDIVISION
PROPOSED SEWER RISING MAIN
JAMES CRK RD TO DIAMOND ST PUMP STATION

TITLE
COVER SHEET
AND SEWER LOCALITY PLAN

Job No.	Drawing No.	Rev No.
2022041-CC	C000	A

GENERAL

G1. ALL DRAWINGS UNDER THIS PACKAGE SHALL BE READ IN CONJUNCTION WITH THE PROJECT SPECIFICATION.

G2. ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE AND COMPLIANCE WITH THE:

- A. RELEVANT AND CURRENT STANDARDS OF AUSTRALIA.
- B. PROVISIONS OF THE BUILDING ACT 1975.
- C. WATER SERVICES ASSOCIATION OF AUSTRALIA (WSA) WATER SUPPLY AND SEWERAGE DESIGN AND CONSTRUCTION CODES.
- D. NSW ELECTRICITY ACT, REGULATIONS AND GUIDELINES

G3. ANY DISCREPANCY SHALL BE REFERRED TO THE SUPERINTENDENT BEFORE PROCEEDING WITH THE WORKS.

G4. UNLESS NOTED OTHERWISE (UNO):

- A. ALL DIMENSIONS ARE IN MILLIMETERS.
- B. ALL CHAINAGES ARE IN METERS.
- C. ALL LEVELS ARE IN METERS TO AUSTRALIAN HEIGHT DATUM (AHD).

G5. ALL DIMENSIONS SHOWN ON THE DRAWINGS ARE NOMINAL ONLY. THE CONTRACTOR SHALL VERIFY THE DIMENSIONS ON SITE PRIOR TO FABRICATION OR CONSTRUCTION. DRAWINGS SHALL NOT BE SCALED FOR DIMENSIONS..

G6. THE CONTRACTOR SHALL CARRY OUT CLEARING AND GRUBBING OF REQUIRED AREAS AS SPECIFIED. THIS SHALL INCLUDE THE REMOVAL OF EXISTING VEGETATION EXCEPT FLORA NOMINATED FOR PRESERVATION.

G7. NO SUBSTITUTE MATERIALS SHALL BE USED WITHOUT THE WRITTEN APPROVAL OF THE SUPERINTENDENT.

G8. THE CONTRACTOR SHALL PROVIDE ADEQUATE TEMPORARY PROTECTION AND SITE FENCING TO PREVENT ENTRY OF ANY UNAUTHORISED PERSONS AND ANIMALS DURING CONSTRUCTION.

G9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING PIPES AND PITS AGAINST FLOTATION DURING CONSTRUCTION.

G10. FOR DETAILS REGARDING WORKING IN PRIVATE PROPERTY REFER PROJECT SPECIFICATION.

G11. THE PROPOSED WORKS AND MATERIALS SHALL BE IN ACCORDANCE WITH THE PRESSURE SEWAGE CODE OF AUSTRALIA (WSA 07-2007-1.1) & CLARENCE VALLEY COUNCIL GUIDELINES. THE CONTRACTOR MUST HAVE A COPY OF THESE DOCUMENTS ON SITE AT ALL TIMES.

G12. EXISTING WATER AND SEWER SERVICES SHOWN ARE INDICATIVE ONLY AND OBTAINED FROM 'YAMBA STRATEGY REPORT'.

G13. EMBEDMENT & TRENCH FILL TYPICAL ARRANGEMENT AR PER PSS-1000 & WAT-1200.

SURVEY, SETOUT AND SERVICES

SS1. COORDINATE NOTES:

ORIGIN OF HORIZONTAL AND VERTICAL DATUM:
PM 66736
EASTING: 554 815.927
NORTHING: 6 874 732.248
RL: 1.928 (AHD)
MGA (MAP GRID OF AUSTRALIA 1994 - ZONE 56)
THIS PLAN IS ON GROUND COORDINATES ORIENTATED TO MGA AZIMUTH. TO CONVERT TO MGA GRID COORDINATES APPLY THE SCALE FACTOR OF 0.999630 BASED ON PM66736.

SS2. LOT AREAS AND BOUNDARY DIMENSIONS HAVE BEEN COMPILED FROM DEPOSITED PLANS AVAILABLE AT LAND REGISTRY SERVICE NSW. NO BOUNDARY SURVEY OR INVESTIGATION HAS BEEN MADE AND NO BOUNDARIES HAVE BEEN MARKED. BOUNDARIES SHOWN HEREON ARE PROVISIONAL AND SUBJECT TO FURTHER SURVEY. POSITION OF IMPROVEMENTS RELATIVE TO BOUNDARIES SHOWN HEREON IS DIAGRAMMATIC ONLY.

SS3. EXISTING SURVEY CONTROL STATIONS - THE CONTRACTOR SHALL ENSURE THAT SURVEY CONTROL STATIONS ARE NOT DAMAGED OR DISTURBED IN ANY WAY BY CONSTRUCTION ACTIVITIES.

SS4. FOR SETOUT:

- A. ALL SETOUT POINTS RELATE TO THE CENTRELINE OF THE PIPELINE, UNO.
- B. ALL SETOUT POINTS AT BENDS REFER TO THE INTERSECTION POINT (IP), UNO.

SS5. EXISTING SERVICES:

- A. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING THE EXISTING SERVICES. VERIFICATION OF THE LOCATION OF THESE SERVICES MUST BE OBTAINED PRIOR TO ANY EXCAVATION COMMENCING .
- B. ONLY UNDERGROUND SERVICES IN THE IMMEDIATE VICINITY OF THIS SURVEY HAVE BEEN LOCATED. INFORMATION OF THE EXISTING SERVICES ARE SHOWN IN THE DRAWINGS IN GOOD FAITH. NO GUARANTEE IS GIVEN OR IMPLIED THAT SUCH INFORMATION IS ACCURATE OR COMPLETE. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO LOCATE THE POSITION OF THE EXISTING SERVICES BEFORE COMMENCING CONSTRUCTION. THE CONTRACTOR IS REQUIRED TO EXERCISE CARE WHEN IN CLOSE PROXIMITY OF SERVICES AND EXCAVATION IN GENERAL. CAREFUL HAND EXCAVATION IS RECOMMENDED WHEN WITHIN CLOSE PROXIMITY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO THE EXISTING SERVICES DURING THE COURSE OF THE CONTRACT.
- C. IN THE EVENT OF SERVICES DEVIATING FROM LOCATIONS SHOWN OR PRESENT BUT NOT SHOWN ON THE DRAWINGS, THE CONTRACTOR SHALL GIVE 3 DAYS NOTICE PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION ACTIVITY THAT MAY AFFECT THE SERVICE.
- D. CONTRACTOR TO OBTAIN PRIOR APPROVAL FROM THE SUPERINTENDENT FOR ANY DEVIATIONS REQUIRED TO AVOID EXISTING SERVICES.

EXCAVATION AND BACKFILLING

EB1. ALL EXCAVATION, BACKFILLING AND COMPACTION SHALL BE CARRIED OUT IN ACCORDANCE WITH AS 3798.

EB2. PRIOR TO COMMENCEMENT OF SITE CLEARANCE AND EXCAVATION, THE CONTRACTOR SHALL MAKE ALL ENQUIRIES AND INVESTIGATIONS TO PROTECT FROM DAMAGE ALL PUBLIC AND PRIVATE PROPERTIES & SERVICES.

EB3. CLEARING AND DISTURBING OF VEGETATION SHALL BE KEPT TO A MINIMUM AND SHALL BE LIMITED TO AREAS CONTAINING THE EXCAVATIONS FOR THE CONSTRUCTION OF THE REQUIRED WORKS.

EB4. ENSURE MINIMAL DISTURBANCE AND APPROPRIATE MANAGEMENT TO ACID SOILS, ACID SULFATE SOILS, CONTAMINATED LAND, AND HIGHLY ERODIBLE AND DISPERSIBLE SOILS.THE CONTRACTOR SHALL UNDERTAKE ALL NECESSARY SOIL TREATMENT IN ACCORDANCE WITH THE CONTRACTOR'S APPROVED ACID SULFATE SOILS MANAGEMENT PLAN.

EB5. ALL TOPSOIL STRIPPED FROM WORK AREAS SHALL BE STOCKPILED FOR LATER RE-SPREADING. RE-SPREAD SHALL BE TO A MINIMUM DEPTH OF 100mm TO A MAXIMUM 300mm

EB6. COMPACTION OF TRENCH BACKFILL MATERIAL IN NON-ROAD PAVEMENT AREAS IS TO BE UNDERTAKEN IN ACCORDANCE WITH THE REQUIREMENTS OF AS3798.

EB7. ALL EXCAVATION OF TRENCHES SHALL BE:

- A. THE MINIMUM NECESSARY TO INSTALL THE PIPELINE AND ASSOCIATED STRUCTURES.
- B. MADE SECURE AGAINST MOVEMENT BY MEANS OF STABLE BATTERS, SHEET PILING OR ANY OTHER SUITABLE SYSTEM.
- C. COMPLETELY DRAINED AT ALL TIMES BY TEMPORARY DRAINS OR PUMPING WHEN NECESSARY.
- D. THE BOTTOM OF THE EXCAVATION FOR A TRENCH OR A FOUNDATION PIT SHALL BE FREE FROM LOOSE EXCAVATED MATERIAL AND SHALL SATISFY THE ALLOWABLE BEARING PRESSURE OF 50kPa.

EB8. PIPELINES SHALL NOT BE LAID ON 'UNCONTROLLED' FILL MATERIAL OR LOOSE / SOFT ALLUVIAL SOILS. UNDER SUCH SOIL CONDITIONS, SOIL BELOW THE PIPE INVERT LEVEL MUST BE REMOVED AND REPLACED WITH 'CONTROLLED' FILL MATERIAL.CERTIFICATES SHALL BE LODGED WITH THE CONTRACT MANAGER CERTIFYING THE FILL IS 'CONTROLLED' FILL COMPACTED TO 95% DDR TO AS 1289.5.1.1.

EB9. BACKFILLING SHALL BE CARRIED OUT USING THE MATERIALS SPECIFIED IN THE DRAWINGS AND PROJECT SPECIFICATION. UNO BACKFILL SHALL BE COMPACTED IN 150mm THICK FINISHED LAYERS, CONDITIONED AND COMPACTED IN ACCORDANCE WITH THE PROJECT SPECIFICATION.

EB10. ALL FILL MATERIAL PLACED SHALL BE COMPACTED AND TRIMMED TO MATCH WITH THE FINAL EARTHWORKS LEVELS AND PROFILES SHOWN ON THE DRAWINGS AND TESTED IN ACCORDANCE WITH THE PROJECT SPECIFICATION.

EB11. THE GROUND SURFACE EXPOSED AFTER TRIMMING SHALL BE COMPACTED IN ACCORDANCE WITH AS 3798.

EB12. ROADWAY RESTORATION:

- A. PAVEMENT AND DRAINAGE WORKS WITHIN ROAD CORRIDORS ARE TO BE CONSTRUCTED IN ACCORDANCE WITH CLARENCE VALLEY COUNCIL STANDARD DRAWINGS AND SPECIFICATIONS AND TO THE SATISFACTION OF COUNCIL OFFICERS.
- B. THICKNESS OF RE-INSTATED ROAD PAVEMENT LAYERS TO MATCH THE EXISTING.
- C. SUB-GRADE AND ROAD PAVEMENTS ARE TO BE COMPACTED TO 98% DDR TO AS 1289.5.2.1.

EB 13. ALL DISTURBED GRASSED AREAS SHALL BE REINSTATED WITH TURF. WATERING AND MAINTENANCE OF THE TURF TO ACHIEVE ESTABLISHMENT IS THE CONTRACTORS RESPONSIBILITY.

EB14. ALL VALVE PIT LIDS (WITH THE EXCEPTION OF THE PUMP WELL) SHALL BE CONSTRUCTED TO ENSURE THE ARE LEVEL WITH THE ADJOINING GROUND SURFACE.

PIPEWORKS

P1. FOR PIPES OTHER THAN POLYETHYLENE:
A. PROVIDE SUFFICIENT TRENCH DEPTH AND WIDTH TO ALLOW FOR DEFLECTION OF PIPES AT JOINTS.

- B. CHANGES IN HORIZONTAL AND VERTICAL ALIGNMENT, OTHER THAN BY MANUFACTURED BENDS, SHALL BE ACHIEVED BY DEFLECTING THE PIPES AT JOINTS. MAXIMUM DEFLECTIONS SHALL BE AS PER MANUFACTURER'S RECOMMENDATIONS.

P2. WHERE CONNECTING TO ANY EXISTING PIPEWORK, THE LEVEL AND THE SIZE OF THE EXISTING PIPEWORK SHALL BE CONFIRMED BY THE CONTRACTOR PRIOR TO CONNECTION.

P3. IF CUTTING OF PIPES IS NECESSARY ON SITE REFER TO MANUFACTURERS REQUIREMENTS.

P4. MINIMUM CLEARANCE TO EXISTING SERVICES SHALL BE IN ACCORDANCE WITH WSA03-2011 CODE UNO.

P5. MINIMUM COVER TO ALL PIPELINES UNDER EXISTING OR FUTURE ROAD FORMATION IN RMS AND CONTROLLED ROAD RESERVES SHALL BE BASED ON RMS SPECIFICATIONS AND DRAWINGS.

P6. ALL PIPES SHALL HAVE MARKER TAPE TO AS 2648.1 COLOURED AS FOLLOWS:

- A. WATER MAIN - GREEN;
- B. SEA WATER - TBC;

THE MARKER TAPES SHALL BE PLACED ON TOP OF THE PIPE EMBEDMENT AND CONTAIN A CONTINUOUS METALLIC STRIP.

P7. FOR ALL POLYETHYLENE PIPEWORK:

- A. PIPE TO BE MANUFACTURED IN ACCORDANCE WITH AS 4130.
- B. POLYETHYLENE FITTINGS TO BE MANUFACTURED IN ACCORDANCE WITH AS 4129.
- C. PIPE TO BE INSTALLED IN ACCORDANCE WITH AS 2033 AND WSA01-2004 CODE.
- D. POLYETHYLENE PIPE MAY BE CURVED ON SITE TO A MINIMUM RADIUS OF 25 TIMES THE PIPE OUTSIDE DIAMETER (UNO) PROVIDED THE AMBIENT TEMPERATURE IS ABOVE 15°C. PIPES MUST NOT BE BENT AROUND STAKES. SAND BAGS MAY BE USED TO BEND THE PIPES.
- E. THE SEWER RISING MAIN SHALL BE SOLID CREAM OR SHEATHED CREAM IN COLOUR.
- F. FOR WELDING OF POLYETHYLENE PIPEWORK:
  2. PE WELDING MUST BE CARRIED OUT ONLY BY CERTIFIED PERSONS:
     a. IN ACCORDANCE WITH PARTEC REQUIREMENTS.
     b. WHO HAS SUCCESSFULLY CARRIED OUT PREVIOUS PRESSURE PIPELINE WELDING PROJECTS.
  2. FUSION BUTT-WELDED JOINTS SHALL BE MADE IN ACCORDANCE WITH WSA01-2004, AS 2033, AS 2566.2 AND THE PIPE MANUFACTURER'S REQUIREMENTS AND RECOMMENDATIONS.
  3. JOINTS SHALL ONLY BE MADE BETWEEN PIPE MATERIALS OF THE SAME GRADE AS DEFINED IN AS4130. PILOT WELDS SHALL BE MADE AND TESTED FOR ANY PROPOSED JOINTS BETWEEN PIPES FROM DIFFERENT MANUFACTURERS.
  4. FUSION BUTT-WELDED JOINTS SHALL ACHIEVE AT LEAST 90% OF THE TENSILE STRENGTH OF THE PARENT PIPE. INTERNAL WELD BEADS SHALL BE REMOVED.
  5. ALL WELDING SHALL BE PERFORMED UNDER CONTROLLED ENVIRONMENTAL CONDITIONS. FIELD WELDING SHALL BE CARRIED OUT IN SHELTERS TO PREVENT DUST AND WATER CONTAMINATION. THE SHELTERS SHALL REMAIN IN PLACE UNTIL COMPLETION OF THE JOINT COOLING PERIOD. PIPE ENDS SHALL BE BLOCKED OFF TO PREVENT WIND CHILL AND DIRT CONTAMINATION.
  6. WELDING MACHINES USING HAND WOUND CARRIAGES WITHOUT PRESSURE GAUGES SHALL NOT BE USED. AT ALL TIMES DURING WELDING, THE WELDER SHALL HAVE A HAND-HELD TEMPERATURE SENSING DEVICE CAPABLE OF CHECKING THE TEMPERATURE OF THE HEATER PLATE AT THE CIRCUMFERENCE OF THE WELD.
  7. PILOT WELDING TRIALS SHALL BE COMPLETED AND APPROVED BY THE SUPERINTENDENT BEFORE THE FIELD WELDING IS CARRIED OUT.
  8. THE PILOT WELDS SHALL BE SUBJECTED TO TENSILE STRENGTH TESTING, TENSILE FRACTURE TESTING AND FLEXURAL BEAM TESTING, BY A THIRD PARTY APPROVED BY THE SUPERINTENDENT.
  9. ACCEPTANCE CRITERIA FOR THE PILOT WELDS SHALL INCLUDE:
     a. AT LEAST 90% TENSILE STRENGTH OF THE PARENT PIPE SECTION;
     b. TENSILE FRACTURES ONLY IN DUCTILE MANNER WITH NO EVIDENCE OF CONTAMINATION OR DISLOCATIONS ON THE WELD FRACTURE SURFACE;
     c. NO FRACTURE OF THE WELD IN FLEXURAL BEAM TESTING.

P8. FOR ALL DI PIPE WORK:

- A. ALL DICL PIPES & FITTINGS MUST BE IN ACCORDANCE WITH AS 2280.
- B. PIPES IN PITS AND WELLS SHALL BE FUSION BONDED EPOXY COATED TO AS 4158.
- C. BURIED PIPES TO BE BITUMEN COATED AND COVERED WITH POLYETHYLENE SLEEVING AS PER THE MANUFACTURER'S RECOMMENDATION.

P9. FOR ALL MILD STEEL PIPEWORK:

- A. PIPES & FITTINGS SHALL COMPLY WITH AS 1579
- B. ALL FITTINGS (COMPOSITE BENDS, BRANCHES ETC.,) SHALL BE BUTT WELDED FROM OUTSIDE USING ROOT FILL AND HOT-PASS METHOD IN ACCORDANCE WITH AS 1554. PIPE ENDS MUST BE BEVELLED TO ACHIEVE A SOUND WELD.

P10. FOR ALL FLANGES:

- A. ALL FLANGES MUST BE IN ACCORDANCE WITH AS 4087 UNO. ALL VALVES AND FITTINGS SHALL BE DRILLED TO AS 2129 TABLE D OR AS4087 PN16 UNO.
- B. ALL BOLTS, NUTS AND WASHERS MUST BE 316 STAINLESS STEEL (GRADE B8M) UNO. BOLTS ARE TO BE ASSEMBLED WITH ANTI-GALLING COMPOUND "DURALAC" OR WITH AN APPROVED EQUIVALENT. ALL BURIED FLANGES ARE TO BE WRAPPED WITH "DENSO" PETROLATUM TAPE TO MANUFACTURER'S REQUIREMENTS.
- C. PRIME, CAULK AND WRAP ALL BURIED FLANGES AND BOLTS WITH DENSO PETROLATUM PRODUCTS OR APPROVED EQUIVALENT AS PER THE MANUFACTURER'S RECOMMENDATIONS.

P11. EXTERNAL COATINGS ARE NOT TO BE REMOVED WHEN THE PIPE FITTINGS ARE SURROUNDED OR COVERED IN CONCRETE.

THRUST BLOCKS AND ANCHOR BLOCKS

TB1. THRUST RESTRAINTS SHALL BE PROVIDED FOR RUBBER RING JOINTED MSCL AND DICL PIPEWORK AT ALL TEES, BENDS, TAPERS AND CHANGES IN DIRECTION.

TB2. THE BEARING FACE OF THE THRUST BLOCKS MUST BE CAST AGAINST UNDISTURBED GROUND.

TB3. CONCRETE FOR THRUST BLOCKS SHALL BE N32 FOR REINFORCED AND N25 FOR UNREINFORCED UNO.

TB4. CONCRETE MUST NOT SPILL OVER SOCKET JOINTS.

TB5. VERTICAL THRUST BLOCKS MUST BE EMBEDDED INTO UNDISTURBED GROUND.

TB6. CONCRETE MUST BE CURED FOR 72HRS (MIN) PRIOR TO PRESSURE TESTING.

TB7. ALL DI PUDDLE/ THRUST FLANGES SHALL BE FACTORY FITTED ONTO PIPE. A MACHINE GROOVE SHALL BE CUT INTO THE OUTSIDE SURFACE OF THE PIPE AND THE PUDDLE FLANGE MACHINED ACCORDINGLY, TO PROVIDE A NOMINAL INTERFERENCE IN ACCORDANCE WITH AS 2280.

TB8. THRUST BLOCK IN ACCORDANCE WITH SEQ WS&S D&C STD DRG SEQ-WAT-1205-1.

TESTING

T1. ALL TESTING SHALL BE CARRIED OUT BY A THIRD PARTY N.A.T.A APPROVED TESTER IN ACCORDANCE WITH THE PROJECT SPECIFICATION.

T2. THE TEST PROCEDURE FOR RISING MAINS SHALL BE IN ACCORDANCE WITH CLAUSE 36.5 OF WSA04-2005. THE HYDROSTATIC TEST PRESSURE FOR THE PROPOSED RISING MAIN SHALL BE MINIMUM 900kPa.

T3. THE FREQUENCY OF COMPACTION TESTING SHALL BE IN ACCORDANCE WITH CLAUSE 36.3.4.4 OF WSA 04-2005. FOR EACH TRENCHED ROAD CROSSING, A COMPACTION TEST IN EACH 150mm LAYER OF FILL IS REQUIRED.

T4. AUDIT AND FINAL INSPECTIONS OF THE WORKS CONSTRUCTED BY THE CONTRACTOR MUST BE ARRANGED TWO DAYS BEFORE-HAND WITH THE SUPERINTENDENT.

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Scale	
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Issue	Description	Date	By
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CLIENT
MPD INVESTMENTS PTY LTD

PROJECT
JAMES CREEK ROAD SUBDIVISION
PROPOSED SEWER RISING MAIN
JAMES CRK RD TO DIAMOND ST PUMP STATION

TITLE
GENERAL NOTES
SHEET 1 OF 2

Job No.	Drawing No.	Rev No.
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CONCRETE

C1. ALL CONCRETE WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS 3600 AND THE CONCRETE SPECIFICATION.

C2. EXPOSURE CLASSIFICATION OF CONCRETE SHALL BE

C2.1 MEMBERS IN CONTACT WITH GROUND (NON AGGRESSIVE SOIL)- 'B1' (AS 5100.5 - 2004)

C2.2 SURFACES IN SEA WATER ENVIRONMENT - 'C' (AS 3735 - 2001)

C3. CONCRETE SHALL BE FROM AN APPROVED SOURCE AND SHALL COMPLY WITH THE REQUIREMENTS OF THE FOLLOWING STANDARDS UNO

C.3.1 AS 3600 - CONCRETE STRUCTURES
C3.2 AS3737 - CONCRETE STRUCTURES RETAINING LIQUID
C3.3 AS4671 - STEEL REINFORCING BARS FOR CONCRETE
C3.4 AS3972 - PORTLAND AND BLENDED CEMENTS
C3.5 AS1379 - SPECIFICATION AND SUPPLY OF CONCRETE
C3.6 AS2758.1 - CONCRETE AGGREGATES
C3.7 AS1141 - METHODS FOR SAMPLING AND TESTING AGGREGATES
C3.8 AS1478 - CHEMICAL ADMIXTURES FOR CONCRETE
C3.9 AS1012 - METHODS FOR TESTING CONCRETE
C3.10 AS3582 - SUPPLEMENTARY CEMENTITIOUS MATERIALS FOR USE WITH PORTLAND CEMENT

C4. CONCRETE GRADE FOR SPECIFIC STRUCTURES UNO SHALL BE AS FOLLOWS

C4.1	BLINDING CONCRETE	N20/20
C4.2	PUMP WELL	N40/20
C4.3	PITS CHAMBERS	N40/20
C4.5	THRUST BLOCKS	N32/20

C5. THE MAXIMUM SIZE OF AGGREGATE IN THE CONCRETE SHALL BE 20mm

C6. CONCRETE MIX DESIGN INCLUDING PROPORTIONS OF ADDITIVES AND CEMENTITIOUS REPLACEMENT MATERIALS, SHALL BE SUBMITTED TO THE SUPERINTENDENT FOR APPROVAL PRIOR TO PLACEMENT. CALCIUM CHLORIDE SHALL NOT BE USED IN ANY MIX.

C7. A MIX DESIGN USING A HIGHER SLUMP AND SMALLER AGGREGATE SIZE SHALL BE CONSIDERED BY THE SUPERINTENDENT WHERE CONCRETING IS DONE BY PUMPING.

C8. MINIMUM CLEAR CONCRETE COVER TO ALL REINFORCEMENT SHALL BE AS FOLLOWS, UNLESS NOTED OTHERWISE ON THE DRAWINGS:

C8.1	CAST AGAINST FORM, TOP OF MEMBER, INTERNAL FACES	- 40mm
C8.2	CAST AGAINST GROUND IF THE SURFACE OF THE CONCRETE IS PROTECTED BY A DAMP-PROOF MEMBRANE	- 40mm
C8.3	CAST AGAINST GROUND	- 50mm
C8.4	CONCRETE IN CONTACT WITH SEA WATER (EXPOSURE CLASSIFICATION 'C')	- 70mm
C8.5	UNLESS NOTED OTHERWISE	- 50mm

C9. SIZES OF CONCRETE ELEMENTS SHOWN ON THE DRAWINGS DO NOT INCLUDE THICKNESS OF APPLIED FINISHES.

C10. THE FINISHED CONCRETE SHALL BE A DENSE HOMOGENEOUS MASS, COMPLETELY FILLING THE FORMWORK, THOROUGHLY EMBEDDING THE REINFORCEMENT AND FREE OF ANY STONE POCKETS OR VOIDS. CONCRETE SHALL BE VIBRATED BY MECHANICAL VIBRATORS DURING PLACEMENT.

C11. ALL FORMED EXPOSED EDGES HAVING A CONTAINED ANGLE OF LESS THAN 120° AND RE-ENTRANT CORNERS SHALL BE CHAMFERED OR FILLETED 25mm UNO.

C12. NO PENETRATIONS, CHASES OR TEMPORARY FIXTURES OTHER THAN THOSE SHOWN ON THE DRAWINGS ARE PERMITTED IN THE CONCRETE MEMBERS WITHOUT PRIOR APPROVAL OF THE SUPERINTENDENT.

C13. REINFORCEMENT AT PENETRATIONS SHALL BE TREATED THUS:

C13.1 FOR PENETRATIONS WITH DIMENSIONS SMALLER THAN 150mm, DO NOT CUT REINFORCEMENT. INSTEAD, DISPLACE REINFORCEMENT TO EACH SIDE OF PENETRATION UNO.

C13.2 FOR PENETRATIONS WITH DIMENSIONS LARGER THAN 150mm, PLACE REINFORCEMENT IN REQUIRED POSITIONS AND CUT TO SUIT PENETRATION. PROVIDE ADDITIONAL BARS TO MATCH THE SIZE, LENGTH AND NUMBER OF BARS CUT, AND PLACE EQUALLY ON ALL SIDES OF THE PENETRATION UNO. ADDITIONAL CIRCULAR TRIMMER BAR SHALL ALSO BE PROVIDED IN EACH FACE.

C14. CONSTRUCTION JOINTS SHALL BE PROPERLY FORMED AND USED ONLY WHERE SHOWN ON THE DRAWINGS OR SPECIFICALLY APPROVED BY THE SUPERINTENDENT. FURTHER CONCRETE SURFACES AGAINST WHICH NEW CONCRETE IS TO BE PLACED SHALL BE CLEAN, FREE OF ALL LAITANCE, AND BE DAMPENED DOWN PRIOR TO COMMENCEMENT OF POURING NEW CONCRETE.

C15. ALL CONCRETE INTERFACES ARE TO BE ROUGHENED TO ENSURE SATISFACTORY BOND BETWEEN INSITU CONCRETE AND PRECAST CONCRETE OR BETWEEN DIFFERENT POURS OF INSITU CONCRETE UNO. ALL CONCRETE SURFACES TO BE FREE OF LAITANCE.

C16. ALL PROPRIETARY FIXINGS TO CONCRETE MEMBERS (CHEMICAL ANCHORS ETC) SHALL BE INSTALLED STRICTLY IN ACCORDANCE WITH THE FIXING MANUFACTURER'S RECOMMENDATIONS.

C17. CHEMICAL ANCHORS FOR FIXINGS TO CONCRETE SHALL BE AS SHOWN ON THE DRAWINGS.

C18. INITIAL CURING OF CONCRETE SHALL COMMENCE NO LATER THAN 2 HOURS AFTER FINISHING OPERATIONS HAVE BEEN COMPLETED. THE CONCRETE SHALL BE KEPT CONTINUOUSLY MOIST AT LEAST OVERNIGHT BY :

C19.1 PONDING OR CONTINUOUS SPRINKLING WITH WATER

C19.2 USE OF AN ABSORPTIVE COVER KEPT CONTINUOUSLY WET

C19.3 COATING WITH AN APPROVED SPRAYED MEMBRANE CURING COMPOUND.

C19. FINAL CURING SHALL IMMEDIATELY FOLLOW INITIAL CURING AND SHALL BE CONTINUED FOR 7 DAYS. ONE OF THE FOLLOWING CURING METHODS SHALL BE ADOPTED FOR FINAL CURING :

C20.1 PONDING OR CONTINUOUS SPRINKLING WITH WATER

C20.2 USE OF AN APPROVED MOISTURE RETAINING COVERING SUCH AS HEAVY GAUGE CLEAR POLYTHENE SHEETING OR BUILDING PAPER FIRMLY HELD AGAINST THE CONCRETE SURFACES TO PREVENT AIR CIRCULATION AT THE CONCRETE SURFACES. SUCH COVERS SHALL BE MAINTAINED UNDAMAGED DURING THE CURING PERIOD.

C20.3 COATING WITH AN APPROVED SPRAYED MEMBRANE CURING COMPOUND.

C20. PLACE A 50mm MINIMUM THICKNESS CONCRETE BLINDING LAYER UNDER ALL CONCRETE CAST AGAINST THE GROUND.

C21. COMPLIANCE TESTING AND SAMPLING OF CONCRETE SHALL BE IN ACCORDANCE WITH AS 3600, AS 1379, AS 1012, AND OTHER RELEVANT SPECIFICATIONS.

REINFORCING

R1. REINFORCEMENT SHOWN ON THE DRAWINGS IS REPRESENTED DIAGRAMMATICALLY AND NOT NECESSARILY SHOWN IN TRUE PROJECTION.

R2. REINFORCING STEEL SHALL BE GRADE D500N TO AS/NZS 4671 (HOT ROLLED DEFORMED BAR) OR GRADE R250N TO AS/NZS 4671 (HOT ROLLED PLAIN ROUND BAR). REINFORCEMENT MESH SHALL BE CLASS L TO AS 4671 (500MPa GRADE) UNO.

R3. REINFORCEMENT ABBREVIATIONS INDICATE THE FOLLOWING:-

R3.1	EF	————	EACH FACE
R3.2	NF	————	NEAR FACE
R3.3	FF	————	FAR FACE
R3.4	EW	————	EACH WAY
R3.5	T or TOP	————	TOP
R3.6	B or BTM	————	BOTTOM

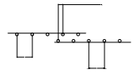
R4. REBENDING OF REINFORCEMENT BY MECHANICAL OR ANY OTHER MEANS IS NOT PERMITTED WITHOUT THE APPROVAL OF THE SUPERINTENDENT.

R5. REINFORCEMENT SHALL BE LAPPED ONLY IN THE LOCATIONS SHOWN ON THE DRAWINGS OR AS OTHERWISE APPROVED BY THE SUPERINTENDENT. WHERE THE LAP LENGTH IS NOT SHOWN IT SHALL BE SUFFICIENT TO DEVELOP THE FULL STRENGTH OF THE REINFORCEMENT. BAR LAP LENGTHS SHALL BE AS SHOWN BELOW UNO

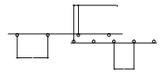
BAR DIAMETER (mm)	HORIZONTAL BARS WITH MORE THAN 300mm OF CONCRETE CAST BELOW THE BAR (mm)		ALL OTHER BARS (mm)	
	f'_c = 32MPa	f'_c = 40MPa	f'_c = 32MPa	f'_c = 40MPa
10	500	450	375	350
12	600	525	450	400
16	800	725	625	550
20	1050	925	800	725
24	1300	1150	1000	900
28	1550	1400	1200	1075
32	1850	1650	1425	1275

R6. FABRIC REINFORCEMENT LAPS

R6.1 FOR S1 = S2 :



R6.2 FOR S1 < S2 :



R7. MECHANICAL SPLICES SHALL ONLY BE USED WHERE APPROVED BY THE SUPERINTENDENT.

R8. REINFORCEMENT SHALL NOT BE WELDED UNLESS SHOWN ON THE DRAWINGS OR APPROVED BY THE SUPERINTENDENT; ALSO REINFORCEMENT SHALL HAVE THE REQUIRED COVER TO THE PIPE WORK, CONDUITS, ETC.

R9. ALL REINFORCEMENT SHALL BE SECURELY SUPPORTED ON PLASTIC OR CONCRETE BAR CHAIRS AT NOT GREATER THAN ONE METRE CENTRES EACH WAY. ALL REINFORCEMENT SHALL BE SECURELY TIED WITH GALVANISED WIRE TIES. TIE ENDS SHALL NOT EXTEND INTO THE COVER ZONE.

R10. LAPS IN MESH SHALL BE THE SPACING OF TRANSVERSE WIRES PLUS 50mm UNO.

R11. REINFORCING MESH SHALL NOT BE PULLED INTO POSITION THROUGH THE WET CONCRETE.

STEELWORK

S1. ALL STEELWORK SHALL COMPLY WITH THE REQUIREMENTS OF AS 4100 UN0.

S2. ALL STEELWORK SHALL BE FABRICATED FROM MATERIAL COMPLYING WITH AS 3678 AND AS 3679.

S3. FABRICATION SHALL COMPLY WITH THE SPECIFICATION AND THE REQUIREMENTS OF AS 4100 AND AS 1554 WHERE APPLICABLE.

S4. TWO COPIES OF ALL WORKSHOP DRAWINGS SHALL BE SUBMITTED TO THE SUPERINTENDENT FOR REVIEW 10 WORKING DAYS PRIOR TO FABRICATION.

S5. ALL PLATES, CLEATS, GUSSETS, STIFFENERS ETC., SHALL BE 10mm THICK UNO..

S6. CONTACT SURFACES BETWEEN DISSIMILAR METALS (ALUMINIUM AND GALVANISED STEEL, ALUMINIUM AND STAINLESS STEEL, STAINLESS STEEL AND GALVANISED STEEL ETC.,) SHALL BE INSULATED WITH RUBBER WASHERS UNO.

S7. ALL MASONRY ANCHORS SHALL BE 316 STAINLESS STEEL AND FITTED WITH ISOLATION WASHERS BETWEEN STAINLESS STEEL AND GALVANISING.

CONCRETE RE-INSTATEMENT

CR1. THOUROUGHLY SCABBLE BACK THE EXISTING SURFACE AND CLEAN BY WATER BLAST BEFORE POURING THE NEW CONCRETE.

CR2. AFTER CLEANING THE EXISTING CONCRETE SURFACE APPLY AN APPROVED BONDING AGENT AND HYDROPHILIC WATERSTOP BEFORE POURING NEW CONCRETE. COMPLY WITH MANUFACTURER'S REQUIREMENTS FOR THE PRODUCT AND ENSURE THAT NEW CONCRETE IS PLACED WITHIN THE TIME LIMITS SPECIFIED FOR THE BONDING AGENT.

CR3. SHOULD DISTURBANCE TO ANY FOOTPATH BE NECESSARY THEN THE RESTORATION SHALL INCLUDE THE REPLACEMENT OF THE WHOLE CONCRETE SLAB SEGMENTS BETWEEN JOINTS FOR THE FULL WIDTH IN ACCORDANCE WITH COUNCIL'S STANDARD DRAWING SD013 "FOOTPATH AND CYCLEWAY DETAILS".

STAINLESS STEEL

ST1. STAINLESS STEEL SHALL COMPLY WITH THE FOLLOWING AUSTRALIAN STANDARDS :

ST1.1 AS1444 - STAINLESS STEEL PLATE

ST1.2 AS/NZS 4673 - STAINLESS STEEL SHEET

ST2. ALL STAINLESS STEEL SHALL BE GRADE 316 UN0.

ST3. ALL STAINLESS STEEL WHICH IS TO BE WELDED SHALL BE 316L. WHERE 316L IS NOT AVAILABLE CONSULT THE SUPERINTENDENT.

ST4. ALL WELDING OF STAINLESS STEEL SHALL CONFORM WITH AS/NZS 1554.6. ALL WELDING CONSUMABLES TO BE E316L UNO.

ST5. ALL STAINLESS STEEL WELDS SHALL BE PICKLED AND PASSIVATED.

ST6. APPLY A NICKEL BASED LUBRICANT OR NICKEL IMPREGNATED TAPE TO THE THREADS OF ALL STAINLESS STEEL BOLTS PRIOR TO ASSEMBLY.

ST7. TWO COPIES OF ALL WORKSHOP DRAWINGS SHALL BE SUBMITTED TO THE SUPERINTENDENT FOR REVIEW 10 WORKING DAYS PRIOR TO FABRICATION.

ALUMINIUM

A1. UNO, ALUMINIUM SHALL BE GRADE 6061 - T6. ALL ALUMINIUM SECTIONS SHALL COMPLY WITH AS 1734 AND AS 1866.

A2. UNO, WELDED CONNECTIONS SHALL BE AS FOLLOWS :

A2.1 BUTT WELDS SHALL BE WELD QUALITY 'A' IN ACCORDANCE WITH AS 1665

A2.2 FILLET WELDS SHALL BE WELD QUALITY 'B' IN ACCORDANCE WITH AS 1665

A2.3 FILLET WELDS SHALL BE 6mm ALL ROUND USING FILLER ALLOY 5356

A3. GRIND OFF ALL SHARP EDGES AFTER FABRICATION.

A4. PROVIDE NYLON OR POLYTHENE WASHERS BETWEEN ALUMINIUM AND CONCRETE INTERFACES.

A5. ALL FASTENERS SHALL BE GRADE 316 STAINLESS STEEL. ISOLATE ALL DISSIMILAR METALS. THE ISOLATION ITEMS ARE TO BE APPROVED BY THE SUPERINTENDENT.

A6. TWO COPIES OF ALL WORKSHOP DRAWINGS SHALL BE SUBMITTED TO THE SUPERINTENDENT FOR REVIEW 10 WORKING DAYS PRIOR TO FABRICATION.

ENVIRONMENT MANAGEMENT

EM1. ALL WORKS ARE TO BE IN ACCORDANCE WITH THE CONTRACTOR'S APPROVED ENVIRONMENTAL MANAGEMENT PLAN.

EM2. SITE TO BE ASSESSED FOR DANGEROUS FLORA AND FAUNA PRIOR TO CONSTRUCTION. WORKERS TO WEAR LONG PANTS AND STEEL CAP BOOTS AT ALL TIMES.

EM3. PRUNING OF TREES SHOWN ON THESE DRAWINGS "TO BE RETAINED" IS NOT PERMITTED WITHOUT PRIOR CONSULTATION AND ACCEPTANCE OF COUNCIL.

TRAFFIC MANAGEMENT

TM1. ALL WORKS ARE TO BE IN ACCORDANCE WITH THE CONTRACTOR'S APPROVED TRAFFIC MANAGEMENT PLAN.

TM2. THE CONTRACTOR SHALL MINIMISE ALL OBSTRUCTIONS TO TRAFFIC.

TM3. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY APPROVALS FROM COUNCILS AND OTHER AUTHORITIES FOR TEMPORARY TRAFFIC ARRANGEMENTS.

TM4. THE CONTRACTOR SHALL PREPARE AND IMPLEMENT A TRAFFIC MANAGEMENT PLAN PRIOR TO THE COMMENCEMENT OF WORK.

TM5. ALL PERSONNEL MUST WEAR HIGH VISIBILITY VESTS/SHIRTS.

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Designed	GC
Drawn	GC
Checked	MC
Date	01/04/22
Certifier	

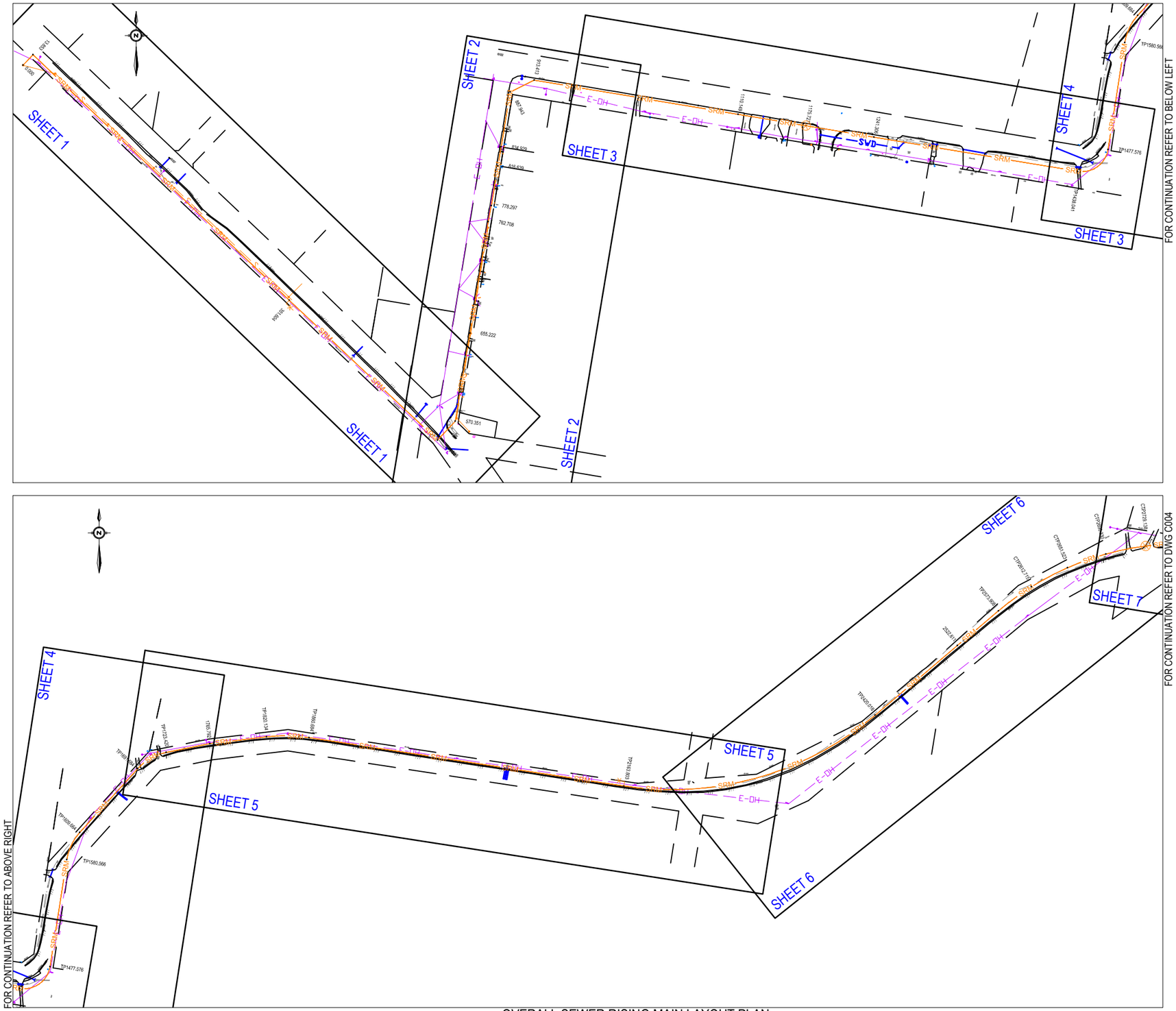
Issue	Description	Date	By
A	ISSUE FOR APPROVAL	01/04/22	

CLIENT
MPD INVESTMENTS PTY LTD

PROJECT
JAMES CREEK ROAD SUBDIVISION
PROPOSED SEWER RISING MAIN
JAMES CRK RD TO DIAMOND ST PUMP STATION

TITLE
GENERAL NOTES
SHEET 2 OF 2

Job No.	Drawing No.	Rev No.
2022041-CC	C002	A



OVERALL SEWER RISING MAIN LAYOUT PLAN

LEGEND

- LIMIT OF WORKS
- SRM — PROPOSED SEWER RISING MAIN DN200 PE100 PN16
- EXISTING KERB AND CHANNEL
- EXISTING EDGE OF BITUMEN
- 5.0 — (0.5m) INTERVAL EXISTING SURFACE CONTOURS
- S — EXISTING SEWER MAIN
- W — EXISTING WATER RETICULATION
- SWD — EXISTING STORMWATER DRAINAGE
- E-OH — EXISTING OVERHEAD ELECTRICAL
- T — EXISTING TELSTRA
- EXISTING FENCE

SEWER RISING MAIN SETOUT

CHAINAGE	X COORD	Y COORD	RADIUS
0.000	521094.376	6740369.846	
13.853	521103.960	6740379.848	
351.604	521347.831	6740146.175	
545.538	521488.898	6740013.095	
570.351	521505.925	6740031.144	
655.222	521519.919	6740114.854	
762.708	521537.278	6740220.929	
778.297	521540.298	6740236.222	
816.639	521546.571	6740274.047	
834.929	521549.564	6740292.091	
887.943	521558.239	6740344.390	
913.413	521581.092	6740355.637	
1110.149	521775.118	6740323.100	
1175.727	521839.794	6740312.254	
1241.306	521904.469	6740301.408	
1438.041	522098.495	6740268.870	25.000
1477.576	522127.328	6740289.654	
1580.566	522143.281	6740391.400	50.000
1609.664	522155.670	6740417.277	
1691.684	522210.823	6740477.984	50.000
1723.420	522237.967	6740493.380	
1765.792	522279.506	6740501.739	
1820.134	522333.472	6740508.126	150.000
1860.684	522373.892	6740507.424	
2163.803	522673.492	6740461.371	300.000
2420.018	522912.687	6740528.730	
2522.611	522991.054	6740594.942	
2573.908	523030.237	6740628.049	270.000
2612.715	523061.576	6740650.881	270.000
2651.523	523095.861	6740668.990	270.000
2690.330	523132.387	6740682.001	270.000
2729.138	523170.401	6740689.646	270.000
2767.945	523209.117	6740691.767	270.000
2806.753	523247.737	6740688.321	
2895.457	523335.296	6740674.113	
2984.161	523422.855	6740659.905	
3072.865	523510.414	6740645.697	
3168.105	523604.415	6740630.387	
3263.344	523698.415	6740615.077	
3358.584	523792.416	6740599.766	
3453.823	523886.417	6740584.456	
3680.216	524109.907	6740548.321	118.000
3864.979	524245.133	6740645.392	
3980.544	524264.149	6740759.381	
4060.545	524277.148	6740838.320	
4211.911	524302.184	6740987.600	
4296.742	524315.553	6741071.372	
4371.585	524327.784	6741145.208	
4446.427	524340.015	6741219.044	
4521.270	524352.246	6741292.881	
4596.112	524364.477	6741366.717	
4684.012	524378.842	6741453.435	
4984.012	524427.868	6741749.402	
5143.042	524453.857	6741906.294	

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Issue: ISSUE FOR APPROVAL

Designed	Drawn
GC	GC
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MC	01/04/22

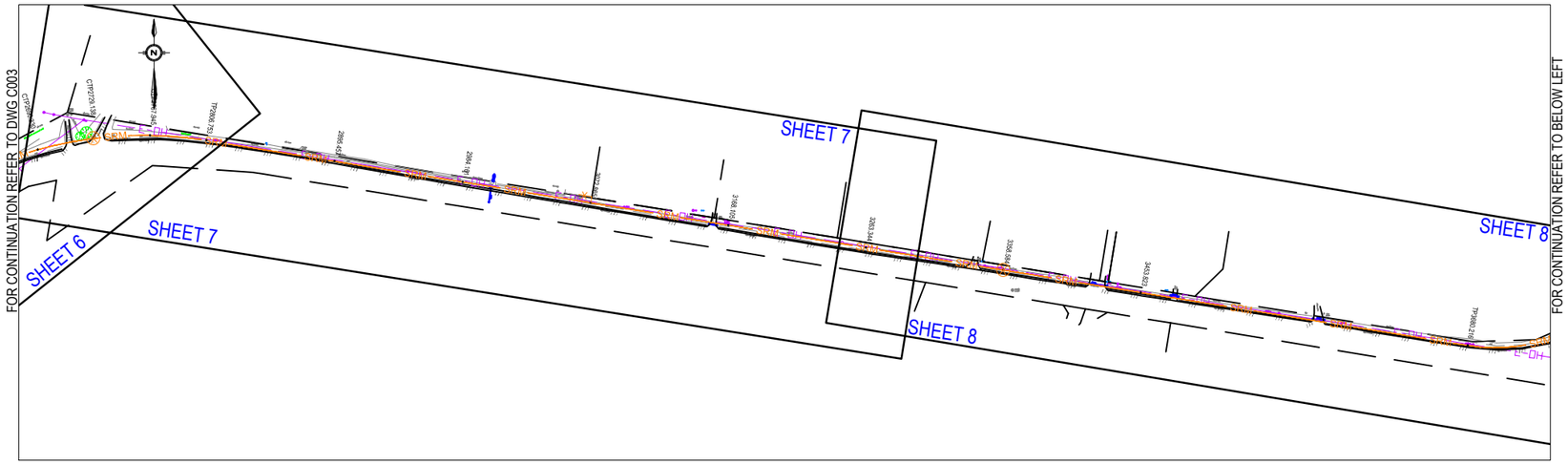
Issue	Description	Date	By
A	ISSUE FOR APPROVAL	01/04/22	

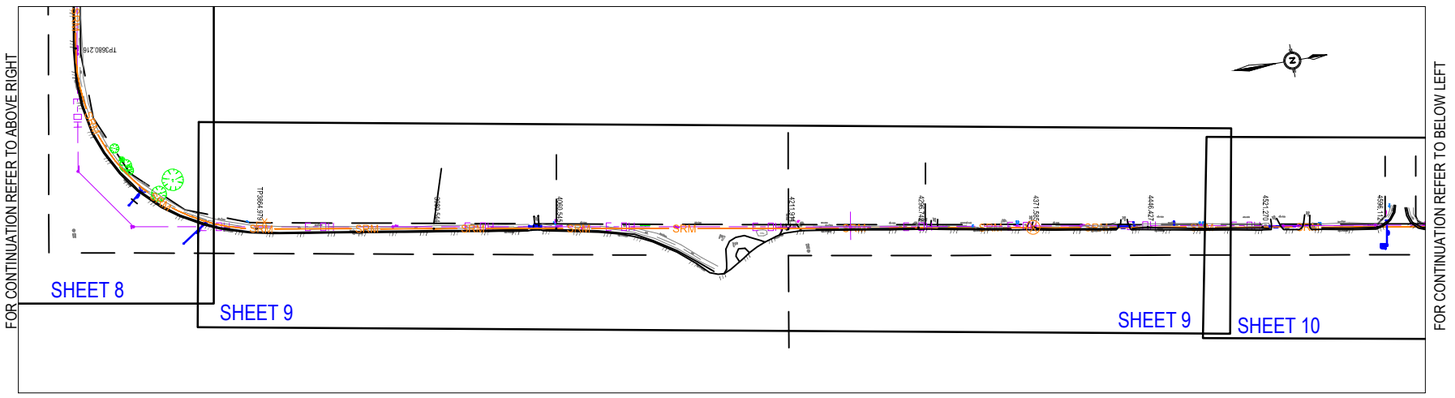
CLIENT
MPD INVESTMENTS PTY LTD

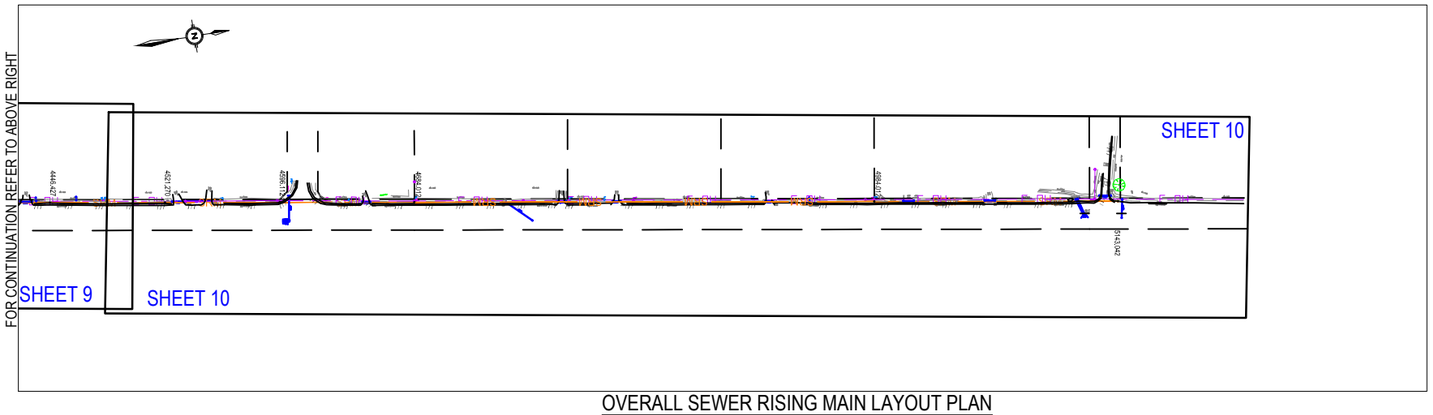
PROJECT
JAMES CREEK ROAD SUBDIVISION
PROPOSED SEWER RISING MAIN
JAMES CRK RD TO DIAMOND ST PUMP STATION

TITLE
SEWER RISING MAIN
OVERALL LAYOUT PLAN
SHEET 1 OF 2

Job No.	Drawing No.	Rev No.
2022041-CC	C003	A







OVERALL SEWER RISING MAIN LAYOUT PLAN

LEGEND

- LIMIT OF WORKS
- SRM — PROPOSED SEWER RISING MAIN DN200 PE100 PN16
- EXISTING KERB AND CHANNEL
- EXISTING EDGE OF BITUMEN
- 5.0 — (0.5m) INTERVAL EXISTING SURFACE CONTOURS
- S — EXISTING SEWER MAIN
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SEWER RISING MAIN SETOUT

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13.853	521103.960	6740379.848	
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545.538	521488.898	6740013.095	
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2651.523	523095.861	6740668.990	270.000
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MC	01/04/22

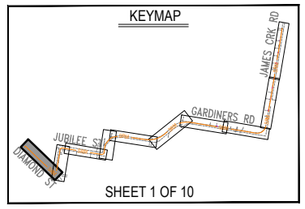
Issue	Description	Date	By
A	ISSUE FOR APPROVAL	01/04/22	

CLIENT
MPD INVESTMENTS PTY LTD

PROJECT
JAMES CREEK ROAD SUBDIVISION
PROPOSED SEWER RISING MAIN
JAMES CRK RD TO DIAMOND ST PUMP STATION

TITLE
SEWER RISING MAIN
OVERALL LAYOUT PLAN
SHEET 2 OF 2

Job No.	Drawing No.	Rev No.
2022041-CC	C004	A



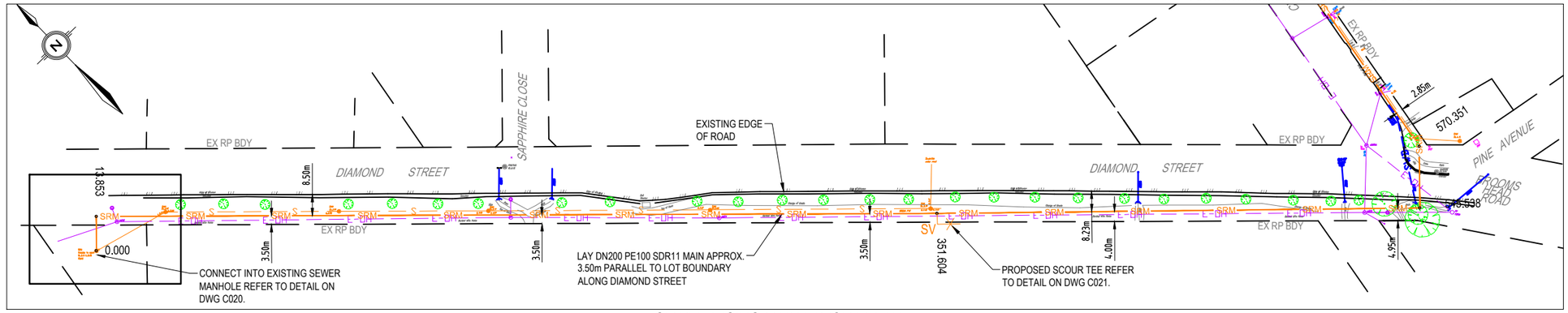
LEGEND

- LIMIT OF WORKS
- SRM — PROPOSED SEWER RISING MAIN DN200 PE100 PN16
- AV — PROPOSED AIR VALVE
- SV — PROPOSED SCOUR TEE
- EXISTING KERB AND CHANNEL
- EXISTING EDGE OF BITUMEN
- 5.0 — (0.5m) INTERVAL EXISTING SURFACE CONTOURS
- S — EXISTING SEWER MAIN
- W — EXISTING WATER RETICULATION
- SWD — EXISTING STORMWATER DRAINAGE
- E-OH — EXISTING OVERHEAD ELECTRICAL
- T — EXISTING TELSTRA
- / — EXISTING FENCE
- FH — EXISTING FIRE HYDRANT
- WM — EXISTING WATER METER
- SV — EXISTING WATER VALVE
- PP — EXISTING POWER POLE
- SMH — EXISTING SEWER MANHOLE
- EPIT — EXISTING ELECTRICITY PIT
- TPIT — EXISTING TELSTRA PIT
- EXISTING TREE

GENERAL SEWER NOTES:

2. REFER TO DWG C001 & C002 FOR DRAWING SET NOTES.
2. FOR PRESSURE SEWER TRENCH DETAIL REFER TO WSA STD DWG PSS-1000.
3. FLUSHING POINT DETAILS REFER TO WSA STD DWG PSS-1007 AND DWG C031.
4. TYPICAL VALVE DETAILS REFER TO WSA STD DWG PSS-1005 & WAT-1207-V AND DWG C021.
5. SCOUR ARRANGEMENT DETAILS REFER TO WSA STD DWG WAT-1307 AND DWG C021.
6. THRUST BLOCK DETAILS REFER TO WSA STD DWG WAT-1205 AND DWG C020.
7. CONTRACTOR IS RESPONSIBLE FOR THE LOCATION AND PROTECTION OF ALL UNDERGROUND SERVICES PRIOR TO COMMENCEMENT OF WORKS.
8. ALL MAINS TO BE LOCATED IN ROAD VERGE IF SHOWN OTHERWISE CONTACT SITE SUPERINTENDENT. SRM IS NOT TO BE CONSTRUCTED UNDER ROADS UNLESS REQUIRED FOR ROAD CROSSINGS.

FOR CONTINUATION REFER TO SHEET 2 ON DWG C011



SEWER RISING MAIN LAYOUT PLAN

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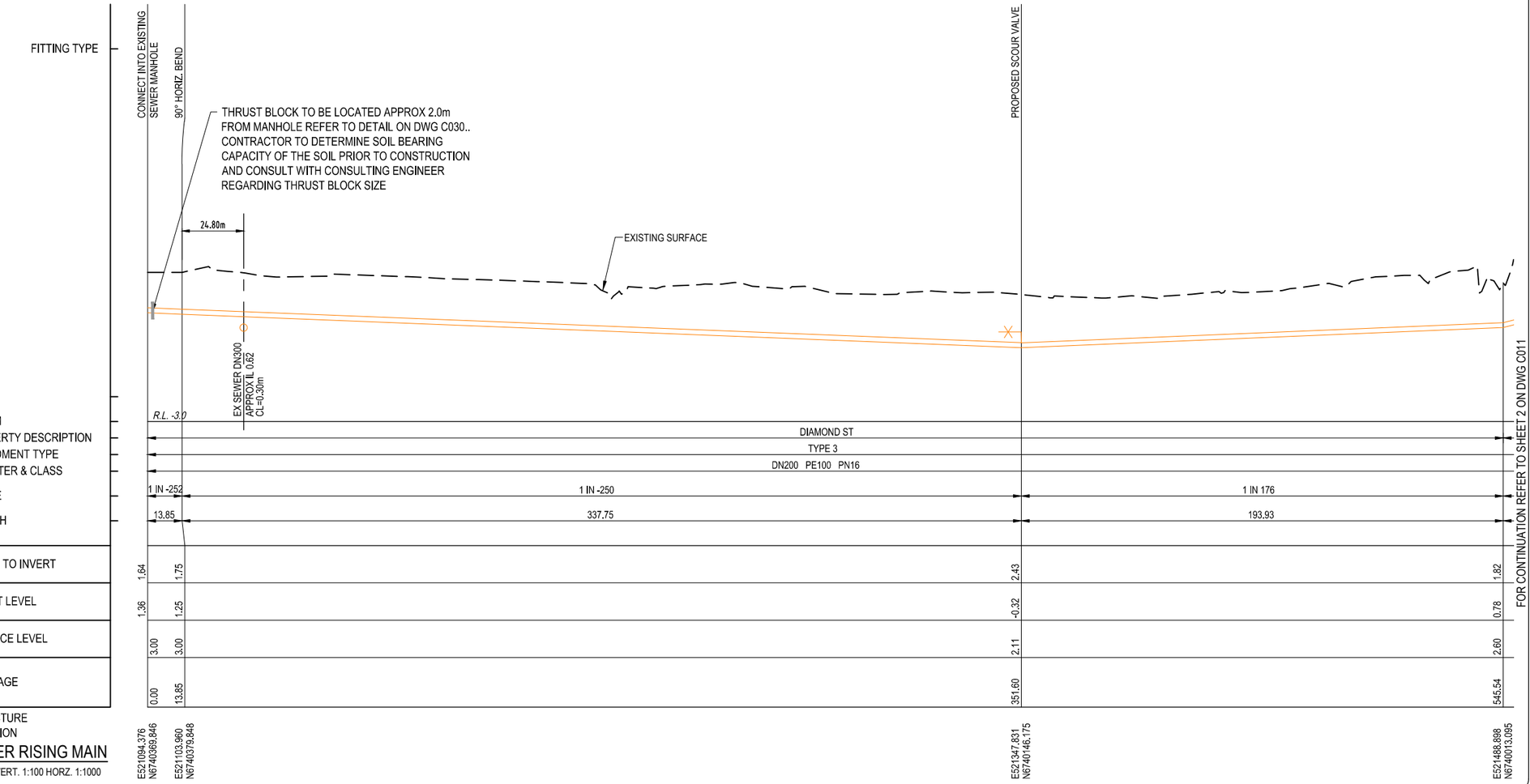

SEWER RISING MAIN

SCALE VERT. 1:100 HORZ. 1:1000

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HORIZ 10 0 10 20 30 40 50 1:1000
VERT 1 0 1 2 3 4 5 1:100
Certifier

Issue: ISSUE FOR APPROVAL

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GC	GC
Checked	Date
MC	01/04/22

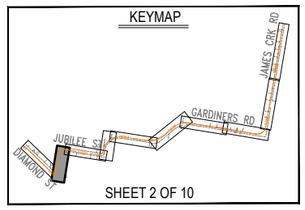
Issue	Description	Date	By
A	ISSUE FOR APPROVAL	01/04/22	

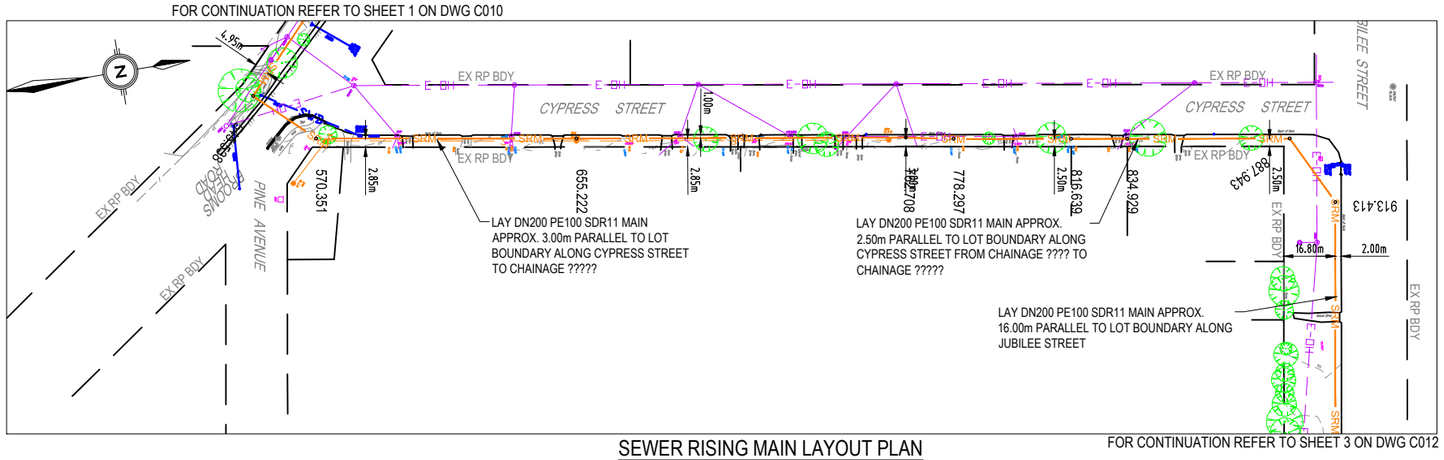
CLIENT
MPD INVESTMENTS PTY LTD

PROJECT
JAMES CREEK ROAD SUBDIVISION
PROPOSED SEWER RISING MAIN
JAMES CRK RD TO DIAMOND ST PUMP STATION

TITLE
SEWER RISING MAIN
LONGITUDINAL SECTION
SHEET 1 OF 10

Job No.	Drawing No.	Rev No.
2022041-CC	C010	A





SEWER RISING MAIN LAYOUT PLAN

SCALE 10 0 10 20 30 40 50 1:1000

GENERAL SEWER NOTES:

1. REFER TO DWG C001 & C002 FOR DRAWING SET NOTES.
2. FOR PRESSURE SEWER TRENCH DETAIL REFER TO WSA STD DWG PSS-1000.
3. FLUSHING POINT DETAILS REFER TO WSA STD DWG PSS-1007 AND DWG C021.
4. TYPICAL VALVE DETAILS REFER TO WSA STD DWG PSS-1005 & WAT-1207-V AND DWG C021.
5. SCOUR ARRANGEMENT DETAILS REFER TO WSA STD DWG WAT-1307 AND DWG C021.
6. THRUST BLOCK DETAILS REFER TO WSA STD DWG WAT-1205 AND DWG C020.
7. CONTRACTOR IS RESPONSIBLE FOR THE LOCATION AND PROTECTION OF ALL UNDERGROUND SERVICES PRIOR TO COMMENCEMENT OF WORKS.
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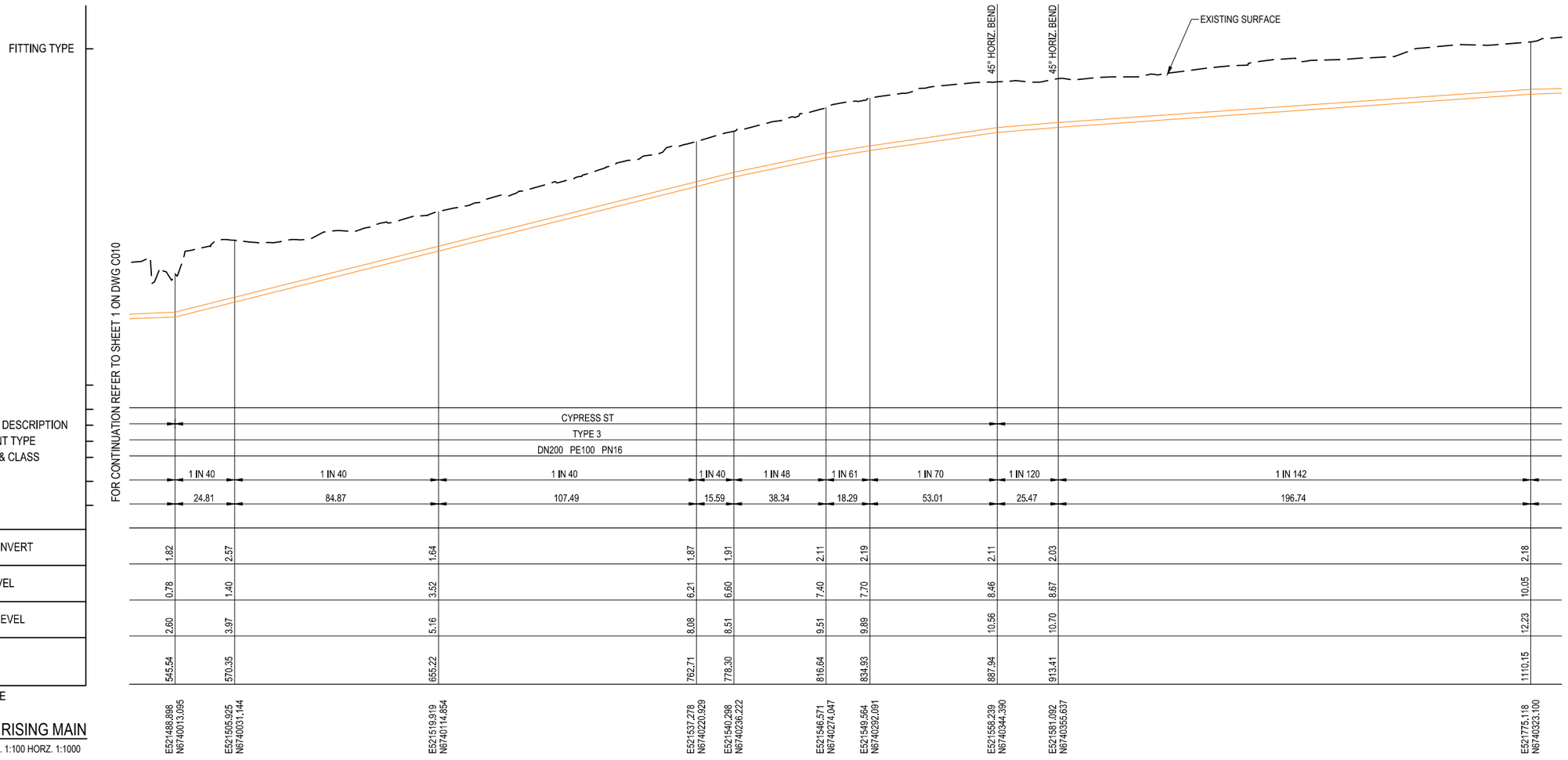
9. REFER TO LEGEND ON DWG C010.



FITTING TYPE
DATUM
PROPERTY DESCRIPTION
EMBEDMENT TYPE
DIAMETER & CLASS
GRADE
LENGTH
DEPTH TO INVERT
INVERT LEVEL
SURFACE LEVEL
CHAINAGE
STRUCTURE LOCATION

SEWER RISING MAIN

SCALE VERT. 1:100 HORZ. 1:1000

Willow+ Sparrow
ENGINEERING+DESIGN
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Email: michael@waseng.com.au
WILLOW & SPARROW PTY LTD A.C.N. 606732512

Scale
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VERT 1 0 1 2 3 4 5 1:100
Certifier

Issue: ISSUE FOR APPROVAL
Designed GC | Drawn GC
Checked MC | Date 01/04/22

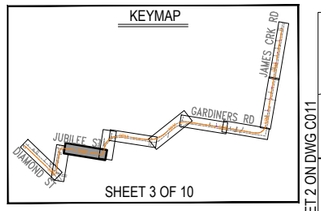
Issue	Description	Date	By
A	ISSUE FOR APPROVAL	01/04/22	

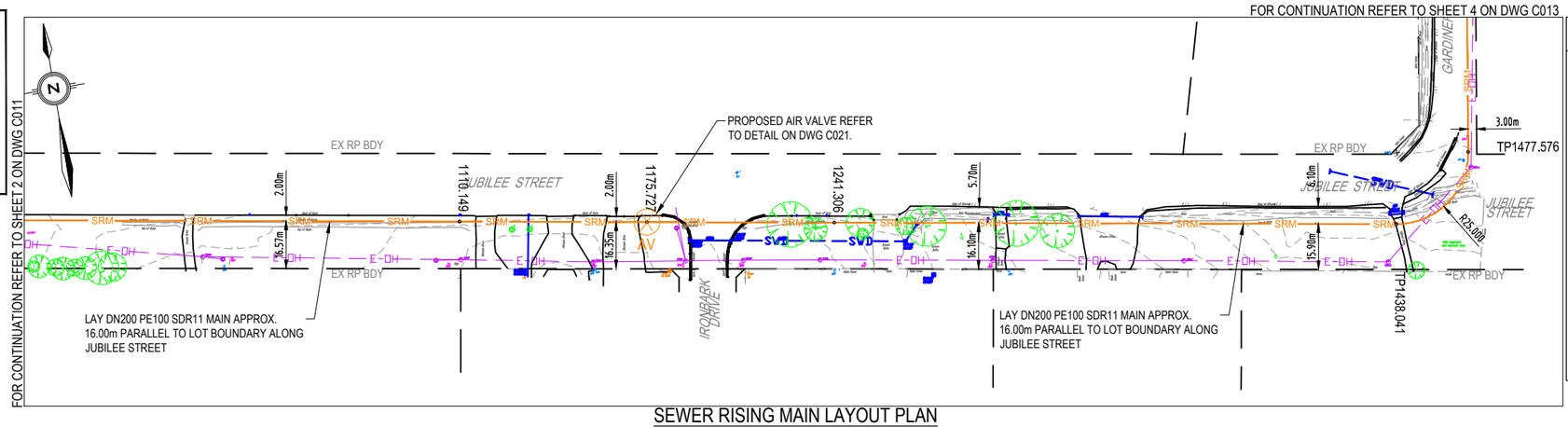
CLIENT
MPD INVESTMENTS PTY LTD

PROJECT
JAMES CREEK ROAD SUBDIVISION
PROPOSED SEWER RISING MAIN
JAMES CRK RD TO DIAMOND ST PUMP STATION

TITLE
SEWER RISING MAIN
LONGITUDINAL SECTION
SHEET 2 OF 10

Job No.	Drawing No.	Rev No.
2022041-CC	C011	A





SEWER RISING MAIN LAYOUT PLAN

SCALE 10 0 10 20 30 40 50 1:1000

GENERAL SEWER NOTES:

1. REFER TO DWG C001 & C002 FOR DRAWING SET NOTES.
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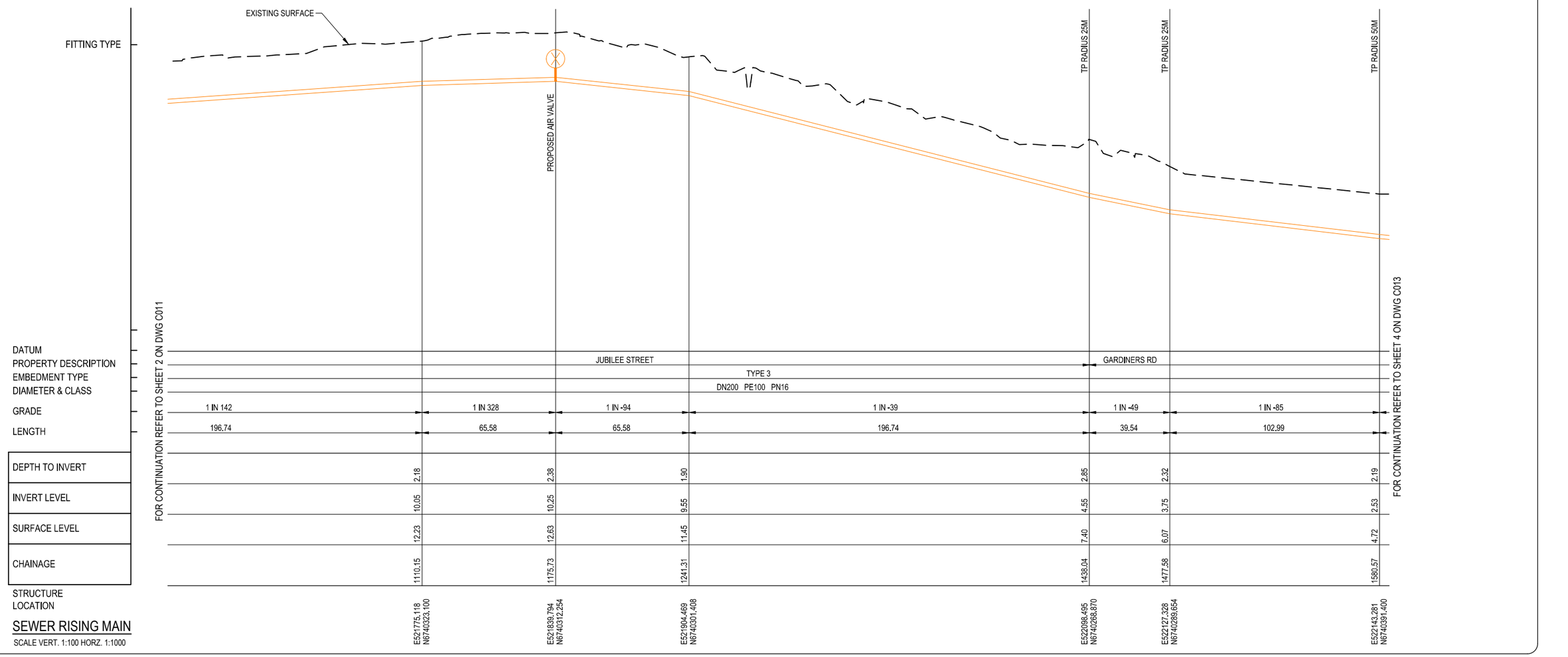

SEWER RISING MAIN

SCALE VERT. 1:100 HORZ. 1:1000

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VERT 1 0 1 2 3 4 5 1:100
Certifier

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GC	GC
Checked	Date
MC	01/04/22

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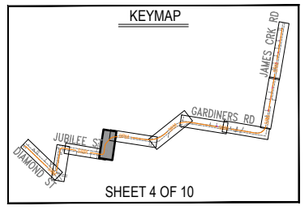
A	ISSUE FOR APPROVAL	01/04/22	

CLIENT
MPD INVESTMENTS PTY LTD

PROJECT
JAMES CREEK ROAD SUBDIVISION
PROPOSED SEWER RISING MAIN
JAMES CRK RD TO DIAMOND ST PUMP STATION

TITLE
SEWER RISING MAIN
LONGITUDINAL SECTION
SHEET 3 OF 10

Job No.	Drawing No.	Rev No.
2022041-CC	C012	A



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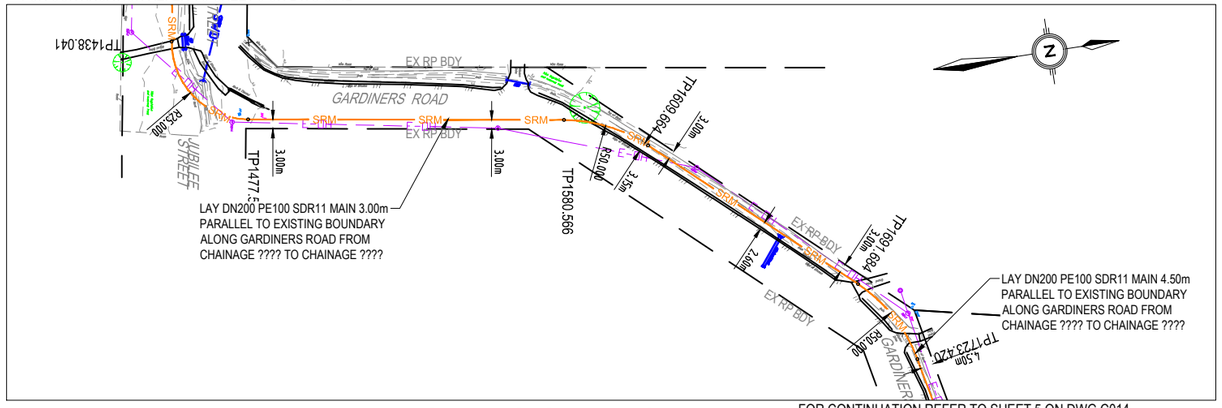
FOR CONTINUATION REFER TO SHEET 3 ON DWG C012



FOR CONTINUATION REFER TO SHEET 5 ON DWG C014

SEWER RISING MAIN LAYOUT PLAN

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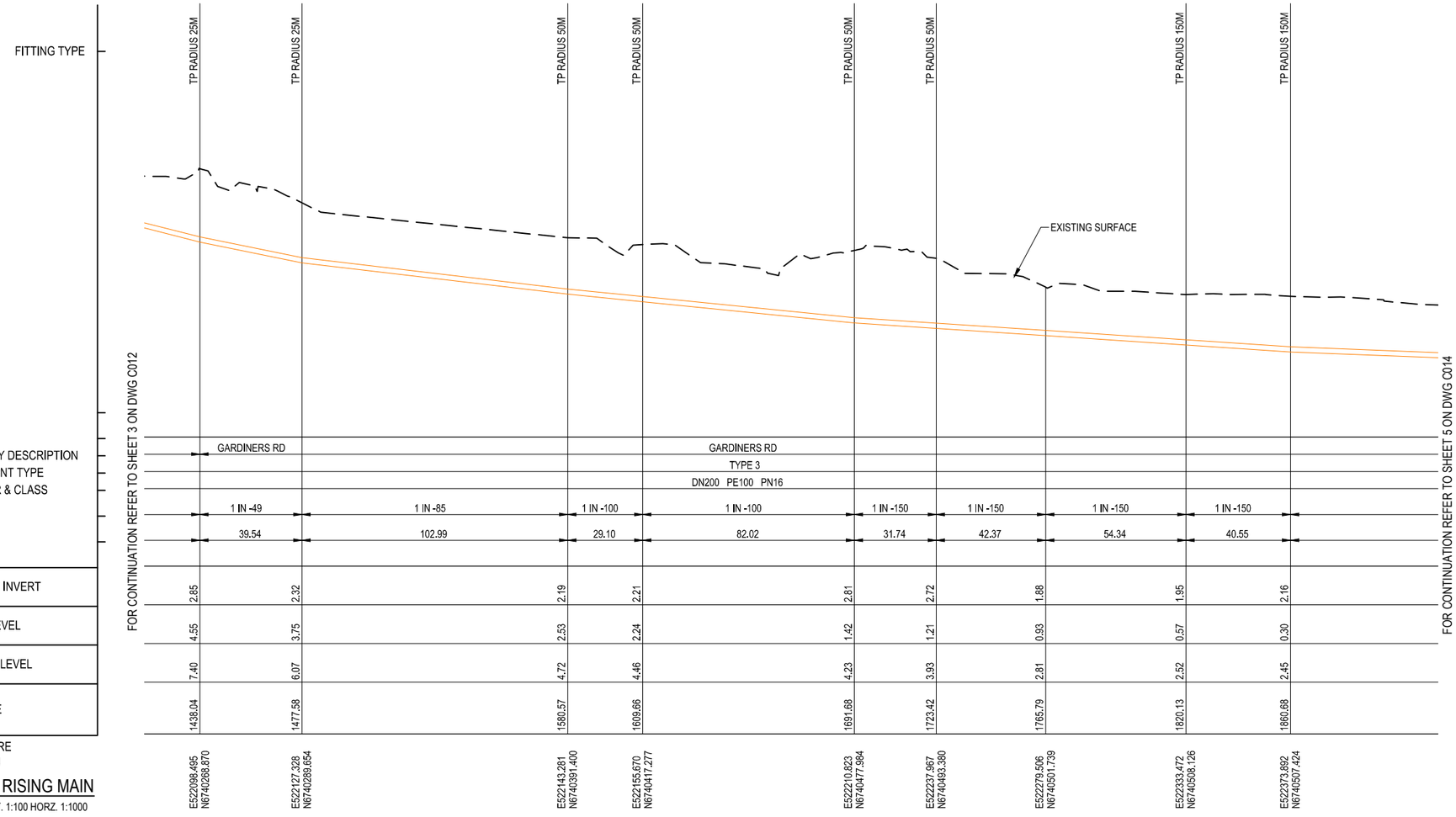

SEWER RISING MAIN

SCALE VERT. 1:100 HORZ. 1:100

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Certifier

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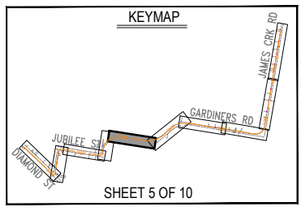
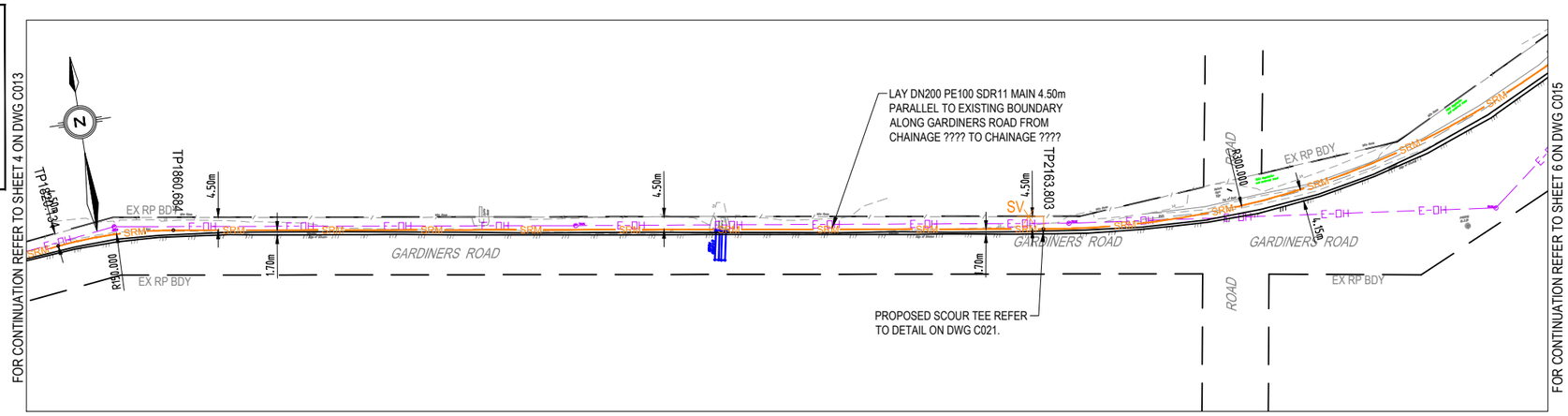
MPD INVESTMENTS PTY LTD

PROJECT
JAMES CREEK ROAD SUBDIVISION
PROPOSED SEWER RISING MAIN
JAMES CRK RD TO DIAMOND ST PUMP STATION

TITLE
SEWER RISING MAIN
LONGITUDINAL SECTION
SHEET 4 OF 10

Job No.	Drawing No.	Rev No.
2022041-CC	C013	A





SEWER RISING MAIN LAYOUT PLAN

SCALE 10 0 10 20 30 40 50 1:1000

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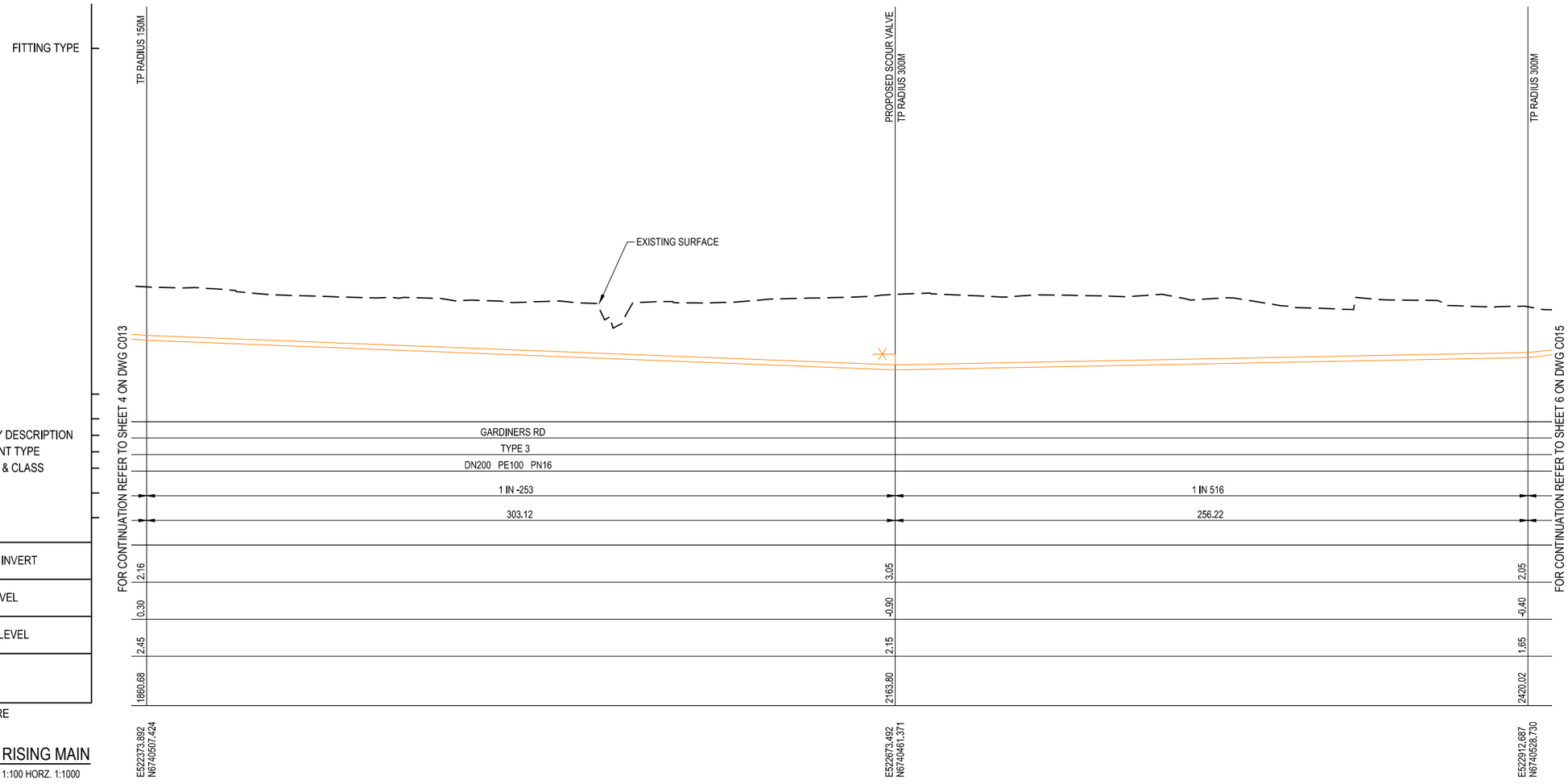

SEWER RISING MAIN

SCALE VERT. 1:100 HORZ. 1:1000

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VERT 1 0 1 2 3 4 5 1:100
Certifier

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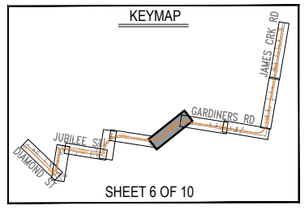
Issue	Description	Date	By
A	ISSUE FOR APPROVAL	01/04/22	

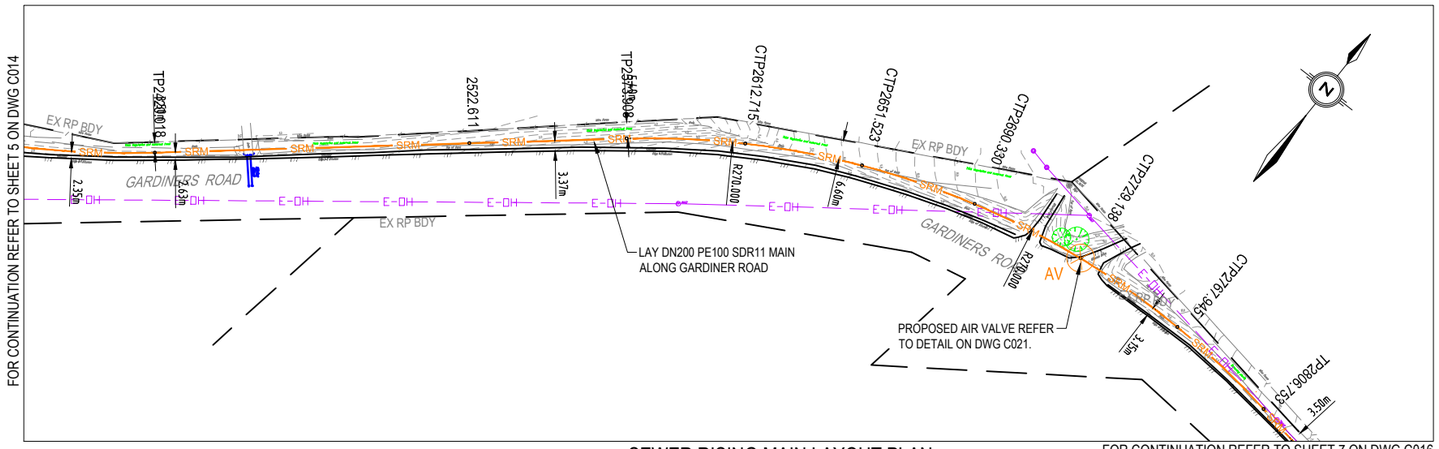
CLIENT
MPD INVESTMENTS PTY LTD

PROJECT
JAMES CREEK ROAD SUBDIVISION
PROPOSED SEWER RISING MAIN
JAMES CRK RD TO DIAMOND ST PUMP STATION

TITLE
SEWER RISING MAIN
LONGITUDINAL SECTION
SHEET 5 OF 10

Job No.	Drawing No.	Rev No.
2022041-CC	C014	A





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SEWER RISING MAIN LAYOUT PLAN

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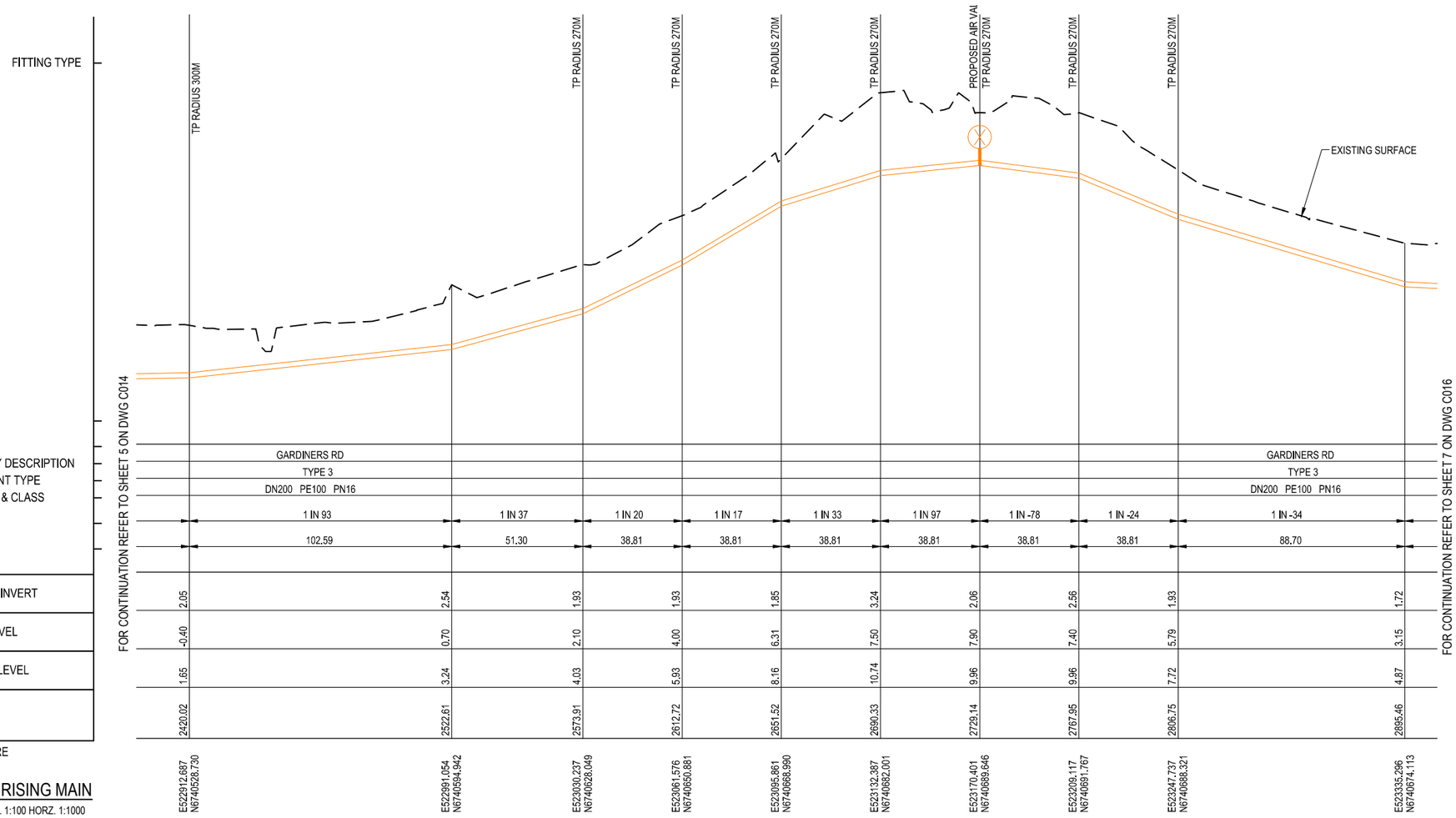

SEWER RISING MAIN

SCALE VERT. 1:100 HORZ. 1:1000

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VERT 1 0 1 2 3 4 5 1:100
Certifier

Issue: ISSUE FOR APPROVAL

Designed	Drawn
GC	GC
Checked	Date
MC	01/04/22

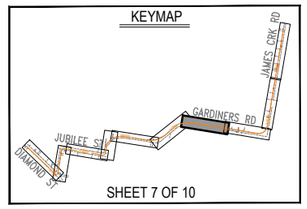
Issue	Description	Date	By
A	ISSUE FOR APPROVAL	01/04/22	

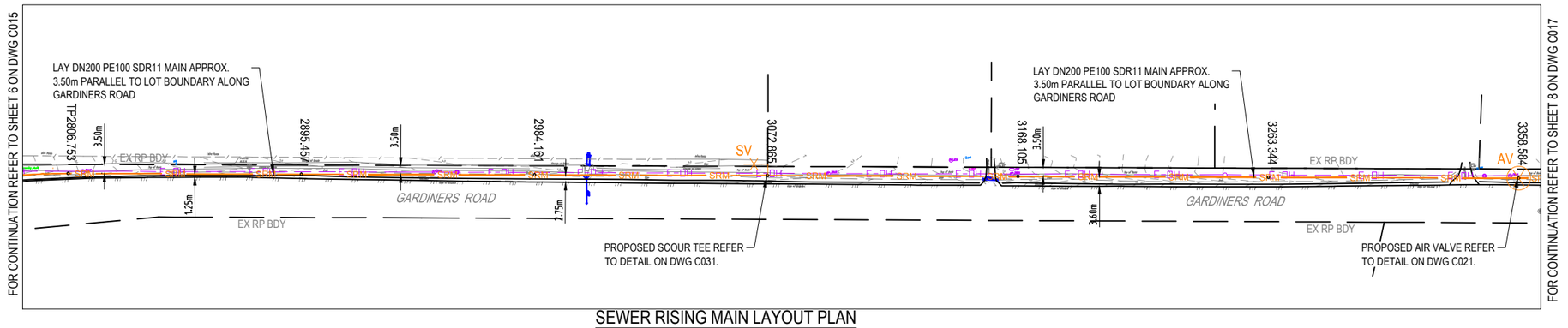
CLIENT
MPD INVESTMENTS PTY LTD

PROJECT
JAMES CREEK ROAD SUBDIVISION
PROPOSED SEWER RISING MAIN
JAMES CRK RD TO DIAMOND ST PUMP STATION

TITLE
SEWER RISING MAIN
LONGITUDINAL SECTION
SHEET 6 OF 10

Job No.	Drawing No.	Rev No.
2022041-CC	C015	A





SEWER RISING MAIN LAYOUT PLAN

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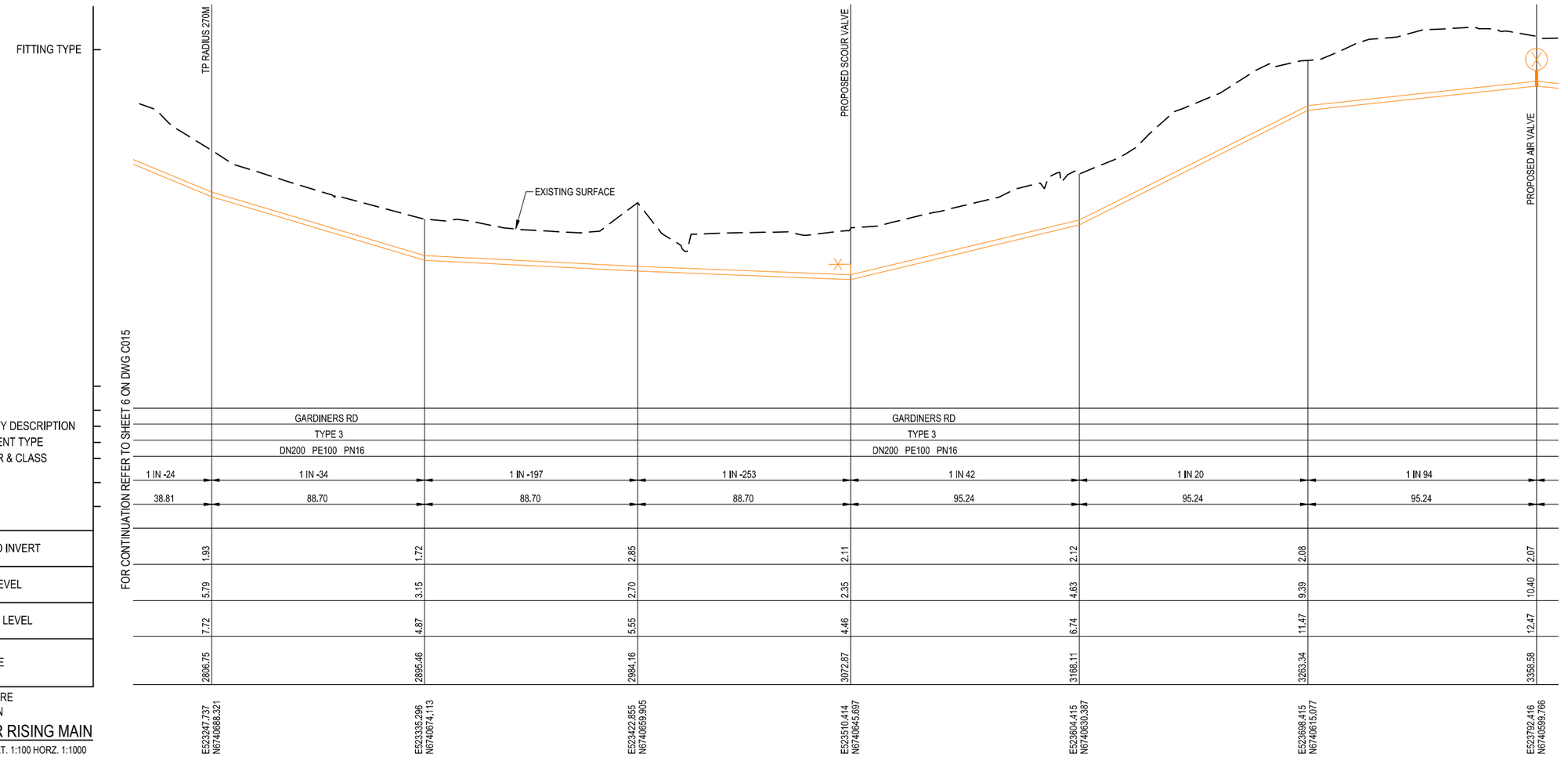

SEWER RISING MAIN
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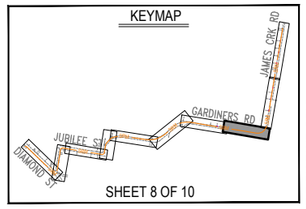
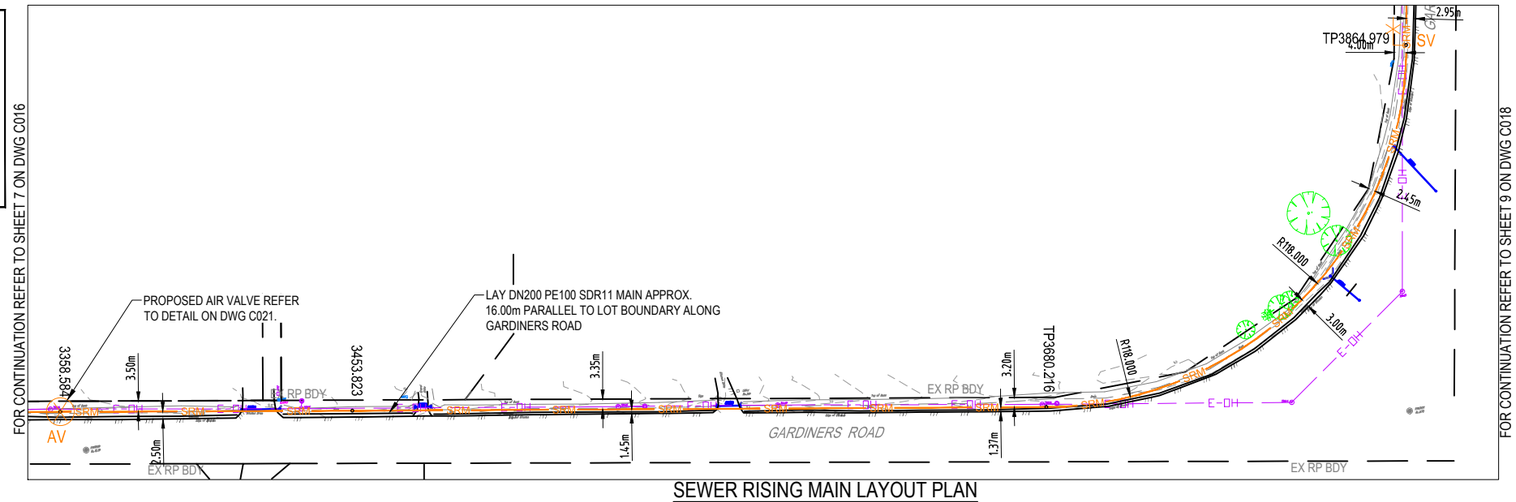
MPD INVESTMENTS PTY LTD

PROJECT
JAMES CREEK ROAD SUBDIVISION
PROPOSED SEWER RISING MAIN
JAMES CRK RD TO DIAMOND ST PUMP STATION

TITLE
SEWER RISING MAIN
LONGITUDINAL SECTION
SHEET 7 OF 10

Job No.	Drawing No.	Rev No.
2022041-CC	C016	A





SEWER RISING MAIN LAYOUT PLAN

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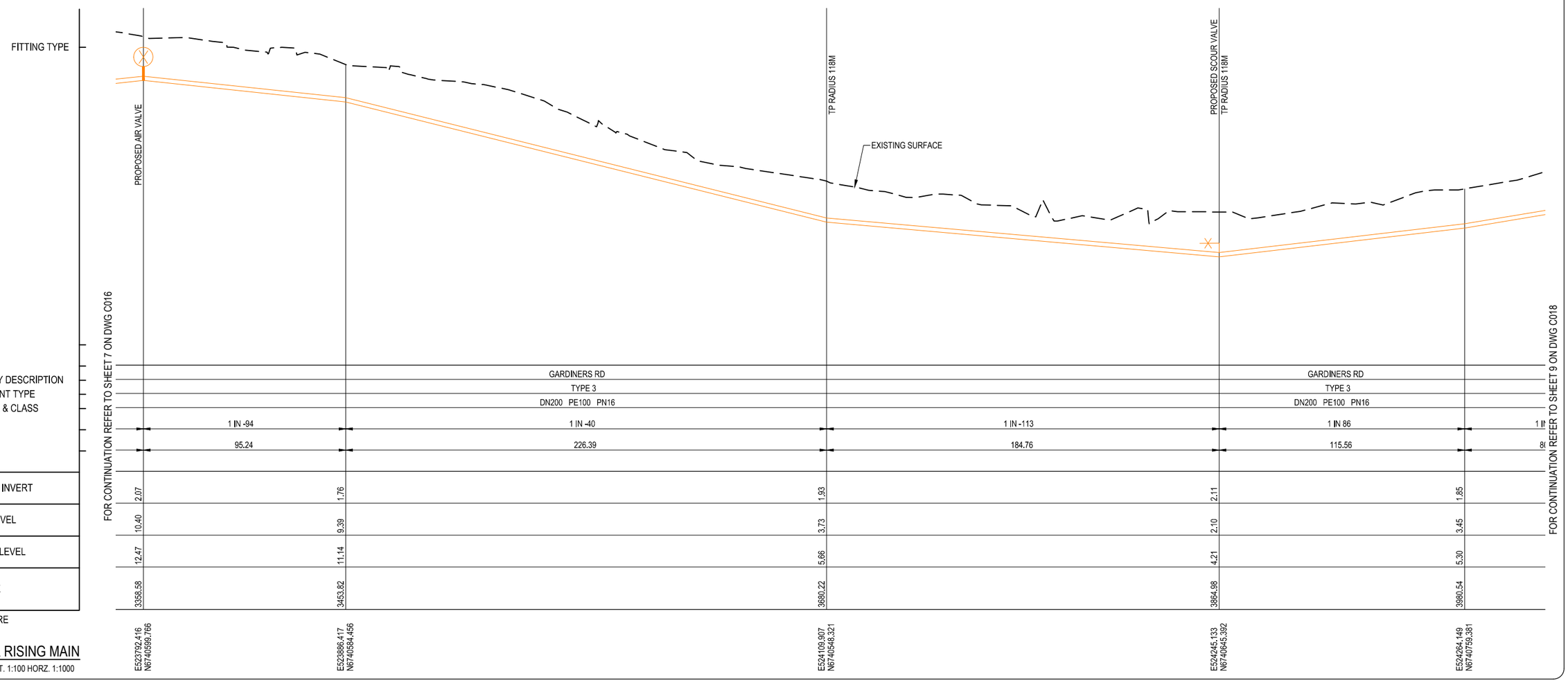

SEWER RISING MAIN

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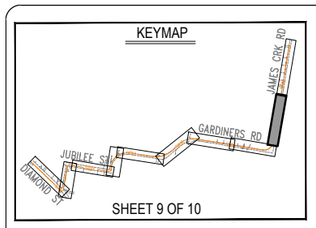
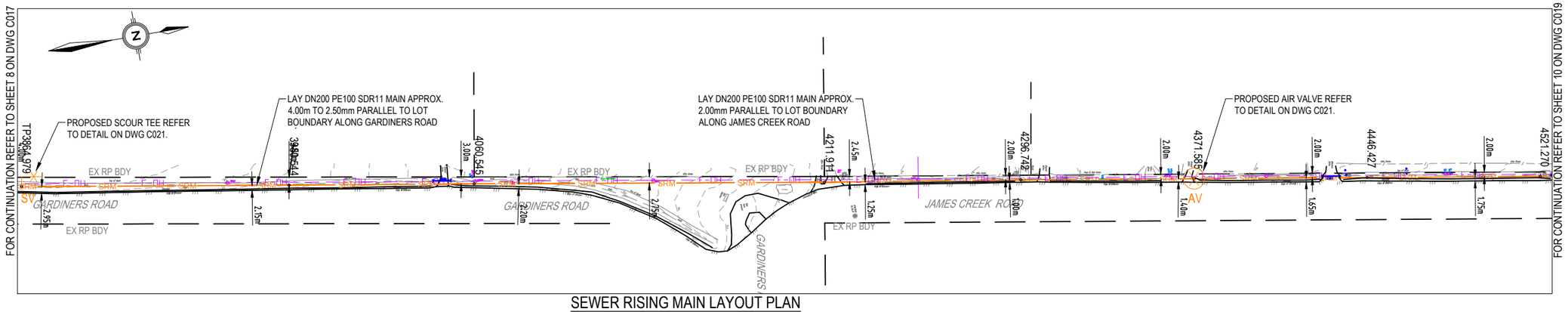
MPD INVESTMENTS PTY LTD

PROJECT
JAMES CREEK ROAD SUBDIVISION
PROPOSED SEWER RISING MAIN
JAMES CRK RD TO DIAMOND ST PUMP STATION

TITLE
SEWER RISING MAIN
LONGITUDINAL SECTION
SHEET 8 OF 10

Job No.	Drawing No.	Rev No.
2022041-CC	C017	A





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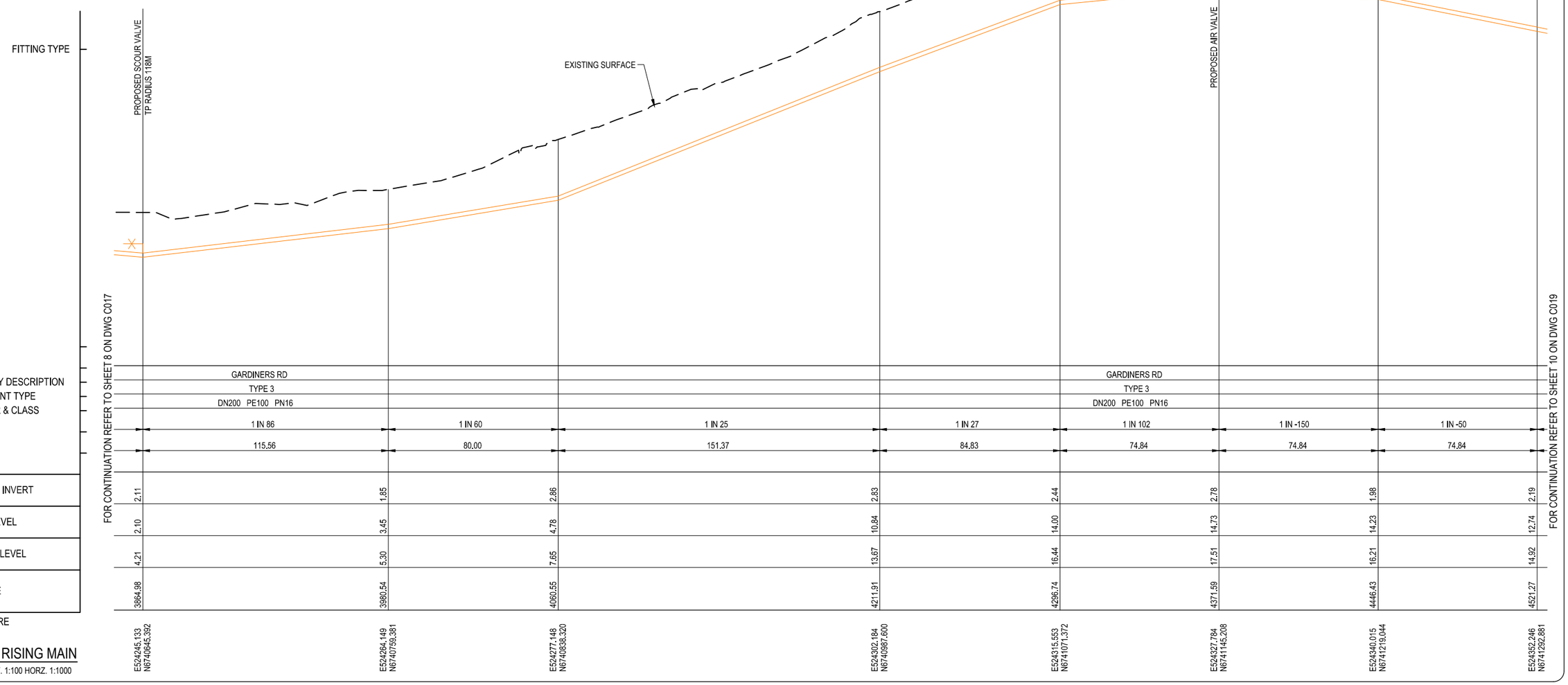

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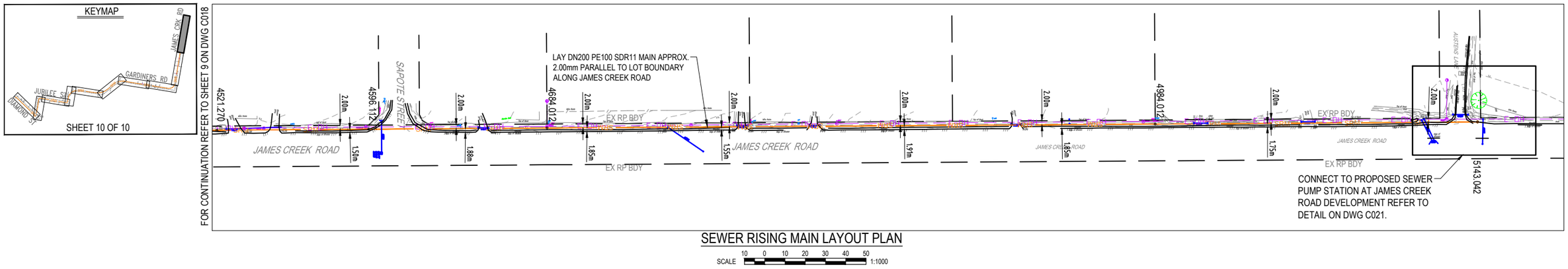
PROPOSED SEWER RISING MAIN
JAMES CRK RD TO DIAMOND ST PUMP STATION

TITLE
SEWER RISING MAIN
LONGITUDINAL SECTION
SHEET 9 OF 10

Job No.	Drawing No.	Rev No.
2022041-CC	C018	A



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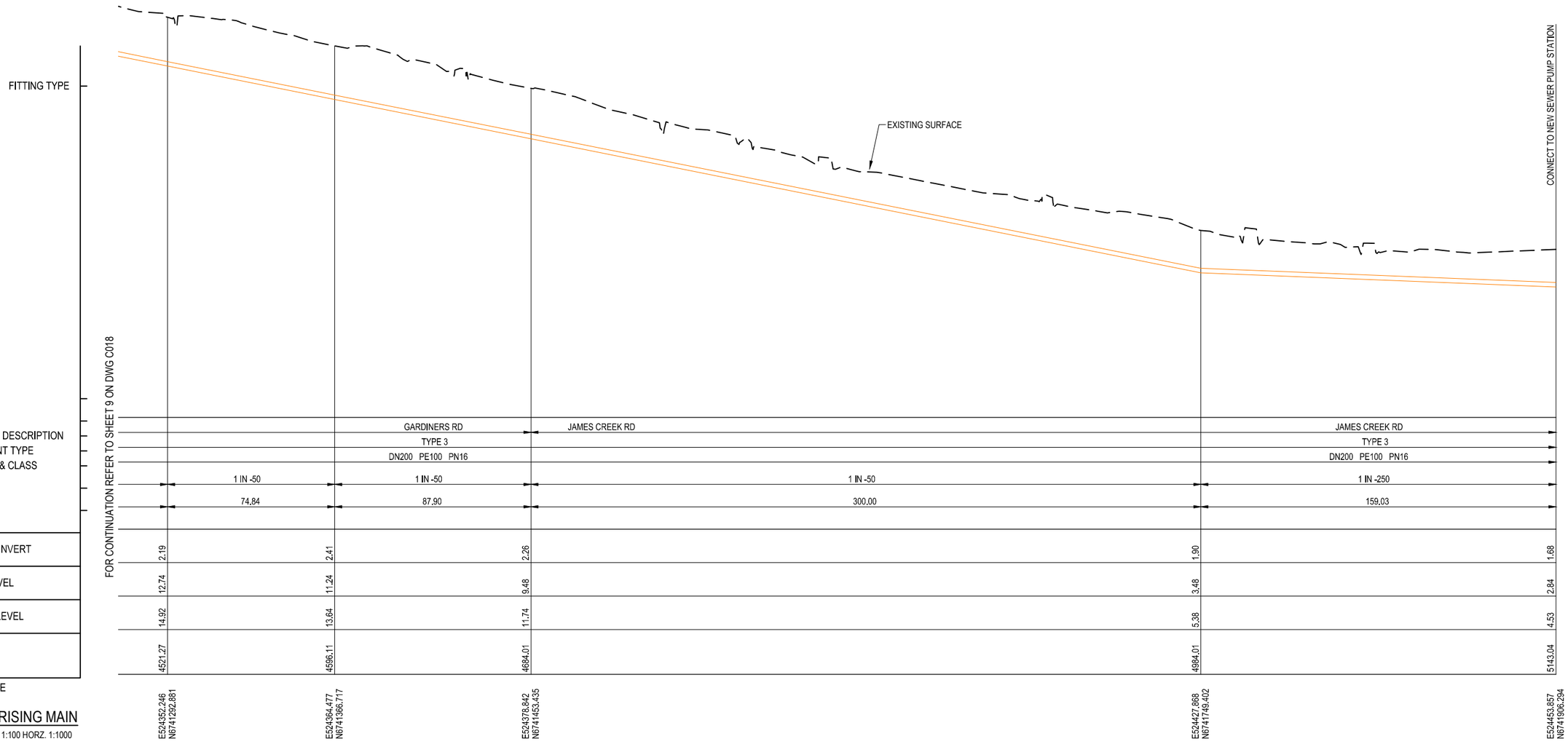

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PROPOSED SEWER RISING MAIN
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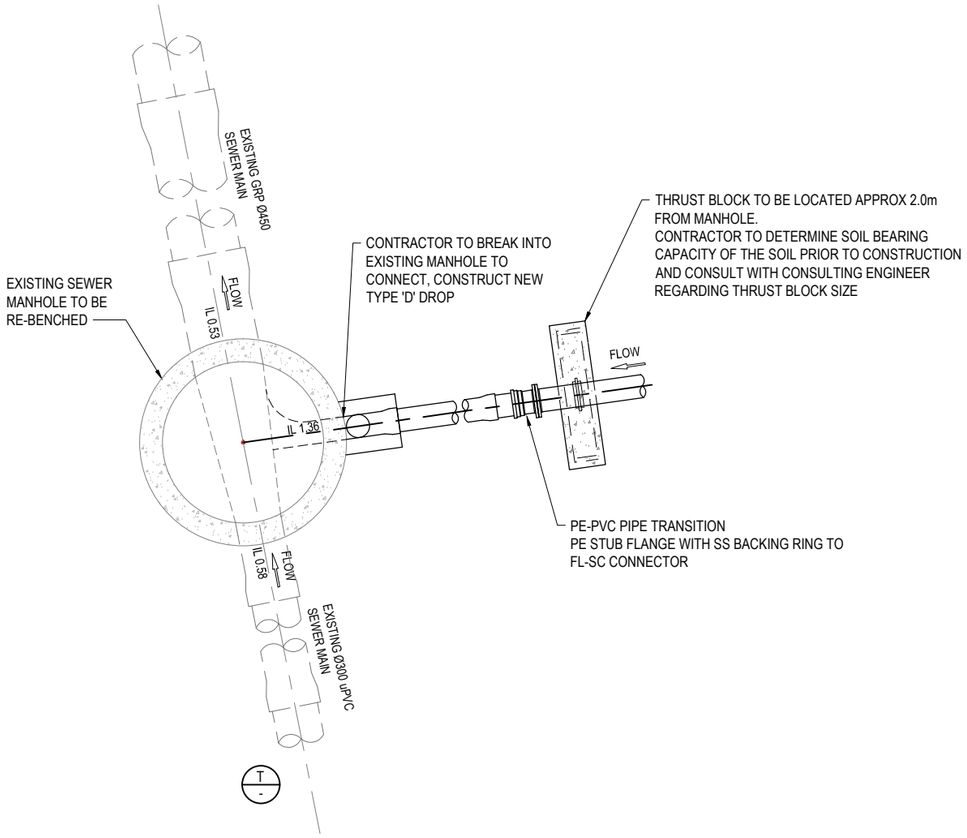
TITLE
SEWER RISING MAIN
LONGITUDINAL SECTION
SHEET 10 OF 10

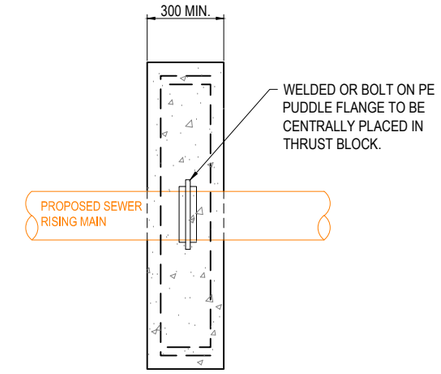
Job No.	Drawing No.	Rev No.
2022041-CC	C019	A

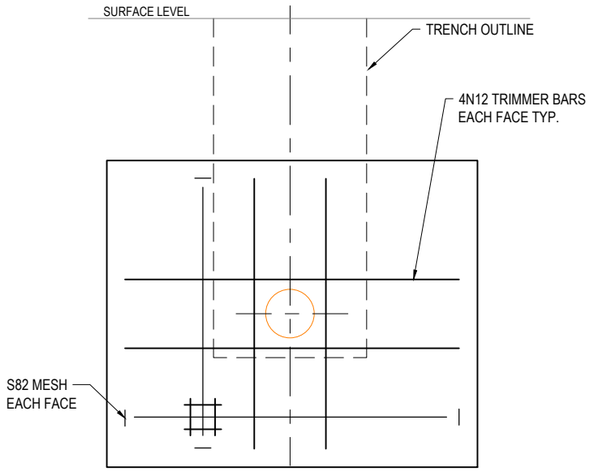


DIAMOND STREET EXISTING MANHOLE XA8 LIVE CONNECTION

SCALE: 1:20

SERVICE PROVIDER AND CONSTRUCTOR LIVE WORKS											
No.	DESCRIPTION	DIA SEWER	MH No.	MH/MS TYPE	COVER TYPE	LOT No.	F.S.L.	E.S.L.	EX.IL	I.L.	DEPTH TO I.L.
1(A)	CONTRACTOR TO BREAK INTO EXISITNG SEWER MANHOLE XA8 AND RE-BENCH UNDER COUNCIL SUPERVISION	150	XA8	1050DIA	-		-	3.061	0.58	1.36	1.701
1(B)	0.5m FROM STUB END CAP, CONTRACTOR TO LAY NEW RISING MAIN. AFTER CLEANSING, TESTING AND INSPECTING, NOTIFY CONTRACTOR AND COUNCIL.										
1(C)	UNDER COUNCIL SUPERVISION CONTRACTOR TO REMOVE TEMPORARY END CAPS ON STUB & RISING MAIN AND MAKE LIVE CONNECTIONS AFTER SUCCESSFUL "ON MAINTENANCE" INSPECTION.										





TYPICAL INLINE THRUST BLOCK DETAILS AT PE/NONE PE TRANSITIONS

SCALE NTS

DETAIL TO BE READ IN CONJUNCTION WITH WSA STD DWG WAT-1207-V FOR ALL STANDARD NOTES AND SPECIFICATIONS.

GENERAL SEWER NOTES:

1. REFER TO DWG C001 & C002 FOR DRAWING SET NOTES.
2. CONTRACTOR TO DETERMINE SOIL BEARING CAPACITY OF THE SOIL PRIOR TO CONSTRUCTION AND CONSULT WITH CONSULTING ENGINEER REGARDING THRUST BLOCK SIZE.

Willow+ Sparrow
ENGINEERING+DESIGN
Dillions Lane, Alstonville NSW 2477
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Email: michael@waseng.com.au
WILLOW & SPARROW PTY LTD A.C.N. 606732512

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

Certifier

Issue: ISSUE FOR APPROVAL

Designed	Drawn
GC	GC
Checked	Date
MC	01/04/22

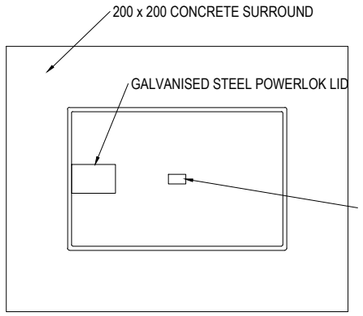
Issue	Description	Date	By
A	ISSUE FOR APPROVAL	01/04/22	

CLIENT
MPD INVESTMENTS PTY LTD

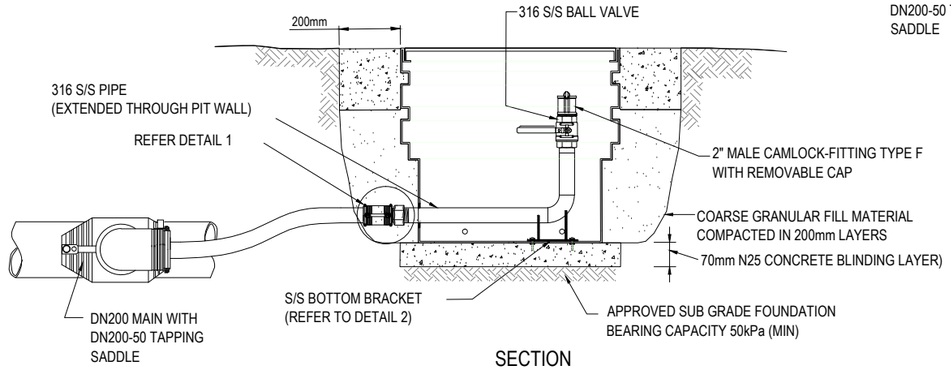
PROJECT
JAMES CREEK ROAD SUBDIVISION
PROPOSED SEWER RISING MAIN
JAMES CRK RD TO DIAMOND ST PUMP STATION

TITLE
SEWER RISING MAIN DETAILS
SHEET 1 OF 2

Job No.	Drawing No.	Rev No.
2022041-CC	C020	A



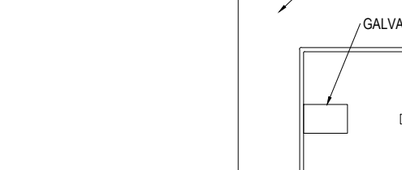
PLAN



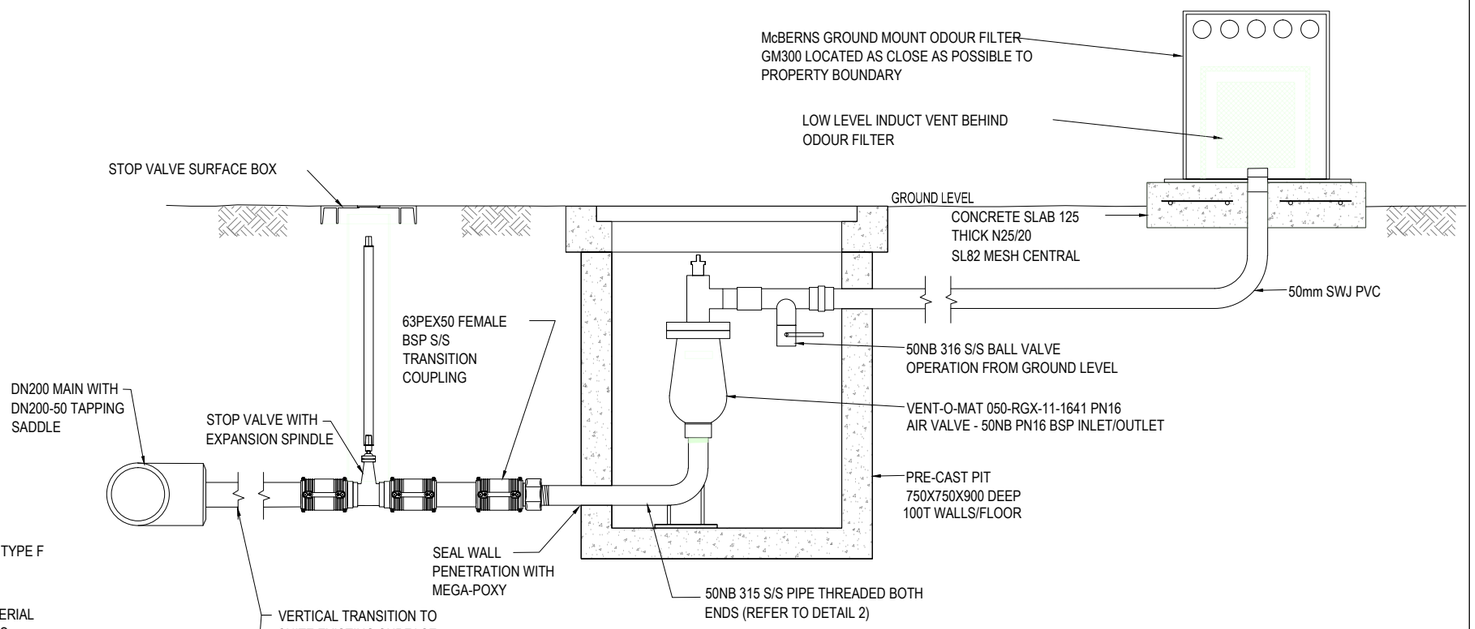
SECTION

POLY F.P BOX WITH GALV.STEEL LID

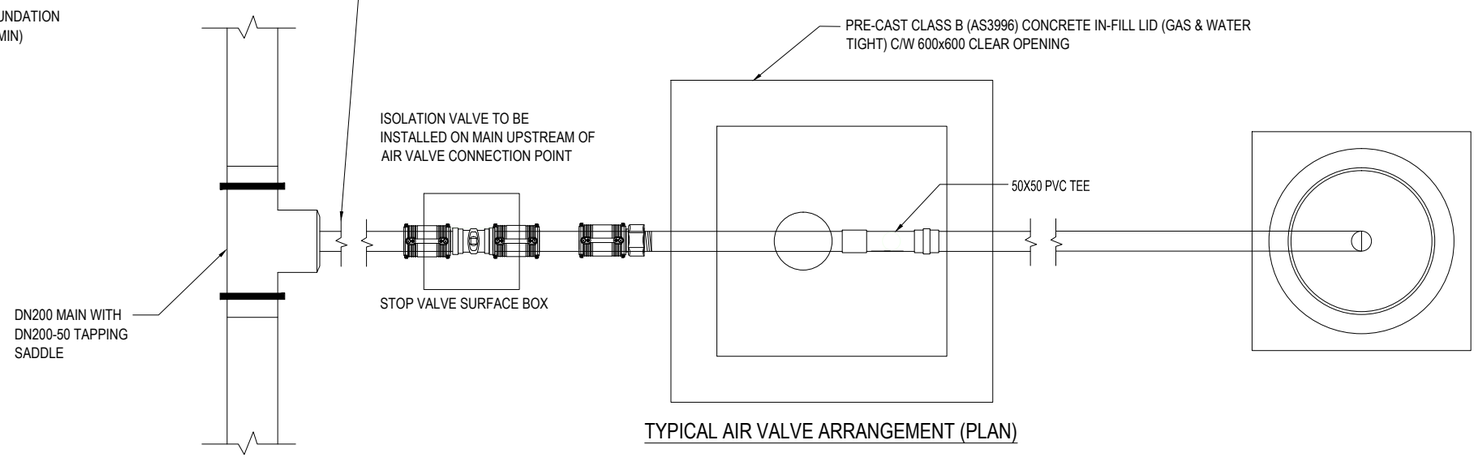
(PSS - FK10)



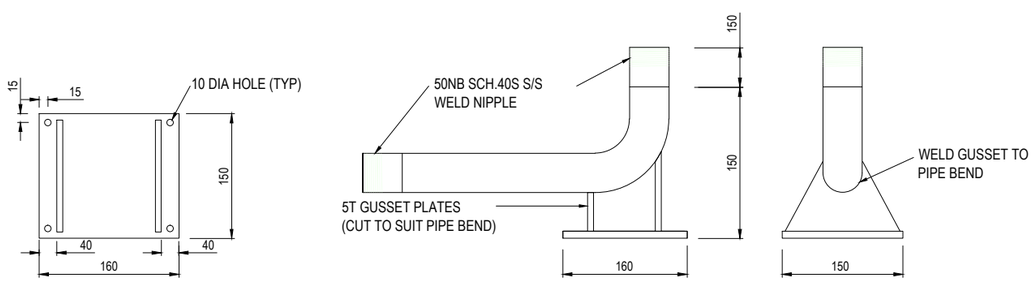
DETAIL 1 PE TO SS CONNECTION



TYPICAL AIR VALVE ARRANGEMENT (SECTION)



TYPICAL AIR VALVE ARRANGEMENT (PLAN)



DETAIL 2: SS PIPE SUPPORT BRACKET

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Scale	
Issue:	ISSUE FOR APPROVAL
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Drawn	GC
Checked	MC
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Issue	Description	Date	By
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PROJECT
JAMES CREEK ROAD SUBDIVISION
PROPOSED SEWER RISING MAIN
JAMES CRK RD TO DIAMOND ST PUMP STATION

TITLE
SEWER RISING MAIN DETAILS
SHEET 2 OF 2

Job No.	Drawing No.	Rev No.
2022041-CC	C021	A