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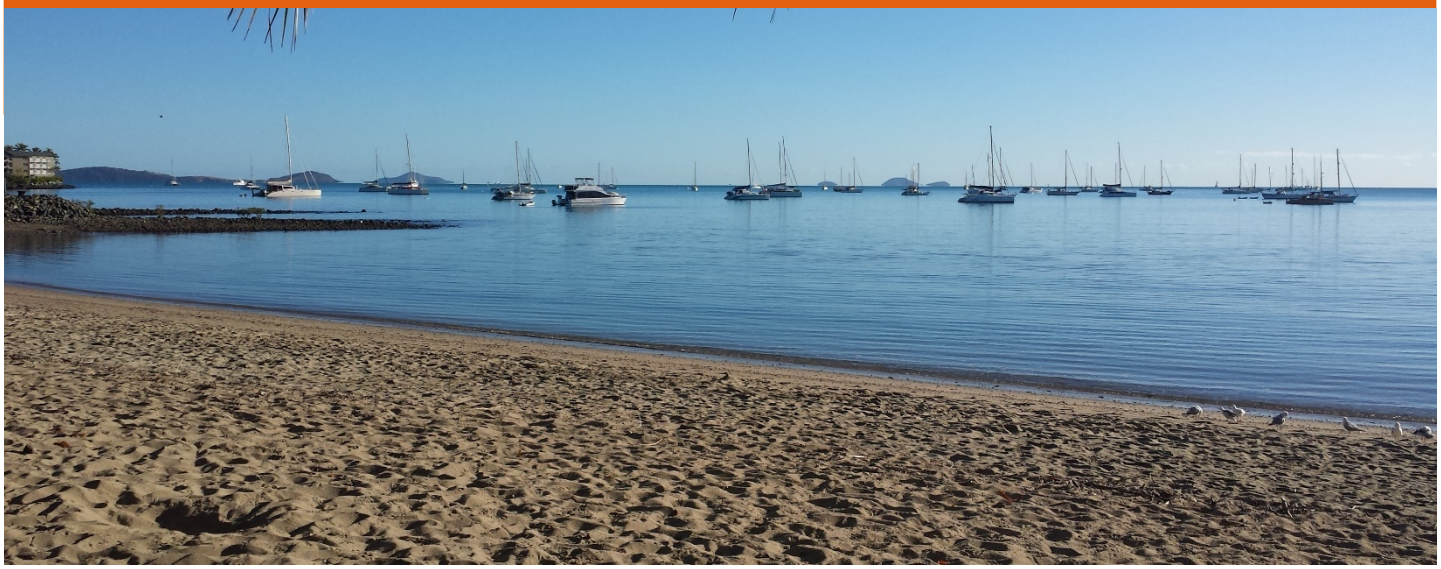
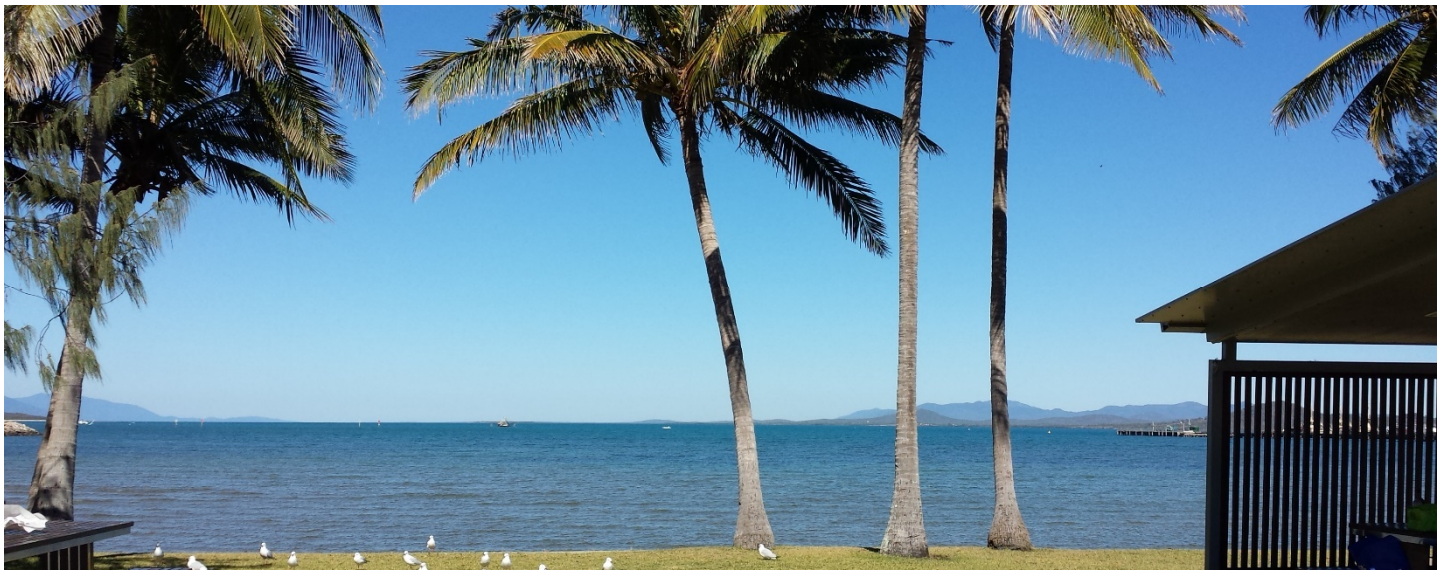
WHITSUNDAYS REGIONAL COUNCIL SEWER AND WATER NETWORK MODELLING

2020 LGIP OPTIMISATION

26 NOVEMBER 2020





Incorporating Hyder

WHITSUNDAYS REGIONAL COUNCIL
SEWER & WATER NETWORK MODELLING

2020 LGIP OPTIMISATION

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CONTENTS

1 EXECUTIVE SUMMARY 4

2 INTRODUCTION 6
2.1 BACKGROUND 6
2.2 PREVIOUS WORK 6
2.3 LIMITATIONS OF REPORT 7

3 PURPOSE OF REPORT 8

4 LGIP ASSESSMENT APPROACH 9

5 BASIS OF ASSESSMENT 10
5.1 UPDATED POPULATION PROJECTION 10
5.2 DESIGN SCENARIOS 11
5.3 DESIGN STANDARDS 11
5.4 OPINION OF COST ANALYSIS BASIS 12
5.5 WATER NETWORK HYDRAULIC MODEL BASE 13

6 WATER SUPPLY NETWORK MODEL AMENDMENTS 14
6.1 DEMAND GENERATION AMENDMENTS TO ALL WATER MODELS 14
6.2 WHITSUNDAYS WATER SUPPLY MODEL DEVELOPMENT 15
6.3 BOWEN WATER SUPPLY MODEL DEVELOPMENT 19
6.4 COLLINSVILLE WATER SUPPLY MODEL DEVELOPMENT 20

7 SEWER MODEL APPROACH AND AMENDMENTS 22
7.1 SEWER NETWORK ASSESSMENT DSS 22
7.2 SEWER MODEL DEVELOPMENT 22
7.3 SEWER MODEL DEMANDS 25

8 WRC WORKSHOP AND MCA 26
8.1 Initial Outputs 26
8.2 Workshop 26

9 WATER SCENARIO OUTCOMES 27
9.1 WHITSUNDAYS WATER NETWORK 27
9.2 BOWEN WATER NETWORK 33
9.3 COLLINSVILLE WATER NETWORK 35

10 SEWERAGE SCENARIO OUTCOMES 39
10.2 SEWERAGE COST ANALYSIS 44

11 DISCUSSION 50
11.1 INDIRECT IMPACTS 50
11.2 POLICY POSITION OPTIONS 50

12 CONCLUSION AND RECOMMENDATION 55

APPENDIX A 57
POTABLE WATER NETWORK AUGMENTATION MAPPING AND SUMMARY 57

APPENDIX B 58
POTABLE WATER NETWORK RESERVOIR ASSESSMENT SUMMARY 58

APPENDIX C 59
SEWER NETWORK AUGMENTATION MAPPING AND SUMMARY 59

APPENDIX D 60
SEWER NETWORK PUMP STATION ASSESSMENT SUMMARY 60

APPENDIX E 61
POTABLE WATER & SEWER NETWORK MCA ASSESSMENTS 61

APPENDIX F 62
INITIAL WATER NETWORK AUGMENTATION OUTPUTS PRE-WORKSHOP 62

APPENDIX G 63
INITIAL SEWER NETWORK AUGMENTATION OUTPUTS PRE-WORKSHOP 63

APPENDICES

APPENDIX A
POTABLE WATER NETWORK AUGMENTATION MAPPING AND SUMMARY

APPENDIX B
POTABLE WATER NETWORK RESERVOIR ASSESSMENT SUMMARY

APPENDIX C
SEWER NETWORK AUGMENTATION MAPPING AND SUMMARY

APPENDIX D
SEWER NETWORK PUMP STATION ASSESSMENT SUMMARY

APPENDIX E
POTABLE WATER & SEWER NETWORK MCA ASSESSMENTS

APPENDIX F
INITIAL WATER NETWORK AUGMENTATION OUTPUTS PRE-WORKSHOP

APPENDIX G
INITIAL SEWER NETWORK AUGMENTATION OUTPUTS PRE-WORKSHOP

1 EXECUTIVE SUMMARY

Whitsunday Regional Council's Water and Waste (Water and Waste) group are seeking explicit guidance from Whitsunday Regional Council (WRC) as a whole on strategic direction regarding water demand and demand management. To inform this discussion Whitsunday Water and Waste have commissioned Arcadis to assess WRC's water and sewer infrastructure and detail what augmentations/upgrades are required to meet projected future demand horizons in light of the recent Norling 2018 population estimation study. This assessment builds on previous Local Government Infrastructure Plan (LGIP) assessments and will provide an updated LGIP for WRC's water and sewer networks and assesses the value / costs of differing demand management / demand accommodative policy settings.

The LGIP infrastructure assessment (in which the current LGIP is based) and the recent revisions to the LGIP were developed based on current EP demands of 500L/EP/day. The outcome of these assessments indicate significant capital expenditure on infrastructure to meet the 2021 horizon and beyond. This impending cost burden was also identified in the 2016 Northern Whitsunday Water Supply Strategy completed by Arcadis and previous iterations of modelling undertaken by Arcadis (Then Hyder).

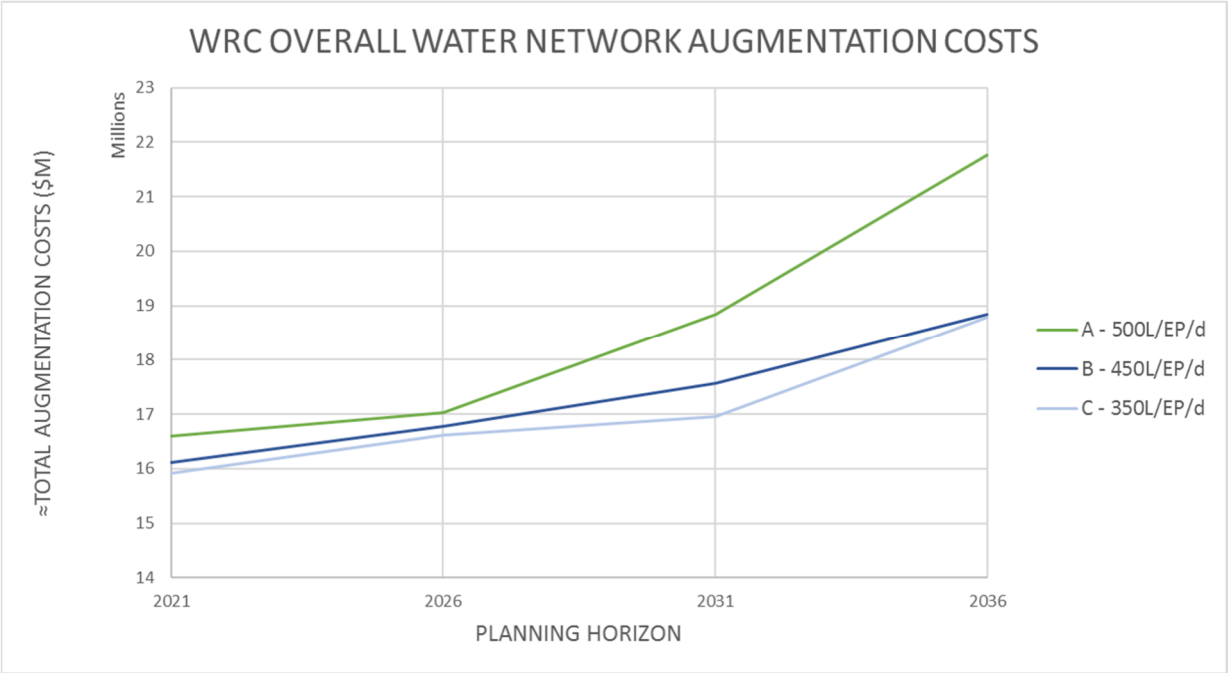
This report, prepared by Arcadis, with input from Water and Waste, for WRC, seeks to investigate demand management scenarios and apply them to WRC's water supply network model, developing infrastructure augmentations and resulting costs implications for each. From these outcomes, WRC should have a clear understanding of the potential impact for applying differing water demand management approaches to their water supply networks and the impact on WRC's financial future.

The assessment has identified augmentations that may be required to the WRC water supply network for varying demand profiles, demonstrating the significant impact design demand has on timing of network performance, infrastructure development and capital expenditure.

The study indicates that by implementing demand reduction options, some key/large infrastructure augmentations required to maintain desired services of standard to the network may be delayed to later design horizons or even omitted depending on the extent of the demand reduction.

When considering the substantial augmentation requirements, originally outlined in the 2016 WRC water strategy report, it is recommended that Council further investigate the opportunity to establish a water efficiency strategy which would allow for Council to delay a large number of augmentations to the network to later planning horizons. Depending on the adoption rate by the WRC community of the requested water demand targets, it may be possible to gradually decrease daily demand per person over a number of years, potentially achieving lower than 350L/EP/d.

Augmentation requirements are observed to increase in direct proportion to the assigned demand per EP, with the following graph illustrating the overall water network augmentation costs per assessment option.



Assessment of the lower demand options demonstrates that the most notable augmentations required to the network may be implemented during later horizons or even omitted depending on the extent of the reduction, with progressively decreasing network augmentation requirements as per person demand decreases in the assessed option B (450L/EP/d) and option C (350L/EP/d). This will allow for a lower long term water price.

WRC should note that there is a potential saving of up to ≈$1M of pipework infrastructure CAPEX for the 2021 horizon if water consumption per EP is dropped by 150l/EP/D from 500 down to 350 L/EP/Day. This is a clear indication of the effectiveness of water demand management and the direct impact, with increasing savings in augmentation requirements and CAPEX in future planning horizons.

2 INTRODUCTION

On behalf of Whitsunday Regional Council (WRC), Whitsunday Water and Waste have commissioned Arcadis to carry out an update to the Local Government Infrastructure Plan for water and sewer reticulation networks within the Council's regions. This includes application of the estimated population growth as per the 2018 Norling report across the required demand horizons through to 2036.

In addition, Arcadis have been asked to build on the previously completed Water Supply Strategy completed in 2016 which sought focus on the potential of capital and operational expenditure reduction via a demand (reduction) management program, if WRC elected to pursue a policy change.

Different policy settings can encourage water efficiency, through demand management, and defer these projects, improving Whitsunday Water's and WRC's financial position. Other policy settings can encourage less efficient water consumption behaviours and may lead to larger capital works programs, which would necessitate additional funding.

Key outcomes of this report will show how the implementation of a water demand management strategy (water use reduction) will allow for the delay in capital expenditure around augmentation of infrastructure and the requirement to source additional raw water supplies.

Therefore, the dual purpose of this assessment is to:

- Provide high level costed options regarding infrastructure upgrade requirements over the next 20 years; and
- To guide WRC on further refinement of a general policy direction on water usage and rates and usage, from which can be analysed further and defined with additional clarity as required.

2.1 BACKGROUND

WRC relies on allocations from the Peter Faust Dam for our raw water, for our communities of Bowen, Cannonvale / Airlie and Proserpine. The WRWSSA Report undertaken by Council and the Queensland Department of Energy and Water Supply in 2016 identified a mid-term limit to WRC's water security (circa 2036 at 2013-16 per person water consumption).

Further studies into the groundwater reliability from the Don River alluvium have demonstrated that whilst important, this groundwater resource does not have urban reliability characteristics. This further frames WRC's water security perspective as being a finite resource that will need to be carefully managed in the short to medium term.

2.2 PREVIOUS WORK

2.2.1 Regional Water Strategy 2016

A regional water strategy for the Whitsunday Regional Council was developed by Arcadis and adopted by Council in April 2016. This assessed all stages of the Water supply from source to supply including:

- current and future water supply demands,
- available water supply sources , existing, future and alternative
- trunk lines and Water treatment plant limitations

the report indicated water source and treatment availability in the short term, but medium to long term shortages based on current water demand levels. In addition to exploring local and regional new raw water sources, the strategy investigated the potential for reducing water usage within the WRC water supply area through a water demand management program. Key outcomes of the strategy included:

- Water consumption at the current rate will result in the requirements of a new raw water source by 2036, and development of recycled water system by 2030.
- Reduced water consumption over the next 6 years negates the need for a new water source to well beyond 2036.

Refer to document number 0009-AA008791-AAR-04 North Whitsunday Water Strategy for further information.

2.2.2 2014 LGIP

Previous relevant studies undertaken by Arcadis to assess WRC network performance and augmentation requirements include the 2014 LGIP study, which sought to assess sewer network augmentation requirements and water network augmentation requirements under the baseline 500L/EP/d demand. This 2014 Network Model Update Report built upon the network models illustrating upgrade requirements based on 2014 population predictions and DSS, that were used as the base for this updated 2020 LGIP assessment. Refer to document number ***'0001-AA006631-AAR-02'*** for further details on the 2014 Network Model Update.

2.2.3 2017 LGIP

A subsequent study to the 2014 LGIP study, was undertaken focusing on the Whitsundays potable water network, involving the introduction of the future 12.5ML Cannon Valley reservoir, allowing for gravity service to the entire Whitsundays water catchment based on its central location and elevation. This 2017 Whitsundays water model and LGIP update also assessed the sensitivity of demand management beyond the baseline 500L/EP/d allocation to determine impacts on augmentation requirements, with all relevant outputs and conclusions contained in the Whitsundays Regional Council Cannonvale Water Network Modelling report '***0008-AA009827-AAR-02'*** to be referred to for further information regarding this 2017 study.

2.3 LIMITATIONS OF REPORT

The outcomes of this Report are based on the base WRC hydraulic models adjusted by Arcadis from information provided by Whitsunday Regional Council. The information is at a master planning level. As such, the outputs (including opinion of costs) are at the feasibility stage and will require further information from preliminary through to detailed designs to refine final construction details.

The aim of this report is to inform key stakeholders of the required infrastructure augmentation to the system over the next 20 years and also the impact water demand management can have on infrastructure program costs and eventually on revenue. Arcadis take no responsibility for the information provided within this report if used by a third party and or/outside of its intended use.

3 PURPOSE OF REPORT

The purpose of this technical report s to undertake an assessment of the performance of WRC's water and sewer network models under the updated Norling 2018 population projection estimates and determine an updated 2020 LGIP set to allow all WRC networks to perform at the required Desired Standards of Service in accordance with the current WRC Development Manual.

The impact of demand management on potable water networks has also been included to assess sensitivity of demand assumptions on WRC LGIP requirements. By assessing different water use demands (above and below the current modelling) for future planning horizons up to 2036, WRC's key stakeholders will be able to understand the potential for delaying (or bringing forward) capital expenditure identified in the LGIP.

The LGIP update also serves as a review tool against previous LGIP recommendations, identifying augmentations carried out and those still outstanding. It can also reclassify and re-prioritise outstanding programmed LGIP upgrades based on new population growth estimates.

4 LGIP assessment Approach

To carry out the LGIP assessment and a review of the impact of water demand management the following steps were taken.

- Basis of assessment –
  - Population update - This included a review of all inputs including, population estimates, spatial distribution of new populations,
  - Design standard review (DSS) and scenario development
  - Model review and update including update of all physical inputs (pipe ID's, material type, invert levels, location, size)
  - Development of an opinion of cost approach
- Initial model outputs for review – assessment was based the Whitsunday Regional Council Development Manual
- Review and discussion with WRC staff on LGIP outputs via a workshop where prioritisation ranking of proposed water infrastructure was developed via a Multi-criteria Analysis.
- Update of model and LGIP updates based on workshop MCA

The above is covered in the following sections of the report.

5 BASIS OF ASSESSMENT

5.1 UPDATED POPULATION PROJECTION

All WRC water and sewer hydraulic network model Scenarios have been updated to reflect the latest Norling 2018 population estimate study. An extract of the total population estimate difference between the 2013 & 2018 revisions of the Norling population estimates are illustrated in Figure 5-1 below.

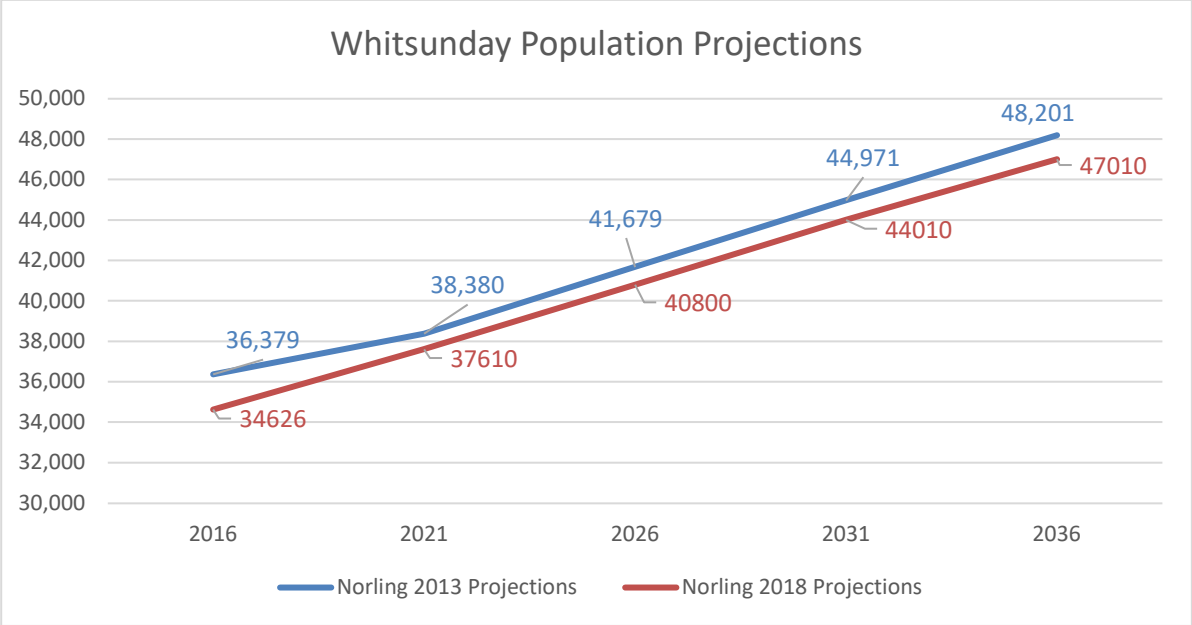


Figure 5-1 Norling 2013 vs 2018 Review Extract – WRC Population Projections

The statistics for the relevant catchments within WRC are summarised in Table 5-1 below.

Table 5-1 Norling 2018 Population Projection Summary

CATCHMENT	2016	2021	2026	2031	2036
Bowen	9290	9330	10320	10920	11250
Collinsville	3496	3690	3710	3830	3840
Airlie-Whitsundays	13011	15090	17490	19740	22180
Proserpine	8829	9040	9280	9520	9720
Whitsundays Region (TOTAL)	34626	37610	40800	44010	47010

As shown population estimates have dropped overall, with over a 1000 EP's less estimated at the 2036 planning horizon. It should be noted that this is slightly misleading, as all regions had reduced from the 2014 estimates except Proserpine, which has risen significantly.

5.2 DESIGN SCENARIOS

5.2.1 WATER DESIGN SCENARIOS

To assess the impact of water demand management, adjustment of the water demand per EP was carried out. The demand management can be adjusted downwards via managed restriction or water use awareness. The following modelling scenarios were developed:

- Option – A – Base/Business as usual – 500 L/EP/d. Reflects current planning and water use, and what was adopted in all LGIP planning currently completed – this is considered the base case of which to assess impacts water management against.
- Option B – Modest 10% water use reduction of Base option A – 450L/EP/d; and
- Option C – Moderate 30% water use reduction of Base option A – 350L/EP/d.

5.2.2 WATER DEMAND SCENARIOS

To analyse the impact of reducing water demands, several new demand levels (as above) for each planning horizon were developed. The levels reflect a decrease in the estimate of water use per Equivalent Person, applied uniformly across all model demands and modified to the following:

- Option A – 500 L/EP/d
- Option B – 450 L/ EP/ d (modest efficiency 10% reduction); and
- Option C – 350L/EP/d (moderate efficiency, 30% reduction).

The resulting Average Day (AD) demands and modelled scenarios are summarised in Table 5-2 below.

Table 5-2 Average Day Demand

Catchment	2021 AD (ML/d)			2026 AD (ML/d)			2031 AD (ML/d)			2036 AD (ML/d)		
	A	B	C	A	B	C	A	B	C	A	B	C
WHITSUNDAYS	12.07	10.86	8.45	13.39	12.05	9.37	14.63	13.17	10.24	15.95	14.36	11.17
BOWEN	4.67	4.20	3.27	5.16	4.64	3.61	5.46	4.91	3.82	5.63	5.06	3.94
COLLINSVILLE	1.85	1.66	1.29	1.86	1.67	1.30	1.92	1.72	1.34	1.92	1.73	1.34

5.3 DESIGN STANDARDS

The assessment has been completed in accordance with the following standards:

- Whitsunday Regional Council Development Manual:
  - D5 Water Reticulation
  - D6 Sewer Reticulation
  - S5 Water Reticulation
  - S6 Sewer Reticulation

- Water Services Association:
  - WSA 03 Water Supply Code
  - WSA 02 Gravity Sewerage Code
  - WSA 04 Sewerage Pumping Station Code
  - WSA 07 Pressure Sewerage Code

The Desired Standards of Service (DSS) for water supply adopted from the abovementioned design standards are shown in Table 5-3 below.

Table 5-3 Water Supply Adopted Desired Standards of Service (DSS)

Criteria	Standard
Minimum pressure	22m
Maximum pressure	80m
Minimum residual pressure under fire flow conditions	12m at hydrant
Reservoir storage	3 (PD – MDMM) + (Greater of Emergency Storage/Firefighting Storage)
Elevated reservoir storage	6 (PH – MDMM/12) + firefighting reserve
Maximum velocity	2.5m/s generally and up to 4m/s under fire flow conditions
Treated water pumps feeding ground level reservoir	MDMM over 20 hours
Treated water pumps feeding an elevated reservoir	6PH – reservoir operating volume

5.4 OPINION OF COST ANALYSIS BASIS

All opinion of costs developed were based on rates from the 2013 Unit Rates Report as prepared by Cardo for the Gold Coat City Council. The Unit Rates Report has been in circulation since 2002 and is revised on a regular basis by various Engineering Consultants. (The current edition of the document has been prepared by Cardno in 2013). Its costings are seen as relevant for preparing comparisons on water and waste capex works at the LGIP level. Several unit rates were cross checked against recent construction projects to verify appropriateness of cost.

Capex costs include the following:

- 40% contingency in line with high level cost estimate;
- 10% regional cost increase based on the Rawlingsons Australian Construction Handbook 2014 building indices;
- All costs are in a present value basis and as such inflation is not accounted for; and

- Upgrade to pump stations, pumps, wet well size, as required per option. Note it was assumed that all pump station upgrades were limited to pumps, pipework and electrical upgrades, with no change to pump station building sizes;

Exclusions:

- De-commissioning of any pump stations;
- Pump station building upgrades.

The costs developed have been estimated infrastructural capital and operational costs only with no allowance for site survey, design or management, and should not be used for any purpose other than feasibility comparison given in this report.

5.5 WATER NETWORK HYDRAULIC MODEL BASE

The following Base networks were adopted for the 2020 LGIP optimisation. Further amendments to the hydraulic model were carried out and is discussed in section 6 of this report.

Whitsundays Network:

The model used for this hydraulic assessment is as per the revised LGIP assessment undertaken in late 2017, with the same assumptions and exclusions – refer to Sections 3 & 4 of Report 0007-AA009827-AAM-02 'Cannonvale Water Supply Trunk Network Isolation' dated 17/11/2017.

Bowen and Collinsville Networks:

The models used for this hydraulic assessment is as per the 2014 network model update and associated '2014 Network Model Update Report' dated 1/08/2014. Refer to this report for information pertaining to the initial set up of this model, superseded by all amendments undertaken as part of this study and mentioned within this report.

6 WATER SUPPLY NETWORK MODEL AMENDMENTS

6.1 DEMAND GENERATION AMENDMENTS TO ALL WATER MODELS

A key modification to the definition of the hourly diurnal pattern was applied across all WRC water network models prior to undertaking of the 2020 LGIP revision. This was aimed at standardising the assessment of network performance based on the current WRC Development Manual criteria.

Demand generation criteria as define by the WRC Development Manual are as follows:

- Average Daily Consumption (AD) = 500L/EP/d
- Mean Day Max Month (MDMM) = 1.50 x AD
- Peak Day (PD) = 2.25 x AD
- Peak Hour (PH) = 1/12 x PD

In the above, peak hour consists of a 2x instantaneous increase in PD flow rate (L/s) over the duration of one hour representing the peak hour of the peak day. Therefore, the peak hour multiplier of the diurnal patterns utilised to represent residential, commercial & industrial flows has been assigned as 2 as the WRC development manual does not differentiate different peak factors between differing development types. This is done whilst maintaining the overall demand throughout the day to still match total peak day demand volumes.

Past 2014 revisions of the network models utilised different diurnal patterns for residential, commercial and industrial loadings hitting the following peak factors:

- Residential = 2.1x
- Commercial = 1.5x
- Industrial = 1.5x

An example comparison of the previous vs updated diurnal pattern for industrial developments is included in Figure 6-1 below.

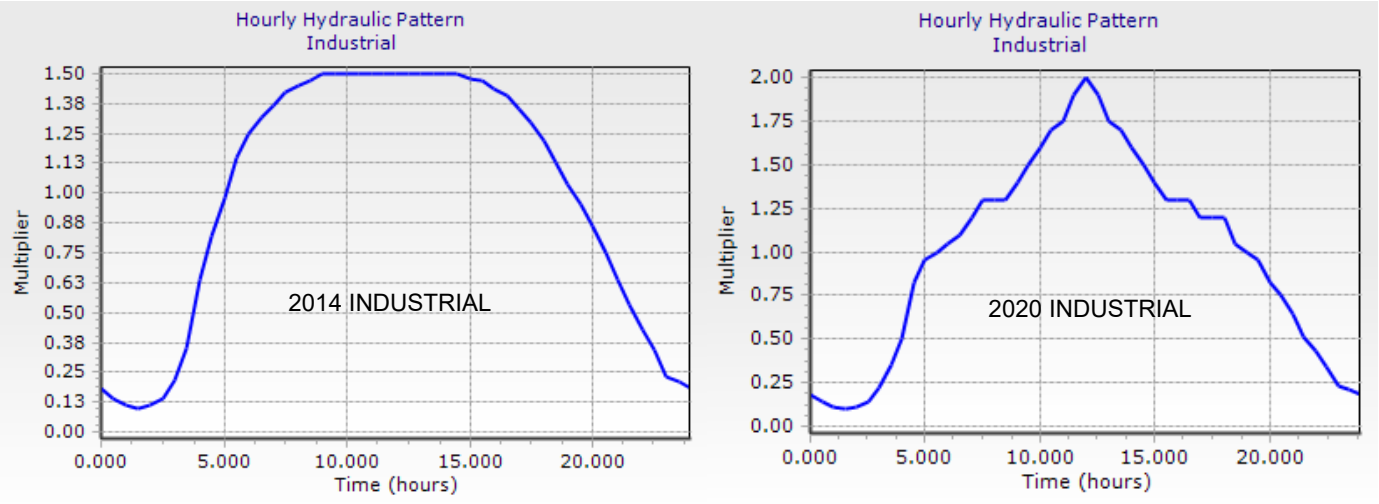


Figure 6-1 2014 Industrial Diurnal Pattern vs Current 2020 Updated Industrial Diurnal Pattern

6.2 WHITSUNDAYS WATER SUPPLY MODEL DEVELOPMENT

The hydraulic modelling undertaken in this assessment has been based on the base model Water Cad model established following the Arcadis 2017 Whitsundays Water Supply Trunk Network Isolation Report and associated updates to the Cannonvale (Whitsundays) potable water network model and revised 2017 LGIP for this network. This base model previously identified a list of LGIP augmentations for implementation into the network for adequate operation of the network under multiple assessment horizons, namely 2014, 2016, 2021, 2026, 2031 and 2036.

Following the introduction of the new 12ML Cannon Valley reservoir and rework of network operation, a new asset has since been included in this study. The bulk water pipeline constructed from the Proserpine WTP to downstream of Booster 2, consisting of an 559OD MSCL pipeline (523mm ID) ≈9300m in length, has been included in this revision of the Whitsundays water model which greatly improves transfer capacity of Proserpine WTP to the new Cannon Valley reservoir.

A number of other updates were subsequently identified to ensure the potable water supply model remains current and based on the latest information available which may not have been available at the time of the previous update iteration, sourced via communication with WRC and further described in the sections below.

6.2.1 TRUNK-RETICULATION CONNECTIONS

Following the update of the water supply model to reflect the most current information made available to Arcadis and with the inclusion of the new 12ML Cannon Valley reservoir, the trunk water supply line originating from Booster 2 pump station south of Whitsunday Quarry carrying water through Cannonvale, Airlie Beach, Jubilee Pocket and Shute Harbour was investigated. This investigation primarily focused on the multiple interconnections between this trunk water supply line and the adjacent reticulation network. The performance of the network following decommissioning of these interconnections was assessed in the 2021 planning horizon to determine the impact to the network's performance. A summary of the interconnecting pipes deactivated in this assessment is included in Table 6-1 below.

Table 6-1 Trunk / Reticulation Interconnections

Pipe Label	Diameter	Material	Start Node	Stop Node	Status
CanW371	225	DICL	BS56	BS158A	Deactivated
CanW333	225	DICL	BS166	BS160	Deactivated
CanW23	225	AC	BS184	BS161	Deactivated
CanW419	225	AC	BS182	BS183	Deactivated
CanW254	150	uPVC	BS171	CA204	Deactivated
CANW399	100	uPVC	BS262	CA281	Deactivated
CANW354	225	DICL	BS209	BS210	Deactivated
AirW138	225	DICL	BS212	BS211	Deactivated
AirW122*	100	DICL	BS227	AB76	Active*
AirW45	225	DICL	BS228	BS97	Deactivated

Pipe Label	Diameter	Material	Start Node	Stop Node	Status
AirW75 (on)	225	uPVC	BS176	AB38	Active
BS313_AB122	200	CIOD	AB122	BS314	Deactivated
BS99_BS98	200	DICL	BS98	BS99	Deactivated
BS229_AB130	200	PVC-M	AB130	BS229	Deactivated
P-176	250	DICL	BS254	BS253	Active
JubW131	250	DICL	BS253	BS254	Active
JubW129	200	MSCL	BS252	BS251	Deactivated
JUBW127	200	DICL	BS250	BS249	Active

**Reactivated since 2017 LGIP/Trunk Isolation Assessment*

6.2.2 BULK WATER PIPELINE

Following the introduction of the new 12ML Cannon Valley reservoir and rework of network operation, a new asset has since been included in this study. The bulk water pipeline constructed from the Proserpine WTP to downstream of Booster 2, consisting of an 559OD MSCL pipeline (523mm ID) ≈9300m in length, has been included in this revision of the Whitsundays water model which greatly improves transfer capacity of Proserpine WTP to the new Cannon Valley reservoir. This bulk water pipeline is supplied via a three parallel pump setup, comprised of 3x Flowserve Hydrotitan 150x125-315 pumps @ 301mm impellers.

6.2.3 MODEL DEMAND GENERATION – PEAK DAY ASSESSMENTS

A notable change has been applied to all peak day scenarios of the Whitsunday model, involving the change of the base demand applied to all junctions from the previously specified AD demand to the required PD demand as per the WRC development manual criteria for assessment of standard flow performance and reservoir performance. This change results in 2.25x the water demand applied to the entire Whitsundays model catchment, directly impacting the previously assumed network performance estimates. All other WRC water network models were set to peak day demands under PD assessment scenarios therefore this modification only applies to the Whitsundays water network model.

6.2.4 RESERVOIRS

The addition of the 12ML Cannon Valley reservoir into the model, has resulted in substantial change to the network. Physical and operational parameters were then reviewed to optimise operation of the systems reservoirs.

A breakdown of key reservoirs including amendments to operational characteristics is included below. The controls listed below can be subjected to minor adjustments to vary the operating levels of the listed reservoirs to operate between the desired levels based on operational preferences.

6.2.4.1 NEW 12ML RESERVOIR – CANNON VALLEY SITE

The proposed 12ML Cannon Valley reservoir has been modelled to the following specifications:

Physical Parameters

- Base elevation = RL89.0m
- Maximum elevation = RL102.0m
- Diameter = 39.41m

Operation

- Reservoir controlled by operation of Booster 2 pump station,
- If water level at Cannon Valley reservoir < RL91.0m, then booster 2 is on
- > RL100.00m, then booster 2 is off
- Pressure Reducing Valve (PRV) proposed prior to connection into reticulation network – set to decrease HGL to 70m prior to connection into reticulation network between the 2021 to 2031 horizons, increasing to 75m in the 2036 horizon.

A Pressure Reducing Valve (PRV) is proposed for implementation on the reservoirs reticulation supply line, due to the available static head at it's location. This then reduce pressures in the low-lying areas of the network being supplied via this reservoir and ensures the Coyne Rd Low Level reservoir is utilised as the supply reservoir for the majority of the residential areas in its vicinity by overcoming the head supplied via the proposed Cannon Valley reservoir.

6.2.4.2 EXISTING 12ML CANNONVALE RESERVOIR

The existing 12ML Cannonvale reservoir previously controlled via Booster 2 pump station has been modified for control via flow control valve to regulate trunk supply to this reservoir dependant on water level within.

Operation

- Reservoir controlled by operation of TCV-6 flow control valve,
- If water level at Cannon Valley reservoir < RL78.20m, then TCV-6 is open
- > RL79.70m, then TCV-6 is closed

The trunk supply network from the existing 12ML Cannonvale reservoir to the Airlie Beach, Jubilee Pocket and Shute Harbour area to the east has been disconnected from the main trunk feed originating from Booster 2 and the new 12ML Cannon Valley reservoir. This is done to ensure the areas to the east listed above are supplied via the existing Cannonvale reservoir to ensure maximum pressures in these areas remain below the DSS maximum of 80m pressure.

6.2.4.3 EXISTING COYNE ROAD LOW & HIGH LEVEL RESERVOIRS

The existing Coyne Road Low Level (LL) reservoir and Coyne Road High Level (HL) reservoir have been modified to meet the operating pressure DSS in the adjacent elevated service area and eastern residential areas. Presently, the only feed from Coyne Road LL supplies pump station WCPS03 pumping to Coyne Road HL, with the outlet from the pump station also connected to the adjacent reticulation network supplying lower lying areas. Due to the lack of a direct gravity feed, Coyne Road LL is substantially under-utilised. This is exacerbated by the connection between low lying areas and the elevated area adjacent to the Coyne Road HL leading to too large of a demand being applied on Coyne Road HL and its subsequent emptying following isolation of the trunk and supply networks.

6.2.4.3.1 COYNE ROAD LOW LEVEL

This reservoir is filled via gravity trunk supply from the new Cannon Valley reservoir.

Operation

- Reservoir controlled by operation of TCV-2 flow control valve,
- If water level at Coyne Rd LL reservoir < RL71.40m, then TCV-2 is open
- > RL73.20m, then TCV-2 is closed

Under-utilisation of this reservoir has been flagged as an issue with the existing system configuration. A direct connection to the gravity network adjacent to the tank allows this reservoir's use to be optimised and service the lower lying residential areas in the vicinity of the LL reservoir. This involves the implementation of a gravity supply pipeline from the LL reservoir to the existing network at the intersection of Shute Harbour Rd & Tropic Rd N, along with further smaller augmentations to strengthen the water supply to the surrounding areas. These augmentations detailed in Appendix A allow for the adequate utilisation of the Coyne Rd LL reservoir.

Under higher loading circumstances (beyond Average Day), the demand drawn by the main reservoirs in the northern network cause the HGL within the trunk supply line to drop too low to supply the Coyne Rd High Level reservoir via gravity. To mitigate this, it is proposed to utilise the Coyne Rd HL Pump Station during such events. Doing this will ensure a steady pumped supply to Coyne Rd HL reservoir during lower HGL events, whilst supplying the Coyne Rd HL reservoir via gravity the rest of the time.

6.2.4.3.2 COYNE ROAD HIGH LEVEL

Following the implementation of the 12ML Cannon Valley reservoir, the head within the trunk supply line is high enough to fill the Coyne Road HL tank via gravity under low to average demand conditions. However, the head within the trunk supply line at the connection point to Coyne Road HL tank is observed to fluctuate at various instances due to reservoir filling patterns.

It is proposed to connect the inlet of the Coyne Rd HL pump station direct from the trunk supply line to minimise any impacts to the capacity of the Coyne Rd LL reservoir and utilise the higher pressures available within the trunk supply line to reduce pump capacity requirements.

As such, it is proposed to maintain operation of Pump Station WCPS03 to pump water to the Coyne Rd HL tank in case the HGL at the connection point is insufficient, however primary operation of the Coyne Rd HL tank will attempt to feed via gravity from the trunk supply pipeline under low to average demand conditions and available head allows for gravity fill, with the option to pump direct from the trunk supply in cases where this is not possible.

There may be potential to alter the magnitude of head fluctuation at the Coyne Rd HL tank connection point via a more detailed assessment of the water supply network and establishment of restrictions to reservoir filling rates and staggering of reservoir filling times – whilst maintaining DSS.

Operation

Reservoir controlled by operation of TCV-6 flow control valve,

- If water level at Cannon Valley reservoir is: < RL94.45m, then TCV-6 is open
- > RL95.5m, then TCV-6 is closed

The residential area located south of Coyne Road LL in the vicinity of Panorama Ct generally lies at elevations RL45m+ reaching up to RL53.7m. This is beyond the service range of Coyne Rd LL to achieve adequate minimum pressure. As such, augmentations are proposed to service this elevated area via the Coyne Rd HL reservoir and isolating this area from the network supplied via Coyne Rd LL and illustrated in the augmentation summary maps provided in Appendix A.

The proposed isolation valves have been implemented in the following pipes:

- CanW143
- CanW137
- P-872
- P-845
- P-877

Implementation of the augmentations and operational changes discussed above allows for the Coyne Rd LL and HL reservoirs to be better utilised and replaces the previously identified LGIP upgrade of the Coyne Rd HL tank following clear definition of the elevated zone serviced via this tank.

6.2.5 PUMP STATIONS

The model used for the hydraulic assessment is as per the revised LGIP assessment undertaken in late 2017, with the same pump amendments and configuration – refer to Section 4.1 of Report 0007-AA009827-AAM-02 'Cannonvale Water Supply Trunk Network Isolation' dated 17/11/2017.

6.3 BOWEN WATER SUPPLY MODEL DEVELOPMENT

6.3.1 CATCHMENT ISOLATIONS

The Bowen town centre area surrounding the reservoir site has been managed via the use of isolation valves to separate certain catchments to allow for more control of water allocation over the system. The areas south of Bowen have been split into separate south-east and south-west catchments, with proposed isolation valves implemented in the following pipes. These are illustrated as the orange separation in Figure 6-2 below.

- P-2100
- P-1646
- BA114A730
- B71A813
- P-2094
- BA113A623
- P-1640
- P-1638
- B125132

An additional two isolation valves have been included in the northern area within the Bowen south-west catchment to further separate this south-western network from northern demands, with proposed isolation valves implemented in the following pipes. These are illustrated as the green separation in Figure 6-2 below.

- BA282A284
- BA280A281

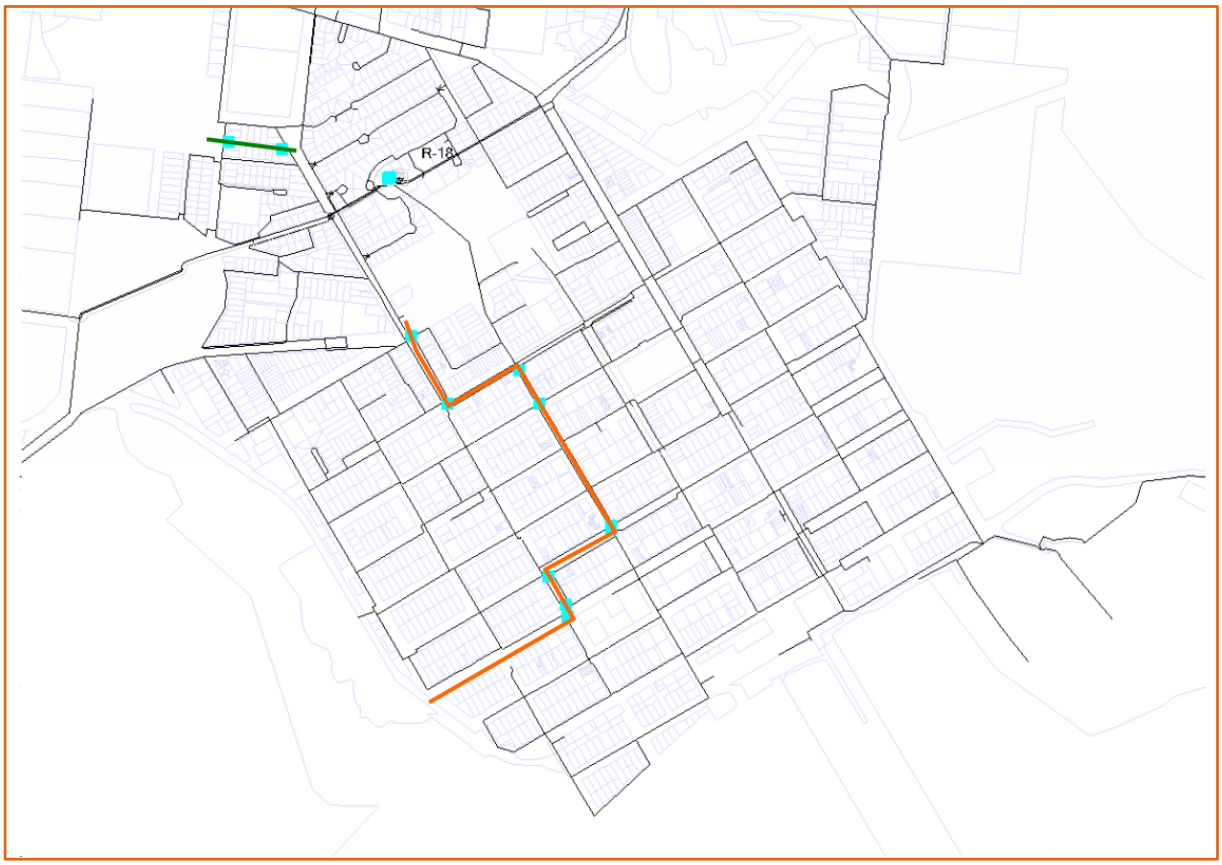


Figure 6-2 Bowen Town Centre Isolation Map

6.4 COLLINSVILLE WATER SUPPLY MODEL DEVELOPMENT

6.4.1 CATCHMENT ISOLATIONS

Similar to the Bowen network, an isolation valve set is proposed in the Collinsville water network east of the Peter Delemothe Rd high level tanks, aimed at separation of this eastern high level reticulation area for service via the Peter Delemothe Rd tanks and isolating the southern portion of the catchment for service via the Miller St tanks. Isolation valves are proposed for implementation in the following pipes and illustrated in Figure 6-3 below.

- P-45
- 20858
- 20909

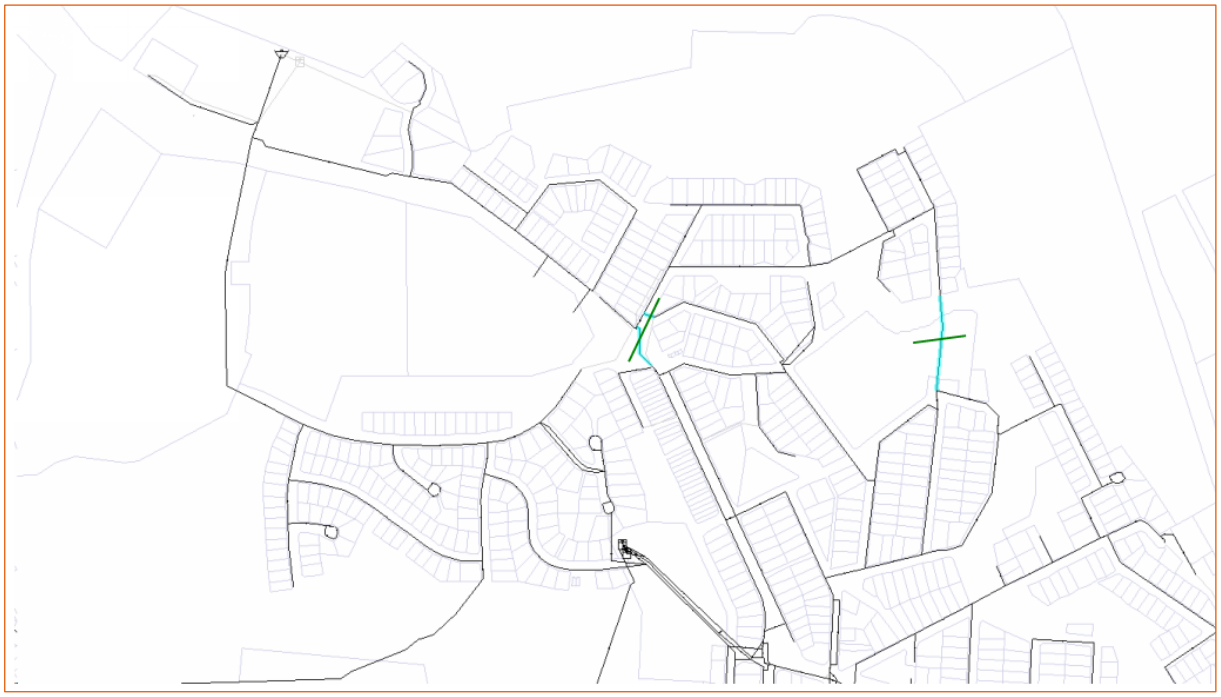


Figure 6-3 Collinsville Isolation Map

7 SEWER MODEL APPROACH AND AMENDMENTS

7.1 SEWER NETWORK ASSESSMENT DSS

The below table specifies the key DSS adopted for the assessment of the WRC sewer network models, in accordance with the WRC Development Manual D6.

Table 7-3 Sewerage Adopted Desired Standards of Service (DSS)

Criteria	Standard
New gravity pipe max depth of flow	75%
Existing gravity system	No overflows under PWWF conditions

7.2 SEWER MODEL DEVELOPMENT

Previous work included sewer network models for Cannonvale, Proserpine, Bowen and Collinsville which were developed in 2014. It was necessary to update these models using current GIS data.

7.2.1 DATA INPUTS

The following sources of information were used to establish the InfoSWMM models for analysis of the sewer network

- 2014 LGIP H2OMap models
- 2019 GIS man hole and pipe data (provided by WRC)
- 2018 Norling Projections

Data from the 2014 H2OMap models were converted into InfoSWMM as the basis for the model update. A visual comparison was made between the previous model and the pipes included in the 2019 GIS data in order to locate where new pipes had been installed. Data associated with these new pipes and manholes was then directly added to the working model.

- Average Dry Weather Flow (ADWF) = 270 L/EP/d;
- Peak Dry Weather Flow (PDWF) = C2 x ADWF;
  - C2= 4.7 x EP-0.105
- Peak Wet Weather Flow (PWWF) = 5 × ADWF;
- Manning's roughness coefficient is taken as 0.013;
- Depth of flow @ PWWF – Existing system = Up to 1.0m below MH cover level and no spillage through overflow structures (as confirmed by Council Officers);
- Emergency Storage: 4 Hours @ ADWF;
- Single Pump Capacity (Duty & Assist): Q = C1 x ADWF;
  - where C1 = 15 x EP-0.1587 but must range between 3.5 – 5
- Operational Storage: Ops Storage = 0.9 x Q/N (See N below);
  - N = 12 (Motors <100Kw);-

- N = 8 (Motors 100-200Kw)
- N = 5 (Motors >200Kw)

- Ideal Pumps have been used to size pipe infrastructure;
- New pipe infrastructure depth of flow during PWWF does not exceed 75%.

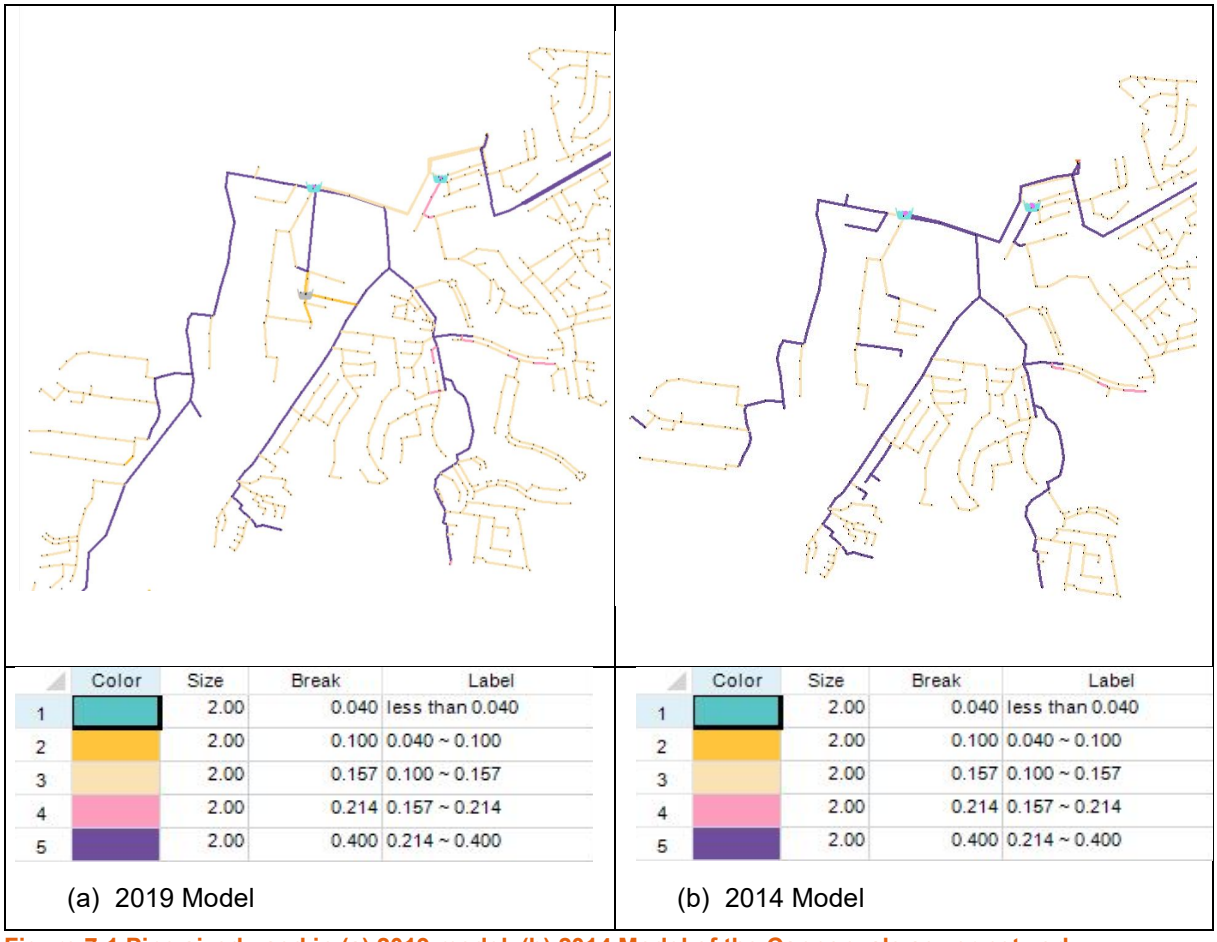
7.2.2 PIPELINES

7.2.2.1 Pipe Diameters

Previous work on the Whitsunday sewer models had estimated the inner pipe diameter using the pipe DNs. In some cases, dependent on the material of the pipe, this was a significant over estimation. In the updated network model, it was important to enter the correct inner diameter for critical pipes. Using pipe material data from GIS, the accurate inner diameters were entered for all pipes above DN150.

Inspecting the DNs of the previous model against the DNs provided in the 2019 GIS data also identified where the incorrect pipe size was entered. Where differences were found, the new data was used in the working model.

Figure 7-1 compares a section of the Cannonvale sewer network modelled in 2014 and 2019. It illustrates some of the discrepancies in the pipe size.



	Color	Size	Break	Label
1		2.00	0.040	less than 0.040
2		2.00	0.100	0.040 ~ 0.100
3		2.00	0.157	0.100 ~ 0.157
4		2.00	0.214	0.157 ~ 0.214
5		2.00	0.400	0.214 ~ 0.400

(a) 2019 Model

	Color	Size	Break	Label
1		2.00	0.040	less than 0.040
2		2.00	0.100	0.040 ~ 0.100
3		2.00	0.157	0.100 ~ 0.157
4		2.00	0.214	0.157 ~ 0.214
5		2.00	0.400	0.214 ~ 0.400

(b) 2014 Model

Figure 7-1 Pipe sized used in (a) 2019 model, (b) 2014 Model of the Cannonvale sewer network

7.2.2.2 Pipe Roughness

As per WRC Combined Development Manual V1.3 Table 6.3, all PVC and Poly pipes were assumed to have a Mannings roughness of 0.013. As all other pipe material types generally have a lower roughness value, for simplicity a Mannings roughness of 0.013 was used uniformly across all pipes.

7.2.2.3 Invert Levels

Invert level and pipe data was not available for all pipes and man-holes in the networks. Where information was not available, these areas of the network were de-activated and an equivalent sewer load entered at the nearest active point.

7.2.3 PUMP STATIONS

Pump station information including pump curves, start-up and shutoff heads, and wet well storage information was brought in from the H2OMap models.

A number of rising sewer mains identified in the GIS data did not have associated pump station information. For modelling purposes, an ideal pump station was entered into the model to service these rising mains.

7.2.4 SEWER LOADS

The following process was used to estimate sewer loads in each of the catchments for the planning horizons:

- Loads taken from appropriate horizon in the previous model
- Each individual load was scaled such that the total catchment load was equal to the 2018 Norling total. The same scaling factor was applied across the whole catchment.

7.2.5 MODEL OPTIMIZATION

As part of the model development, areas were augmented significantly to optimize the networks. These ultimately allowed for more efficient networks with less overall augmentations. These optimizations to the different models are described in detail below.

7.2.5.1 Cannonvale

A diversion from the CANN14 pump station was created to direct flow south directly into the rising main within Shute Harbour Road. The diversion allows for less flows towards the Broadwater drive gravity line which reduced significant pipe augmentations required if the full existing flows were maintained. An image of the optimization can be seen in sheet 2 of the Cannonvale Sewer Network Augmentation Layouts.

7.2.5.2 Bowen

A long extension of rising main was created along the south-western edge of the town in Norris and Dalrymple Streets directly to the 3-PUMPS pump station. The new rising main diverts significant flows from the north around the existing constricted gravity network alleviating flooding and backing up issues from the network. An image of the optimization can be seen in sheet 1 of the Bowen Sewer Network Augmentation Layouts.

7.2.5.3 Proserpine

A decommissioning of an existing pipe and extension of an existing rising main was created to direct flows directly to a rising main within Anzac Road. The diversion allowed large flows to be removed from the current gravity lines removing significant flooding and the need for large pipe augmentations in residential surrounds, while also allowing a smaller augmentation of the pump that it was directed to following the existing gravity route. In both scenarios it ultimately is directed to the same rising main toward the WWTP. An image of the optimization can be seen in sheet 2 of the Proserpine Sewer Network Augmentation Layouts.

7.3 SEWER MODEL DEMANDS

This report contains considerable focus on water demand reduction, which will impact potable water supply infrastructure augmentation, however it is noted that the majority of the decrease in water use through demand management will not carry over to reduction in flows to the sewer. Most of the flow reduction will be around water use external to the household, therefore the base demand scenario of Average Dry Weather Flow (ADWF) = 270 L/EP/d, is maintained with population increase over the demand horizons being considered as the variable to assess,

8 WRC WORKSHOP AND MCA

8.1 Initial Outputs

After application of the above hydraulic model changes to the WRC networks model, the scenarios were run, with a list of augmentations developed. This included, timing, location and cost of each augmentation/upgrade required. These initial outputs, shown in Appendix F & G were provided to Whitsundays Water and Waste design and operations staff for review, allowing for preliminary identification of areas requiring augmentations to be further refined based on knowledge of augmentation opportunities, preferred/alternate alignments, current augmentation plans and the likes.

8.2 Workshop

Based on initial feedback on [possible changes/variations to the proposed infrastructure a workshop in the ARCADIS offices was proposed to provide a more detailed analysis of each augmentation. The aim of the workshop included:

- Verify / ground truth requirement for augmentation based on site specific information such as asset life (i.e. old poor-quality asbestos pipe replacement to be bought forward)
- Rank and prioritisation of each augmentation based on MCA criteria given below:
  - Need to service
  - Operational (known bursts/construction fails)
  - Redundancy/management
  - Realistic growth/ability to service/climate adaption

Key outputs from the workshop are given in the following sections and are considered to be the final adjusted outputs from the 2020 LGIP assessment.

9 WATER SCENARIO OUTCOMES

With the updated models, the water demand scenarios A through to C were assessed against the planning horizons, 2021-2036. This illustrated a step change requirement of infrastructure over the next 15 years based on the water demand. This link and the importance of managing water usage is discussed in detail below, discussing how key infrastructure is impacted.

9.1 WHITSUNDAYS WATER NETWORK

9.1.1 BULK TREATED WATER SUPPLY IMPACT

A verification of the available bulk water supply against the predicted average day demands was undertaken to assess the availability of water external to the local Cannonvale potable water supply network. Table 9-1 & Figure 9-1 below demonstrates the requirement on the WTP drawn by the Cannonvale & Proserpine network under the assessed demand management scenarios.

Table 9-1 Bulk Treated Water Supply Summary

Demand Scenario	MDMM (ML/d) 2021	Available WTP Capacity (ML/d)
A – Base	18.10	23.6
B – 450L/EP/d	16.29	
C – 350L/EP/d	12.67	

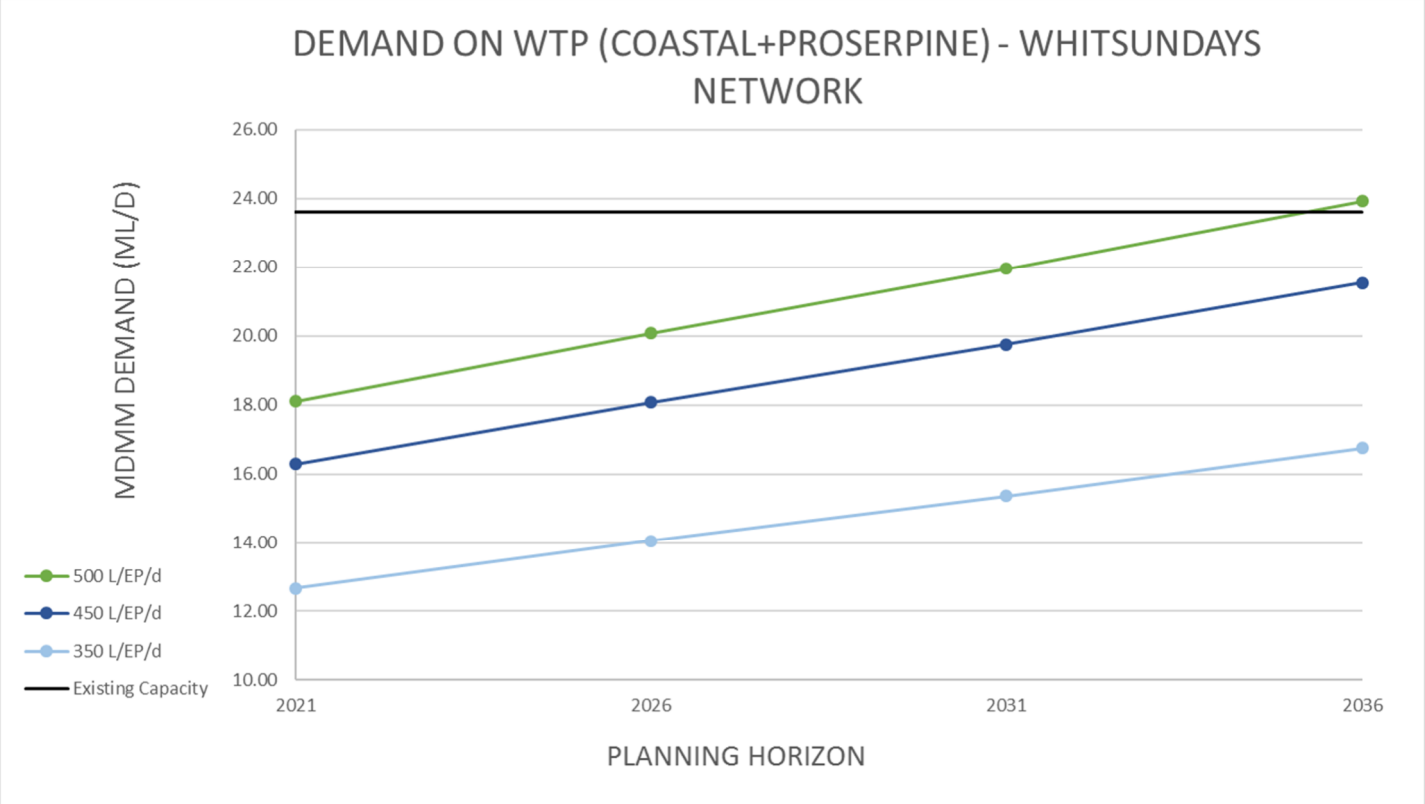


Figure 9-1 Whitsundays Water Network - WTP Demand Over Time

Based on the above, the Whitsundays network experiences a deficiency in existing WTP capacity in the 2036 base (500L/EP/d) scenario of 0.33ML/d which equates to a shortfall of 120.2ML/year, with demand first exceeding existing capacity in ≈2035. Should WRC remain at 500L/EP/d allocation/utilisation, an augmentation to the existing WTP capacity will be required at this time to make up for this shortfall. Based on the Urannah Dam Study (future water source), specifically Appendix 11 – Economics, users within the WRC network can expect a 2000ML/year water source costing $2000/ML as the next planned increase to existing WTP capacity resulting in a drastic increase in required augmentation costs. Through the use of demand management, this augmentation may be delayed past the design 2036 horizon.

9.1.2 RESERVOIR IMPACTS

The service catchment of all reservoirs within the Whitsundays catchment has been isolated in the 2021 horizon and factored accordingly based on Norling 2018 population projections to determine reservoir requirements across the 2021-2036 planning cycle. The service catchment demand of each reservoir is summarised in Table 9-2 below, with a summary of the total spare capacity available within the Whitsundays network included in Table 9-3 based on total reservoir volumes.

Refer to the detailed reservoir calculation summary located in Appendix B for further information.

Table 9-2 Whitsundays Network Reservoir Summary

Reservoir	Total Volume (ML)	15%-95% Operational Storage Volume (ML)	Service Catchment Demand (EPs)[N1]			
			2021	2026	2031	2036
Proserpine (LL+HL)	5.254	4.203	8895.20	9131.36	9367.51	9564.31
Mt Julian	0.722	0.577	382.74	443.61	500.68	562.57
Cannon Valley[N2]	15.858	12.686	4464.98	5175.12	5840.87	6562.84
Coyne Rd LL	2.278	1.823	2304.65	2671.19	3014.83	3387.48
Coyne Rd HL	0.132	0.106	290.88	337.14	380.51	427.55
Cannonvale	12.818	10.254	4913.17	5694.59	6427.17	7221.61
Airlie Summit	0.398	0.319	180.62	209.35	236.28	265.48
Moonlight Dr	0.247	0.198	69.58	80.65	91.02	102.27
Sanctuary Dr (NEW)[N3]	0.188	0.150	-	-	-	-
Shute Harbour LL	0.359	0.287	3.95	4.58	5.17	5.81
Shute Harbour HL	0.577	0.461	1176.85	1364.02	1539.50	1729.79
Daydream	0.393	0.314	798.31	925.28	1044.31	1173.39
Satinwood Ct	1.001	0.801	201.16	233.15	263.15	295.67
Macona Cres	0.267	0.214	178.02	206.33	232.88	261.66

Reservoir	Total Volume (ML)	15%-95% Operational Storage Volume (ML)	Service Catchment Demand (EPs)[N1]			
			2021	2026	2031	2036
Pepperberry Ln	0.427	0.342	219.16	254.02	286.69	322.13
Hamilton Park	0.039	0.031	50.70	58.76	66.32	74.52

[N1] Some reservoir supply areas vary depending on loading scenario, above factored based on 2021 supply catchments

[N2] EPs supplied = Dedicated supply from Cannon Valley res – does not include catchments of reservoirs supplied via Cannon Valley gravity feed

[N3] Sanctuary Dr new proposed tank – primarily catering for fire flow requirements with small (<20ET) residential catchment peak day standard flow supplementation – service area TBD

Table 9-3 Whitsundays Network Reservoir Assessment Summary

Demand Scenario	Total Volume (ML)	15%-95% Operational Storage Volume (ML)	Spare Capacity (ML)[N1]			
			2021	2026	2031	2036
500L/EP/d	40.959	32.767	8.962	5.846	2.556	-0.558
450L/EP/d			11.815	9.006	6.005	3.197
350L/EP/d			17.342	15.276	12.903	10.707

[N1] Spare overall network storage capacity based on total reservoir volumes

9.1.3 PUMP AUGMENTATION REQUIREMENTS

9.1.3.1 WPPS01

The pump station fed via the Proserpine LL reservoir and servicing the Proserpine HL Water Tower has been assessed following its associated pipe capacity augmentation, for comparison of current performance against required performance as per WRC DSS. The pipe capacity augmentation in question consists of a replacement of the existing DN225 AC class C main from WPPS01 pump station, with a proposed DN375 (ID386mm) mPVC main for the majority of the underground section of the pipeline and an OD419 (ID383mm) MSCL main for the above ground segments up to the tower, noting pipe material selection is preliminary only and may be changed according to detail design requirements.

Following this pipe replacement, performance of the existing Grundfos HS 200x150-380 pumpset is able to do the following, based on average performance at tank ≈halfway through filling:

- Existing pump performance ≈180.5L/s @ 35.5m

Based on WRC DSS, Table 9-4 below lists the required capacity of treated water pumps feeding an elevated reservoir across the three assessed demand scenarios.

Table 9-4 WPPS01 Required Capacity

WPPS01	2021	2026	2031	2036
A – 500L/EP/d	220.0	226.2	232.5	237.7
B – 450L/EP/d	196.5	202.1	207.7	212.4
C – 350L/EP/d	149.4	153.7	158.1	161.8

A deficiency in capacity is seen in scenarios A & B, whilst existing capacity remains adequate throughout demand scenario C. As such, pump capacity augmentations have been specified for the non-compliant demand scenarios, with an indicative pump selection provided below based on the most conservative requirement being the 2036 planning horizon under base 500L/EP/d demand. A preliminary selection is included below for information consisting of a 1+1 pumpset configuration based on the existing pump model HS in Figure 9-2 below.

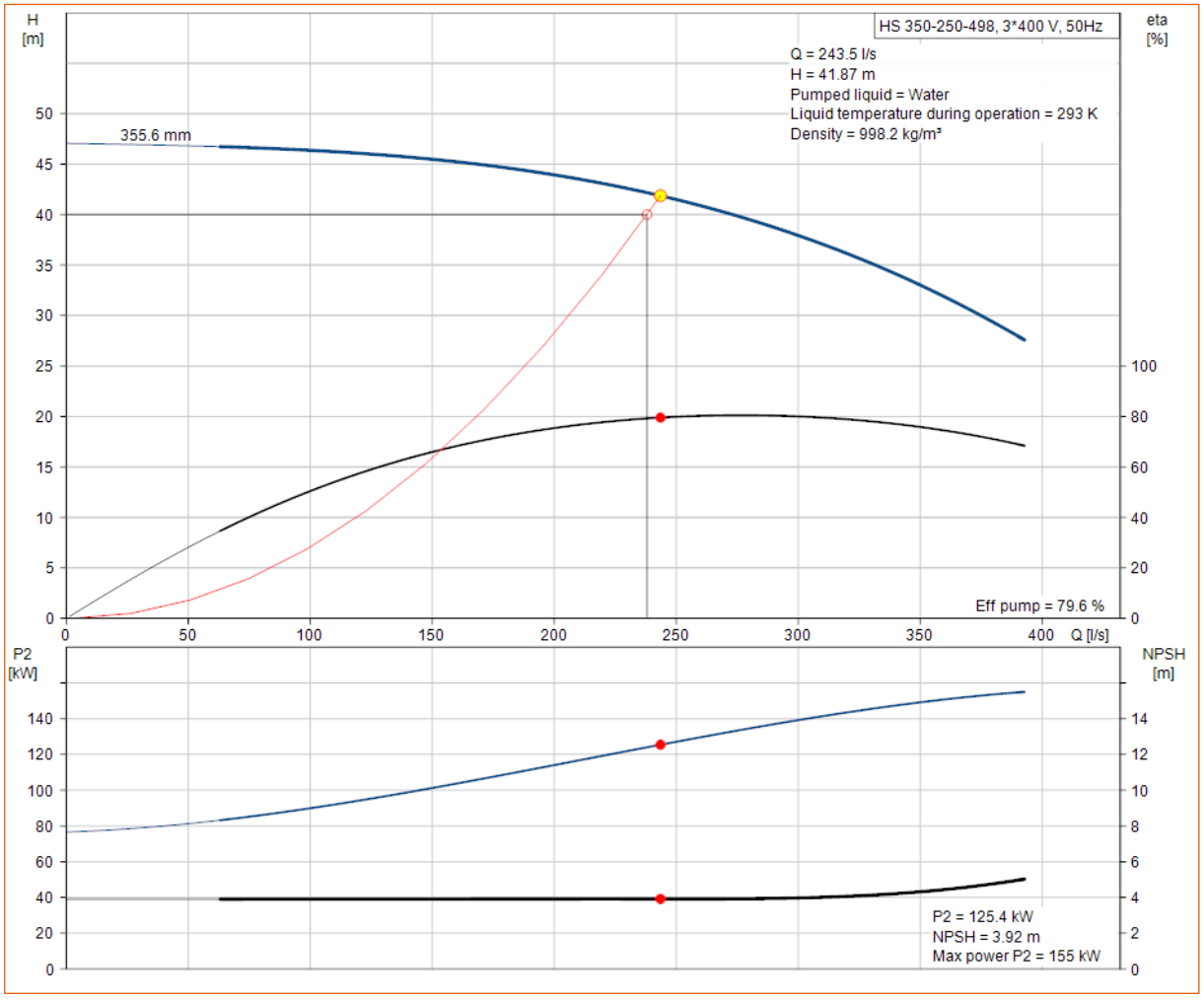


Figure 9-2 Grundfos HS 350-250-498 Indicative Proserpine HL Supply Pump Curve – 500L/EP/d 2036 Requirement

9.1.3.2 Bulk Water Pipeline Pumpset

An augmentation to the existing pumpset supplying the Whitsundays bulk water pipeline from Proserpine WTP to the trunk water supply line downstream of Booster 2 pump station has been specified, for implementation in the 2031 500L/EP/d scenario or the 2036 450L/EP/d scenario. The existing pumpset consists of three parallel Flowserve Hydro-Titan 150x125-315 pumps. The augmentation specified consists of increasing impeller size of the existing pumpset from the current 301mm impellers to 307mm whilst still allowing the pumps to function off the currently installed motors. Doing so provides a modest increase in design performance from 97.5L/s @ 109m per pump to 98L/s @ 114m, allowing for better performance from the future Cannon Valley reservoir in maintaining adequate levels during a three consecutive peak day demand event. The augmented performance curve of the Bulk Water Pipeline Pumpset following impeller size increase is included in Figure 9-3 below.

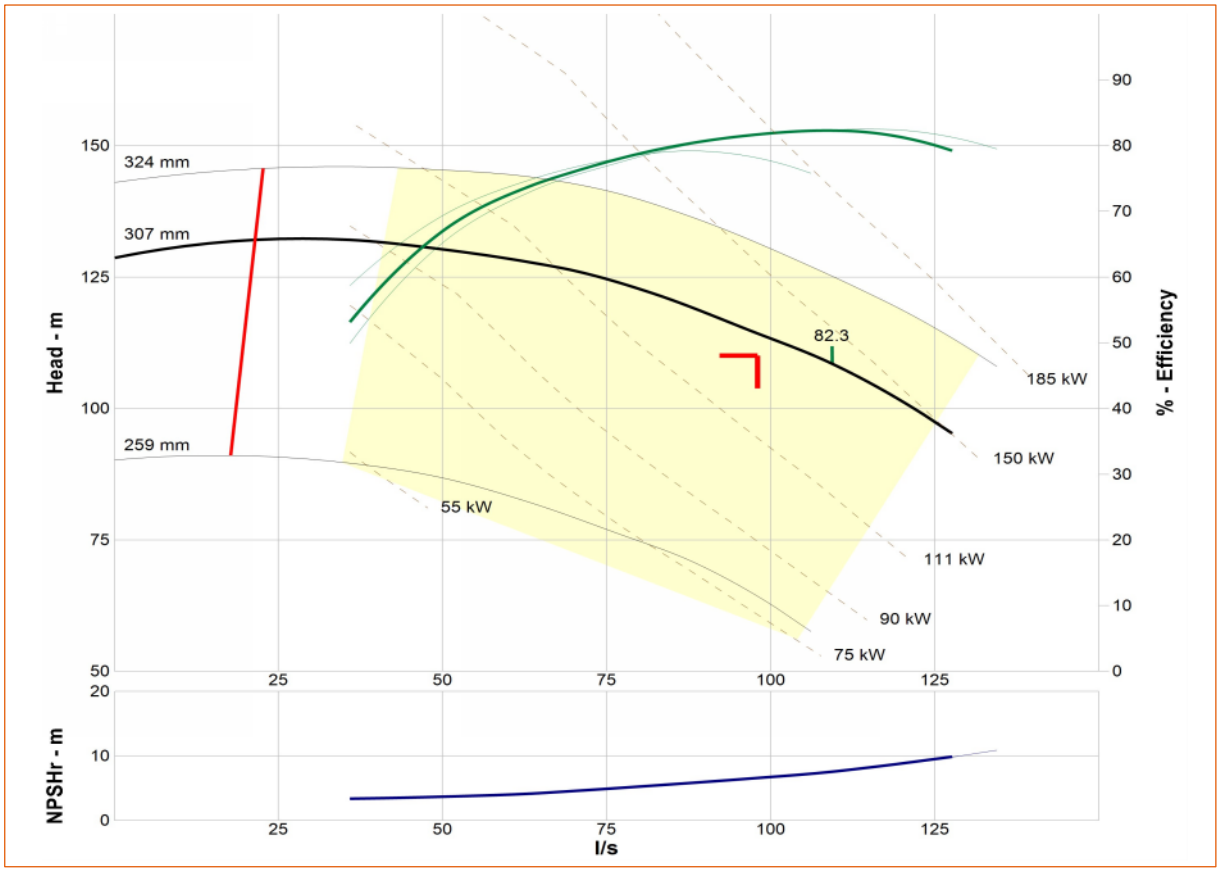


Figure 9-3 Flowserve Hydro-Titan 150x125-315 - 307mm Impeller

9.1.4 PROSERPINE WATER SUPPLY SECURITY

An opportunity has been identified to supplement water supply capability to the Proserpine area following the notable increase in projected population from the updated Norling 2018 study. With the majority of Proserpine being serviced via the Proserpine HL water tower, the supply pumps from the Proserpine GL reservoir feeding the HL water tower are a key asset in maintaining supply to the Proserpine catchment.

To avoid sole reliance on this pumpset and to provide some redundancy to the supply network servicing Proserpine, it is recommended to introduce a gravity supply option from the Cannon Valley reservoir. This would likely be achieved via the use of the supply line previously used by the Booster 1 pump station to transfer water up to the north-eastern part of the network i.e. Cannonvale and beyond, which

is to be decommissioned following the introduction of the Bulk Water Pipeline. Use of this Booster 1 pipeline as a gravity main fed via direct connection to the Cannon Valley reservoir allows for reliable gravity service to the Mt Julian area and would also allow for this gravity supply to extend to the Proserpine catchment as an alternate supply source in case of any issues with the Proserpine HL water tower and associated supply pumpset. This option would require the use of PRVs to limit service pressure from direct gravity feed via Cannon Valley reservoir.

9.1.5 NETWORK AUGMENTATION SUMMARY

Refer to Appendix A for detailed breakdown of pipe & pump augmentations required for network performance to WRC DSS for the Whitsundays potable water network.

Option A – 500L/EP/d

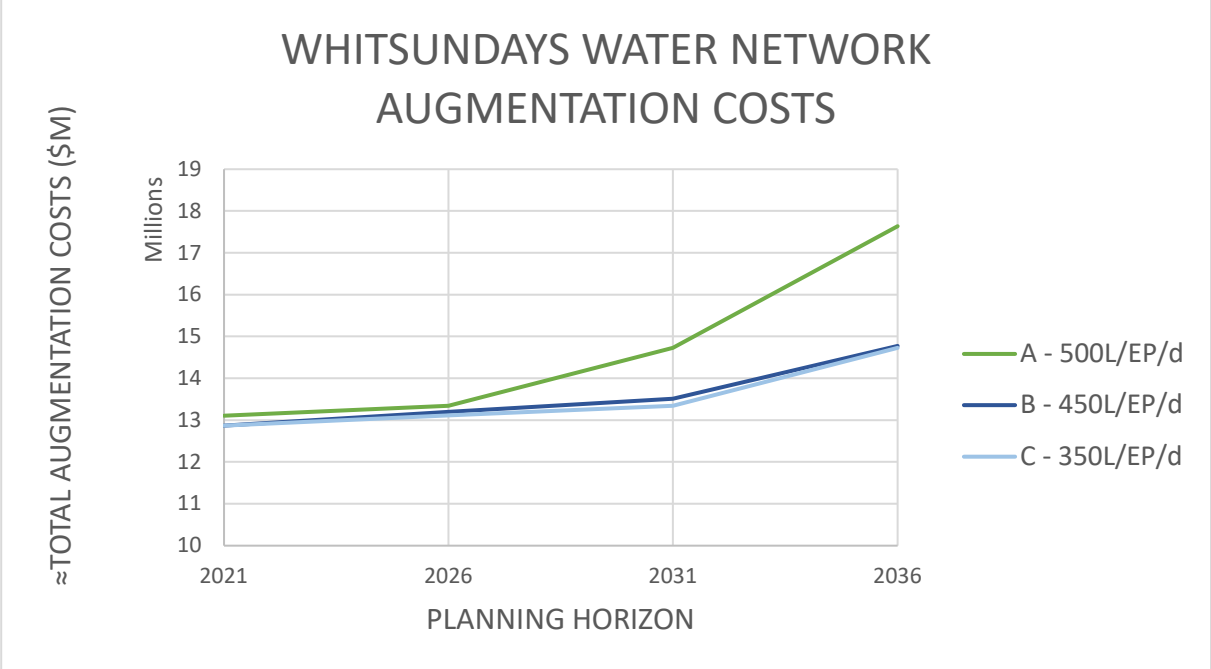
	2021	2026	2031	2036
Pipe Augmentations	131 pipes ≈18,584m total pipe length ≈$13,111,315	137 pipes ≈19,070m total pipe length ≈$13,340,206	148 pipes ≈21,374m total pipe length ≈$14,730,410	197 pipes ≈26,575m total pipe length ≈$17,639,716
Pump Augmentations	• Proserpine HL reservoir supply pumps	• Proserpine HL reservoir supply pumps	• Proserpine HL reservoir supply pumps • Proserpine WTP Bulk Water Pipeline pumps	• Proserpine HL reservoir supply pumps • Proserpine WTP Bulk Water Pipeline pumps

Option B – 450L/EP/d

	2021	2026	2031	2036
Pipe Augmentations	126 pipes ≈18,027m total pipe length ≈$12,867,797	133 pipes ≈18,767m total pipe length ≈$13,196,108	139 pipes ≈19,379m total pipe length ≈$13,509,301	149 pipes ≈21,476m total pipe length ≈$14,777,616
Pump Augmentations	• Proserpine HL reservoir supply pumps	• Proserpine HL reservoir supply pumps	• Proserpine HL reservoir supply pumps	• Proserpine HL reservoir supply pumps • Proserpine WTP Bulk Water Pipeline pumps

Option C – 350L/EP/d

	2021	2026	2031	2036
Pipe Augmentations	126 pipes ≈18,027m total pipe length ≈$12,867,797	131 pipes ≈18,584m total pipe length ≈$13,111,315	137 pipes ≈19,070m total pipe length ≈$13,340,207	148 pipes ≈21,374m total pipe length ≈$14,730,410
Pump Augmentations				



9.2 BOWEN WATER NETWORK

9.2.1 RESERVOIR IMPACTS

The service catchment of all active reservoirs within the Bowen catchment have been isolated in the 2021 horizon and factored accordingly based on Norling 2018 population projections to determine reservoir requirements across the 2021-2036 planning cycle. The service catchment demand of each reservoir is summarised in Table 9-5 below, with a summary of the total spare capacity available within the Bowen network included in Table 9-6 based on total reservoir volumes.

Refer to the detailed reservoir calculation summary located in Appendix B for further information.

Table 9-5 Bowen Network Reservoir Summary

Reservoir	Total Volume (ML)	15%-95% Operational Storage Volume (ML)	Service Catchment Demand (EPs)[N1]			
			2021	2026	2031	2036
Bowen Central Res	17.091	13.673	9019.32	9513.51	10265.41	10790.84
Heronvale (NEW)	0.884	0.707	197.10	199.96	207.77	210.72

[N1] Some reservoir supply areas vary depending on loading scenario, above factored based on 2021 supply catchments

Table 9-6 Bowen Network Reservoir Assessment Summary

Demand Scenario	Total Volume (ML)	15%-95% Operational Storage Volume (ML)	Spare Capacity (ML)[N1]			
			2021	2026	2031	2036
500L/EP/d	17.091	13.673	5.817	5.199	4.259	3.602
450L/EP/d			6.944	6.388	5.542	4.951
350L/EP/d			9.199	8.767	8.109	7.649

[N1] Spare overall network storage capacity based on total reservoir volumes

[N2] New Heronvale reservoir omitted from above summary

9.2.2 NETWORK AUGMENTATION SUMMARY

Refer to Appendix A for detailed breakdown of pipe & pump augmentations required for network performance to WRC DSS for the Bowen potable water network.

Option A – 500L/EP/d

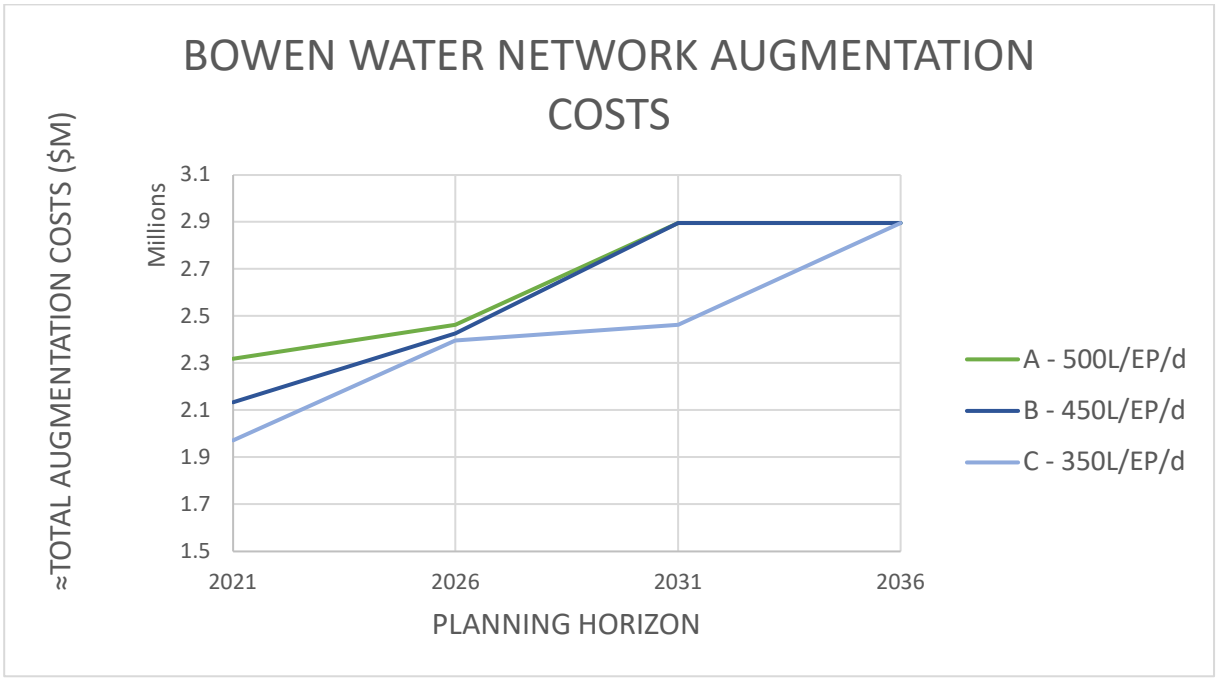
	2021	2026	2031	2036
Pipe Augmentations	31 pipes ≈4,843m total pipe length ≈$2,318,354	34 pipes ≈5,210m total pipe length ≈$2,461,970	43 pipes ≈6,123m total pipe length ≈$2,894,765	43 pipes ≈6,123m total pipe length ≈$2,894,765
Pump Augmentations				

Option B – 450L/EP/d

	2021	2026	2031	2036
Pipe Augmentations	28 pipes ≈4,433m total pipe length ≈$2,133,198	33 pipes ≈5,129m total pipe length ≈$2,425,393	43 pipes ≈6,123m total pipe length ≈$2,894,765	43 pipes ≈6,123m total pipe length ≈$2,894,765
Pump Augmentations				

Option C – 350L/EP/d

	2021	2026	2031	2036
Pipe Augmentations	26 pipes ≈4,119m total pipe length ≈$1,971,431	32 pipes ≈5,058m total pipe length ≈$2,396,101	34 pipes ≈5,210m total pipe length ≈$2,461,970	43 pipes ≈6,123m total pipe length ≈$2,894,765
Pump Augmentations				



9.3 COLLINSVILLE WATER NETWORK

9.3.1 RESERVOIR IMPACTS

The service catchment of all active reservoirs within the Collinsville catchment have been isolated in the 2021 horizon and factored accordingly based on Norling 2018 population projections to determine reservoir requirements across the 2021-2036 planning cycle. The service catchment demand of each reservoir is summarised in Table 9-7 below, with a summary of the total spare capacity available within the Collinsville network included in Table 9-8 based on total reservoir volumes.

The total spare network capacity assessed in Table 9-8 includes the total demand and volumes of both reservoirs within the network. This is only possible due to the Peter Delemothe Rd reservoir spare capacity being able to be utilised by the Miller St reservoirs via gravity feed.

Refer to the detailed reservoir calculation summary located in Appendix B for further information.

Table 9-7 Collinsville Network Reservoir Summary

Reservoir	Total Volume (ML)	15%-95% Operational Storage Volume (ML)	Service Catchment Demand (EPs)[N1]			
			2021	2026	2031	2036
Peter Delemothe Rd[N2]	6.107	4.886	2015.78	2002.90	2067.26	2155.79
Miller St	1.615	1.292	1674.20	1707.05	1762.71	1784.16

[N1] Some reservoir supply areas vary depending on loading scenario, above factored based on 2021 supply catchments

[N2] EPs supplied = Dedicated supply from Peter Delemothe Rd res – does not include catchments of reservoirs supplied via Peter Delemothe Rd res gravity feed

Table 9-8 Collinsville Network Reservoir Assessment Summary

Demand Scenario	Total Volume (ML)	15%-95% Operational Storage Volume (ML)	Spare Capacity (ML)[N1]			
			2021	2026	2031	2036
500L/EP/d	7.722	6.178	2.639	2.616	2.481	2.357
450L/EP/d			3.054	3.034	2.912	2.801
350L/EP/d			3.884	3.868	3.774	3.687

[N1] Spare overall network storage capacity based on total reservoir volumes

9.3.2 NETWORK AUGMENTATION SUMMARY

Refer to Appendix A for detailed breakdown of pipe & pump augmentations required for network performance to WRC DSS for the Collinsville potable water network.

Option A – 500L/EP/d

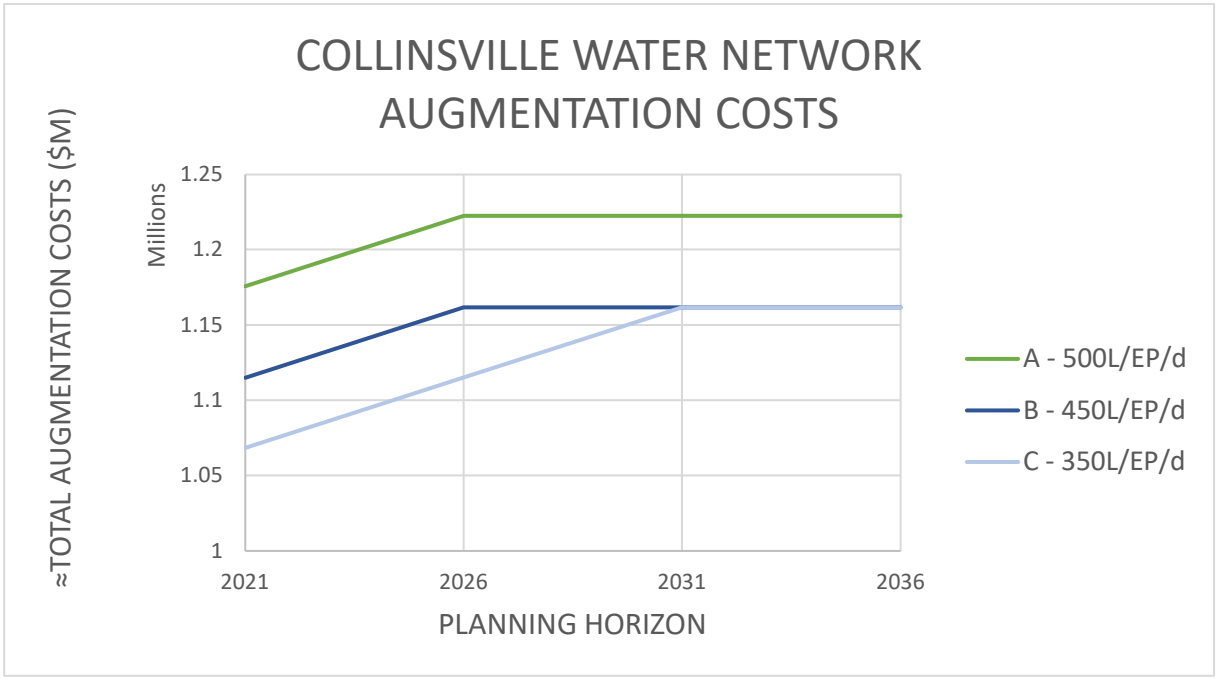
	2021	2026	2031	2036
Pipe Augmentations	17 pipes ≈2,576m total pipe length ≈$1,175,785	18 pipes ≈2,677m total pipe length ≈$1,222,465	18 pipes ≈2,677m total pipe length ≈$1,222,465	18 pipes ≈2,677m total pipe length ≈$1,222,465
Pump Augmentations				

Option B – 450L/EP/d

	2021	2026	2031	2036
Pipe Augmentations	16 pipes ≈2,458m total pipe length ≈$1,114,994	17 pipes ≈2,559m total pipe length ≈$1,161,673	17 pipes ≈2,559m total pipe length ≈$1,161,673	17 pipes ≈2,559m total pipe length ≈$1,161,673
Pump Augmentations				

Option C – 350L/EP/d

	2021	2026	2031	2036
Pipe Augmentations	15 pipes ≈2,329m total pipe length ≈$1,068,345	16 pipes ≈2,458m total pipe length ≈$1,114,994	17 pipes ≈2,559m total pipe length ≈$1,161,673	17 pipes ≈2,559m total pipe length ≈$1,161,673
Pump Augmentations				


COLLINSVILLE WATER NETWORK AUGMENTATION COSTS
≈TOTAL AUGMENTATION COSTS ($M)
Millions
1.25
1.2
1.15
1.1
1.05
1
2021
2026
2031
2036
PLANNING HORIZON
A - 500L/EP/d
B - 450L/EP/d
C - 350L/EP/d

10 SEWERAGE SCENARIO OUTCOMES

Following updating of the sewerage models, the increased flows outlined in the LGIP through the 2021 to 2036 horizons were assessed against the DSS. The assessment determined large augmentations of the pipe network, operational storage, and sewer pump capacities were necessary. The determined augments are discussed in detail below. Refer to Appendix C for a breakdown of sewer network augmentations and mapping.

10.1.1 PIPE AUGMENTATIONS

Pipe augmentations were undertaken with the flowing points noted:

- All new augmentations were sized using internal diameters for PVC-U pipelines from AS1477;
- All AC pipes 150mm in diameter or smaller were replaced and not duplicated;
- Replacement was also taken on AC pipes known to be un-serviceable and in areas where failure may lead to unacceptable risks; and
- New gravity pipes were sized to provide a max depth of flow of 75% in line with WRC guidelines.

Table 10-1 Pipe Augmentations Summary 2021 – 2036 horizons

Horizon	2021	2026	2031	2036
Cannonvale Pipe Augmentations	7 pipes ≈1386m total pipe length	10 pipes ≈1556m total pipe length	12 pipes ≈1664m total pipe length	24 pipes ≈4274m total pipe length
Bowen Pipe Augmentations	1 pipe ≈723m total pipe length	2 pipes ≈1988m total pipe length	2 pipes ≈1988m total pipe length	2 pipes ≈1988m total pipe length
Proserpine Pipe Augmentations	5 pipes ≈2948m total pipe length	5 pipes ≈2948m total pipe length	5 pipes ≈2948m total pipe length	5 pipes ≈2948m total pipe length
Collinsville Pipe Augmentations	1 pipe ≈175m total pipe length	1 pipe ≈175m total pipe length	1 pipe ≈175m total pipe length	1 pipe ≈175m total pipe length

10.1.2 PUMP CAPACITY & OPERATIONAL STORAGE AUGMENTATIONS

Table 10-2 Number of Pump Capacity & Operational Storage Upgrades Required - Cumulative

Horizon	2021	2026	2031	2036
Cannonvale Operational and Storage Augmentations	3	1	1	0
Bowen Operational and	1	0	0	0

Horizon	2021	2026	2031	2036
Storage Augmentations				
Proserpine Operational and Storage Augmentations	6	0	0	0
Collinsville Operational and Storage Augmentations	1	0	0	0
Number of Total Augmentations	11	1	0	0

10.1.3 PUMP STATION DETAILS

A summary of pump station loading information has been included in Table 10-3 through to Table 10-6 below. Note existing pump capacity has been sourced via model curve extracts and data provided by WRC where possible, assessing available head of the pump against the required flow rate of its respective catchment in the 2036 horizon. Refer to Appendix D for a summary of WRC pump station performance characteristics and requirements.

Table 10-3 Cannonvale Pump Station Details

Pump Station ID	Operational Storage Volume	Existing Pump Capacity	Catchment Loading (EPs)			
			2021	2026	2031	2036
PUMP-CANN1.2	15.00	59 L/s @ 35m	2404	2786	3144	3533
PUMP-CANN11.1	2.60		970	1124	1269	1426
PUMP-CANN12.1	1.80	52 L/s @ 12m	2221	2574	2905	3264
PUMP-CANN14.2	1.23		106	123	139	156
PUMP-CANN15.2	0.43	N/A	0	0	0	0
PUMP-CANN17.1	16.00	N/A	14	16	18	20
PUMP-CANN18.1	16.00	N/A	146	169	191	215

Pump Station ID	Operational Storage Volume	Existing Pump Capacity	Catchment Loading (EPs)			
			2021	2026	2031	2036
PUMP-CANN2.2	2.04	25.5L/s @ 3.9m	314	364	410	461
PUMP-CANN3.1	15.00	33L/s @ 30m	1774	2057	2321	2608
PUMP-CANN4.1	8.68	N/A	116	135	152	171
PUMP-CANN5.2	6.51	50L/s @ 51m	2177	2523	2848	3200
PUMP-CANN51.1	2.00	N/A	23	26	30	33
PUMP-CANN6.2	39.00	N/A	680	789	890	1000
PUMP-JUBI1.1	8.68		3871	4487	5064	5690
PUMP-JUBI2.2	4.98	55L/s @ 6m	1537	1781	2011	2259
PUMP-JUBI3.2	15.00	N/A	323	374	422	475
PUMP-JUBI4.2	1.33	10.5L/s @ 6.7m	398	461	520	584
PUMP-SHUT1.2	2.54	24L/s @ 2.5m	310	360	406	456
PUMP-SHUT2.1	4.06	N/A	148	171	193	217
PUMP-SHUT3.1	16.00	N/A	86	99	112	126

Table 10-4 Bowen Pump Station Details

Pump Station ID	Operational Storage Volume	Existing Pump Capacity	Catchment Loading (EPs)			
			2021	2026	2031	2036
1-PUMPS	61.65	300L/s @ 22m	9289	10274	10871	11200
10-PUMPS	1.52	22.5L/s @ 7.9m	67	74	78	80
13-PUMPS	1.52	40L/s @ 4.4m	173	192	203	209

Pump Station ID	Operational Storage Volume	Existing Pump Capacity	Catchment Loading (EPs)			
			2021	2026	2031	2036
15-PUMPS	1.52	4L/s @ 5m	53	59	62	64
1A-PUMPS	1.52	4L/s @ 2.7m	6	6	7	7
1C-PUMPS	1.52	N/A	0	0	0	0
2-PUMPS	12.26	50L/s @ 16m	1430	1582	1674	1724
2A-PUMPS	1.52	8L/s @ 9m	109	121	128	132
2B-PUMPS	1.52	10.5L/s @ 9m5.4	213	236	250	257
2D-PUMPS	1.52	N/A	0	0	0	0
2E-PUMPS	1.52	N/A	0	0	0	0
2F-PUMPS	1.52	N/A	0	0	0	0
2G-PUMPS	1.52	N/A	0	0	0	0
3-PUMPS	17.53	81L/s @ 34m	2785	3080	3259	3358
4-PUMPS	12.26	49L/s @ 28.5m	1334	1475	1561	1608
4A-PUMPS	1.52	32L/s @ 3.5m	74	81	86	89
A-PUMPS	1.77	13L/s @ 14m	248	275	291	300
B-PUMPS	2.14	11L/s @ 12m	305	338	357	368
C-PUMPS	2.14	4L/s @ 10m	351	388	411	423
D-PUMPS	1.78	10L/s @ 12m	170	188	199	205
E-PUMPS	6.80	19L/s @ 6.7m	1260	1393	1474	1519
F-PUMPS	1.41	10L/s @ 4m	30	33	35	36
G-PUMPS	1.42	2L/s @ 4.5m	194	215	227	234
H-PUMPS	6.80	64L/s @ 37m	2214	2449	2592	2670
J-PUMPS	2.49	45L/s @ 13.5m	1097	1213	1283	1322
KING_ST	29.22	4L/s @ 6m	23	25	27	28

Pump Station ID	Operational Storage Volume	Existing Pump Capacity	Catchment Loading (EPs)			
			2021	2026	2031	2036
L-PUMPS	1.73	20L/s @ 7m	633	700	741	763
M-PUMPS	2.71	3.5L/s @ 6m	39	43	45	47
N-PUMPS	1.22	50L/s @ 9m	6517	7208	7627	259
O-PUMPS	1.22	4.5L/s @ 5.2m	86	95	100	103
P-PUMPS	0.92	22L/s @ 7m	265	293	310	319
Q1-PUMPS	1.52	27L/s @ 7.5m	109	121	128	132
Q3-PUMPS	1.52	N/A	0	0	0	0
Q4-PUMPS	1.52	N/A	0	0	0	0
R-PUMPS	2.49	40L/s @ 4m	362	401	424	437
S-PUMPS	1.52	N/A	0	0	0	0
T-PUMPS	1.52	4L/s @ 6m	13	15	16	16
WS-PUMPS	1.52	N/A	4123	0	0	0
Z-PUMPS	22.68	90L/s @ 25m	4123	4560	4825	4971

Table 10-5 Collinsville Pump Station Details

Pump Station ID	Operational Storage Volume	Existing Pump Capacity	Catchment Loading (EPs)			
			2021	2026	2031	2036
1-C_PUMPS	18.012	100L/s @ 28m	2843	2858	2951	2958
2-C_PUMPS	5.7096		583	586	605	606
B-C_PUMP	1.524	N/A	19	19	19	20
A-C_PUMPS	1.524	4L/s @ 5m	60	61	63	63

Table 10-6 Proserpine Pump Station Details

Pump Station ID	Operational Storage Volume	Existing Pump Capacity	Catchment Loading (EPs)			
			2021	2026	2031	2036
PROS_6	1.59		782	803	824	841
PROS_PS1	10.97		3365	3454	3543	3618
PROS_PS10	0.80	15L/s @ 2m	88	90	92	94
PROS_PS11	0.80	15L/s @ 1.5m	87	90	92	94
PROS_PS12	0.80		881	905	928	948
PROS_PS2	5.85		3170	3255	3339	3409
PROS_PS3	2.92		1568	1610	1651	1686
PROS_PS4A	1.33	N/A	0	0	0	0
PROS_PS5	1.20	16.5L/s @ 4.5m	478	491	503	514
PROS_PS9	0.93		471	483	496	506
PUMP-11	0.80	35L/s @ 16m	650	667	684	699

10.2 SEWERAGE COST ANALYSIS

A breakdown of the sewerage augmentation costs for the four models are provided below and include a 10% regional increase and 30% contingency as outlined in Section 5.2 – Cost Analysis Basis:

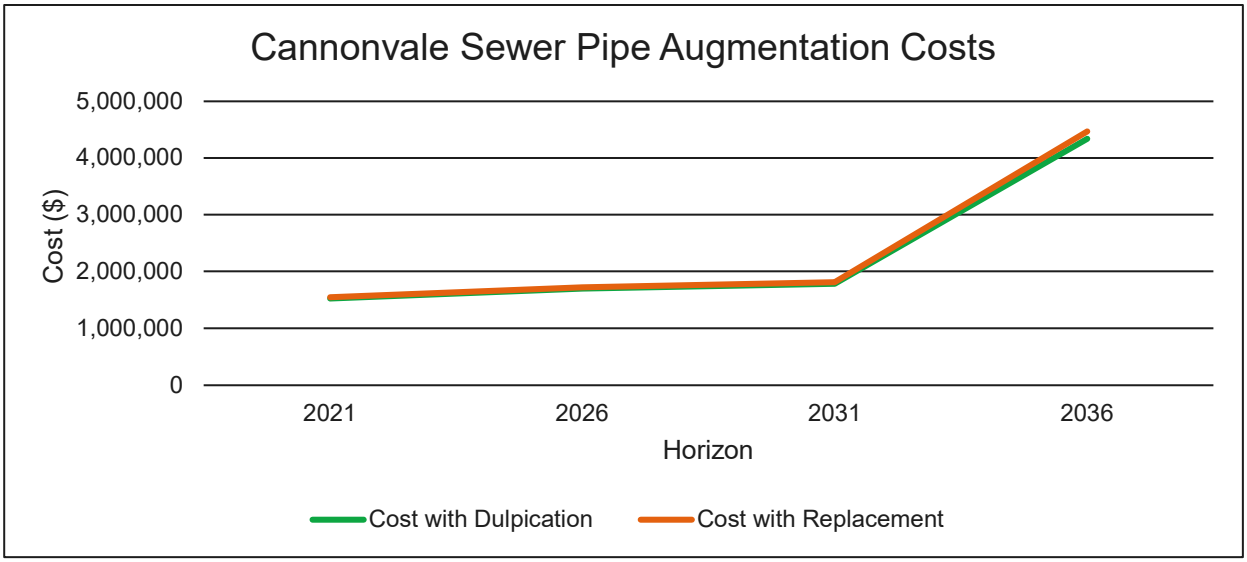
10.2.1 PIPE AUGMENTATIONS

10.2.1.1 CANNONVALE SEWER PIPE AUGMENTATION COSTS

Table 10-7 Cannonvale Sewer Pipe Augmentation Costs

Horizon	2021	2026	2031	2036
Pipes	7 pipes ≈1386m total pipe length	10 pipes ≈1556m total pipe length	12 pipes ≈1664m total pipe length	24 pipes ≈4274m total pipe length
Cost – Duplication	$1,524,149	$1,696,571	$1,782,641	$4,340,048
Cost - Replacement	$1,547,415	$1,719,837	$1,813,657	$4,469,596

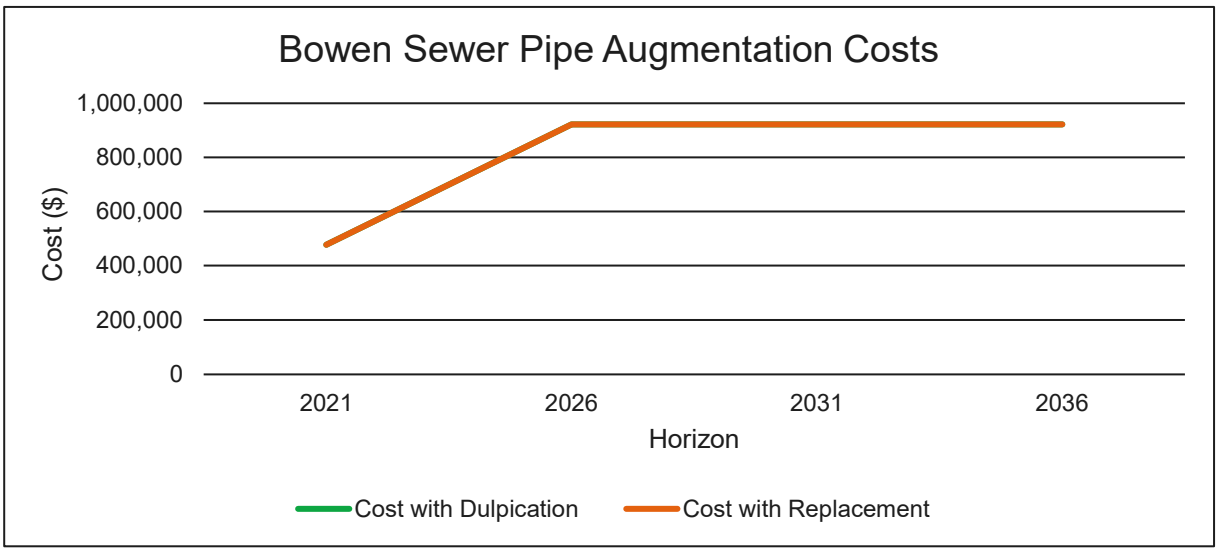
Horizon	2021	2026	2031	2036
Cost Replacement Increase	$23,266	$23,266	$31,016	$129,549



10.2.1.2 BOWEN SEWER PIPE AUGMENTATIONS COST

Table 10-8 Bowen Sewer Pipe Augmentation Costs

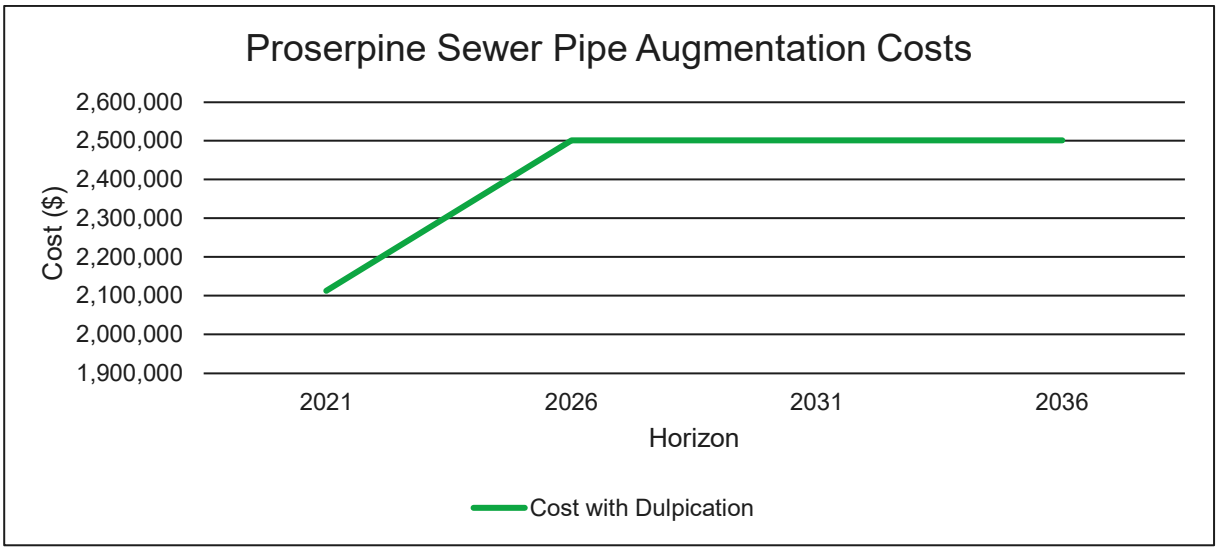
Horizon	2021	2026	2031	2036
Pipes	1 pipe ≈723m total pipe length	2 pipes ≈1988m total pipe length	2 pipes ≈1988m total pipe length	2 pipes ≈1988m total pipe length
Cost – Duplication	$477,387	$921,564	$921,564	$921,564
Cost - Replacement	$477,386.56	$921,564	$921,564	$921,564
Cost Replacement Increase	-	-	-	-



10.2.1.3 PROSERPINE SEWER PIPE AUGMENTATION COSTS

Table 10-9 Proserpine Sewer Pipe Augmentation Costs

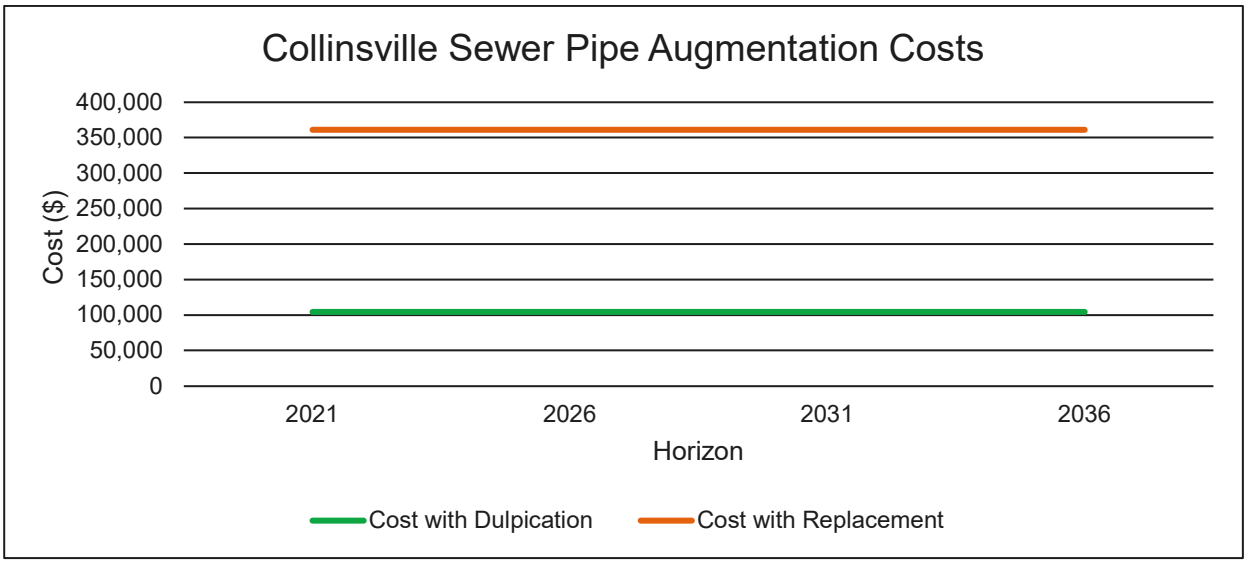
Horizon	2021	2026	2031	2036
Pipes	5 pipes ≈2948m total pipe length	5 pipes ≈2948m total pipe length	5 pipes ≈2948m total pipe length	5 pipes ≈2948m total pipe length
Cost – Duplication	$1,778,347	$1,778,347	$1,778,347	$1,778,347
Cost - Replacement	-	-	-	-
Cost Replacement Increase	-	-	-	-



10.2.1.4 COLLINSVILLE SEWER PIPE AUGMENTATION COSTS

Table 10-10 Collinsville Sewer Pipe Augmentation Costs

Horizon	2021	2026	2031	2036
Pipes	1 pipe ≈175m total pipe length	1 pipe ≈175m total pipe length	1 pipe ≈175m total pipe length	1 pipe ≈175m total pipe length
Cost – Duplication	$97,511	$97,511	$97,511	$97,511
Cost - Replacement	$239,554	$239,554	$239,554	$239,554
Cost Replacement Increase	$142,043	$142,043	$142,043	$142,043



10.2.1.5 TOTAL SEWER PIPE AUGMENTATION COSTS

Table 10-11 Total Sewer Pipe Augmentation Costs

Horizon	2021	2026	2031	2036
Cost – Duplication	$4,117,211	$4,733,811	$4,819,880	$7,377,287
Cost - Replacement	$4,282,520	$4,899,119	$4,992,939	$7,648,878

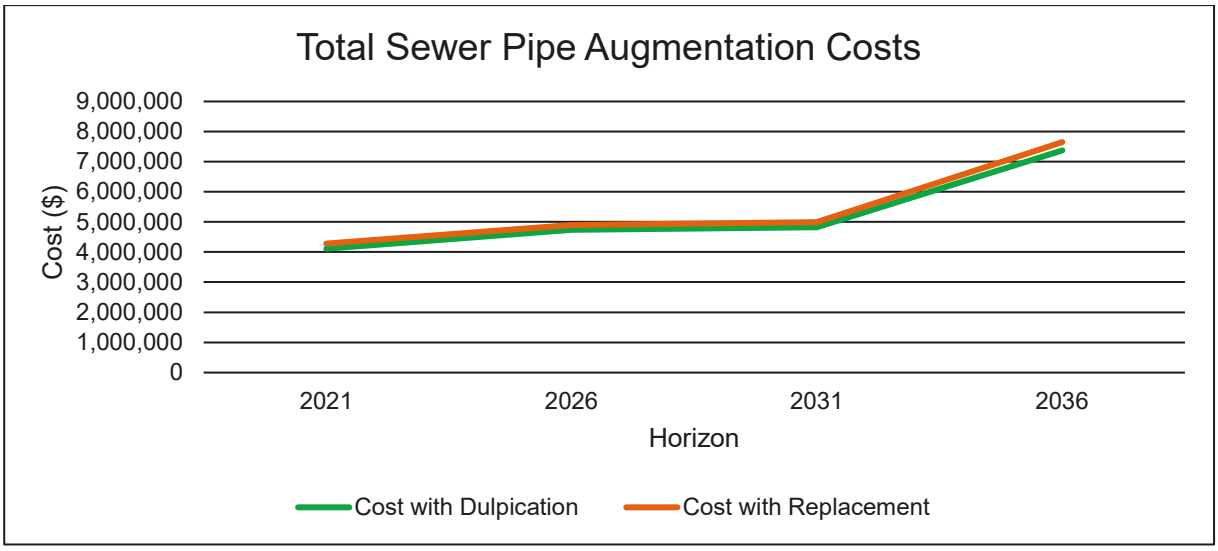


Figure 10-1 Total Sewer Pipe Augmentation Duplication/Replacement Comparison

10.2.2 SEWERAGE PUMP CAPACITY AND STORAGE UPGRADE COSTS – 2036 HORIZON

The costs of pump capacity upgrades and storage augments for the four locations through the horizons are represented below:

Table 10-12 Pump Capacity and Storage Upgrade Costs – 2036 Horizon

	Cannonvale	Bowen	Proserpine	Collinsville	TOTAL
Pump Capacity Upgrade Costs	$1,036,699.66	$287,242.01	$740,071.59	$174,906.69	$2,238,919.95
Operational Storage Upgrade Costs	$21,556.70	$102,352.02	$2,624.99	$-	$126,533.70
TOTAL	$1,058,256.35	$389,594.03	$742,696.57	$174,906.69	$2,365,453.65

11 DISCUSSION

11.1 INDIRECT IMPACTS

Beyond the consideration of the direct water network costs, Council should also consider the indirect implications of demand management on other Council systems as this would represent additional, albeit more modest benefits, that can be more fully explored, should Council consider this way forward desirable.

11.1.1 SEWAGE COLLECTION SYSTEM

Reducing per person water consumption not only impacts water supply systems, but also impacts sewage collection systems, reducing overall hydraulic loads. If a 150 L/EP/d reduction was achieved from 500L/EP/d, this equates to a 30% reduction in potable water demands and may also come with a 10% reduction in sewer flows, delaying augmentations within this system as well. Conversely increasing demands will bring forward augmentations to both the water networks (quantified) and the sewer collection and treatment system (not quantified).

11.1.2 STP

The impacts of altering the system demand do not impact the sewage treatment plants as much as they are often limited by their process load and not their hydraulic load. There will be some savings in particular sizing of primary and secondary tanks within as the total flows maybe reduced (from the base scenario) but the process vessels that are sized to nutrient loads may not be altered significantly.

There is potential for the concentration of the process lad to be impacted (lower flows, similar quality loads) if a demand reduction was applied quickly. This in turn may impact the treatment ability of any biological nutrient removal due to influent concentration increase, however this would only be a short term impact and managed through pre-dosing of bacteria or ongoing operations management. In all likelihood, the water demand would occur over a longer period softening the impact.

Reflecting on the concentration increase and given Proserpine STP is approaching hydraulic limits and is facing a modest growth forecast, but has a higher process capacity. There may be an opportunity for demand management (and infiltration management) to defer spend on this facility.

11.1.3 RECYCLED WATER

In using recycled water (or alternative sources of raw water) to offset potable water use, demand on the potable system can be reduced and allow the existing potable water network to service additional customers as the per person potable water demand is reduced. With a higher percentage of effluent recycled it may be possible into the future for some form of environmental licence relaxation that could in turn lead to opportunities for additional cost savings.

11.2 POLICY POSITION OPTIONS

There are four policy positions investigated for Council's consideration with regard to urban water demand management. These options are:

1) Staged demand reduction – recommended;

2) Support current design demands;

3) Target a 450 L/p/d demand;

4) Target a 350 L/p/d demand;

In supporting each of these scenarios it is acknowledged that not all water users are the same. For this study three basic categories and sub-categories of water users are considered:

COUNCIL CONSUMPTION AND LOSSES

- Parks and gardens irrigation rates and source;
- Council facilities consumption rates;
- Pipe leaks, losses and bursts;
- Stand-pipe and fill point meter management; and
- Water theft management.

COMMERCIAL WATER CONSUMPTION

- Typically, savings come from structural efficiency improvement opportunities typical, over discretionary improvements;
- Influenced by total water cycle costs (charging trade waste, removes a current subsidy, from residents to business, and encourages efficiency). A clear price path may encourage the water savings to be put in place before full charges applied;
- Overall sector performance important, rather than individual business (as long as equitable policies enforced);
- Typically, lower percentage savings achievable, as water consumption is often viewed as an input cost and actively reduced by many businesses already; and
- Severe restrictions can impact the economy as hospitality and food service industries in particular trade on a reputation / standard.

RESIDENTIAL WATER CONSUMPTION

- Both structural and discretionary improvements typically achievable;
- Overall performance of region / town is important not individual performance business (as long as equitable policies enforced);
- Typically, higher percentage savings have been observed as response to information and pricing can lead to change in the way water is consumed; and
- Historically price sensitive

For demand management to be effective, their needs to be a focus on all three groups of water users. It is recommend that Council continue to lead by example in pursuit of “intelligent” water efficiency, and advocate for residents and businesses to work with us to achieve this community goal.

11.2.1.1 STAGED DEMAND REDUCTION – RECOMMENDED

By adopting a staged demand reduction program the strategy will target only the necessary demand reduction needed to defer new capital work expenditure by a rolling 5 years. This will then allow for demand management to be approached in a cost effective and non-disruptive way by avoiding the need to engage is subsidies and large scale compliance action.

In adopting this strategy the demands have been modelled in a step down approach with the following adopted:

- achieving 450 L/EP/day for each town from 2017 to 2026;
- reducing to 350 L/EP/day beyond this period.

To achieve it is recommended that target savings from each of our water using groups be proposed as outlined below:

ALL GROUPS

Recommend setting a regional water restrictions policy inclusive of when WRC is able to offer an allocation tariff.

- When Peter Faust Dam is below 60% at the start of any financial year, allocation tariff will not be available for customers to purchase. In doing this we will be straight up with our customers in being clear we will not pre-sell water when there is a risk we cannot supply the full volume, through applying water restrictions; and
- Set Water restrictions regionally by source, with Bowen Airlie / Cannonvale and Proserpine on common water restrictions set from the Peter Faust Dam level or in response to network constraints. Set Collinsville's water restrictions on Eungella Dam or in response to network constraints.

COUNCIL/WRC CONSUMPTION

- Continue to optimise our irrigation water consumption with Parks and Gardens with recycled and raw water sources where viable and through the use of efficient irrigation technology that Parks and Gardens are now deploying. This is a key component of WRC reducing it's own demands, through the Greening and Growing Bowen Program and Queens Beach Bore Concept. In using recycled water, we can maintain a level of amenity in the community with a lower reliance on potable water supplies;
- Continue to work with WRC/Council facilities to reduce water consumption and inefficiency when they are undertaking renewal activities;
- Continue to address leakage and losses through:
    - Reviewing and expanding our district meter program to target areas with higher losses;
    - Continuing to respond promptly to observed leaks;
    - Active investigation of "unusual greenery" as a potential sign of leakage;
    - Continued roll out of the Bowen Cast Iron Main Replacement program; and
    - Focused renewal of water meters with appropriately sized meters (reducing under-read of water consumption).
- More actively manage standpipe losses by working with our technology provider and looking for data gaps and anomalies and promptly following up; and
- Recommend Waste and water continues with their investigation into and compliance activities in reducing water theft and water losses that has resulted in reduced losses of over 500 ML last financial year.

BUSINESS CONSUMPTION

- Recommend that trade waste charging begin for all water users (on a 3 year price path or similar). In engaging with business customers noting to them the costs the Council faces in sourcing, treating water and collecting treating and disposing of / reusing their sewage. This would be done in the hope that this knowledge will lead to changes in water consumption where economic. The

Council should engage with them and advise that it is Council's preference that they look at their business and improve their water efficiency where they can and save them the charges and the Council, the cost of supplying additional capacity for our growing community. It is acknowledged that the region relies upon food manufacturing and services and hospitality, both are industries that need sufficient water to operate safely and for which the image as a clean and healthy place is essential. To support these and other industries in the mid-term it is suggested that the Council work with local businesses rather than to overtly seek to restrict their water use (from a common base).

RESIDENTIAL CONSUMPTION

- Recommend the volumetric set point associated with the allocation tariff to align with the design parameters and be set to 500kL / property / year (at the same price point, inflation adjusted). By doing this the Council can be confident in the near term that we can supply water that people may have pre-paid for. As the design set point is reduced, it is suggested that the allocation tariff is further reduced in line with the revised design set point;
- Recommend a low-cost water efficiency program based on school education, Facebook, Twitter and Instagram posting of what Council is doing to conserve water, and asking the community to work with the Council to do their part; and
- Suggest that adjustment of pricing to reduce the incentive of the current allocation tariff by raising the allocation tariff at inflation plus 2% for example to both the allocation charge and excess consumption charge.

11.2.1.2 500L TARGET DEMAND (CURRENT DESIGN BASIS)

By adopting the 500 L/EP strategy Council will define a standard for the community to achieve and adhere to. This has both positive negative implications:

- This is an expansionary target and may lead the community to believe that water and sewerage services are in fact cheap to supply and a "right", rather than a service that could be delivered efficiently;
- The expansionary target will result require all LGIP infrastructure to be provided (and cost more than $30m over the next 15 years in additional capital expenditure should introduction of a new water source be required in the later planning horizons;
    - After each piece of infrastructure / source augmentation / allocation purchase is committed to, the costs to supply needs to be met, regardless of water demand reduction achieved after this date. There is a clear risk of a structural revenue shortfall by adopting this pathway, requiring Council to bail out the Water and Sewage business for an extended period rather than be a source of a modest dividend.
- In 2036, WRC may need to consider a growth cap / look at a new source (with all the associated costs) that would not be needed for another 10 or 20 years had moderate demand management been successful. Should the resultant price increase drive demand reduction after the new source is built Whitsunday water financial position may be severely challenged even with a doubling of retail water prices;
- In defining a numerical target user groups may splinter as the heavy lifting is born by one group vs another etc; and
- Residents and businesses may view the target as the long-term goal, rather than a journey to efficiency as we work together to deliver the necessary water and sewerage services as efficiently as possible.

It is proposed that adoption of similar types of policies to what the Council already has, but will require the allocation tariff be set at 500 kL / household per annum.

Only 12 of the 1067 residents that opted into allocation tariff last FY used over 500kL/a, this represents 1.12% of those who took up allocation tariffs or 0.08% of ratepayers more generally were allocation tariff holder who used over 500kL. In refining the allocation to this lower amount, the allocation tariff would be in alignment with our policy setting and infrastructure build program. Additionally, it is recommended that the draft water restrictions policy be reviewed and adopted.

11.2.1.3 450L TARGET DEMAND

By adopting the 450 L/EP strategy, WRC will define a target for the community to achieve. This has both positive negative implications:

- The modest target will be relatively easy to achieve;
- The modest target will result in modest drop in demand / revenue;
- In defining a numerical target user groups may splinter as the heavy lifting is born by one group vs another etc; and
- Residents and businesses may view the modest target as the long-term goal, rather than a journey to efficiency as we work together to deliver the necessary water and sewerage services as efficiently as possible.
- It is proposed that adoption of similar types of policies to what the Council already has, but will require the allocation tariff be set at 450 kL / household per annum.

11.2.1.4 350L TARGET DEMAND

By adopting the 350 L/EP strategy Council will define a target for the community to achieve. This has both positive negative implications:

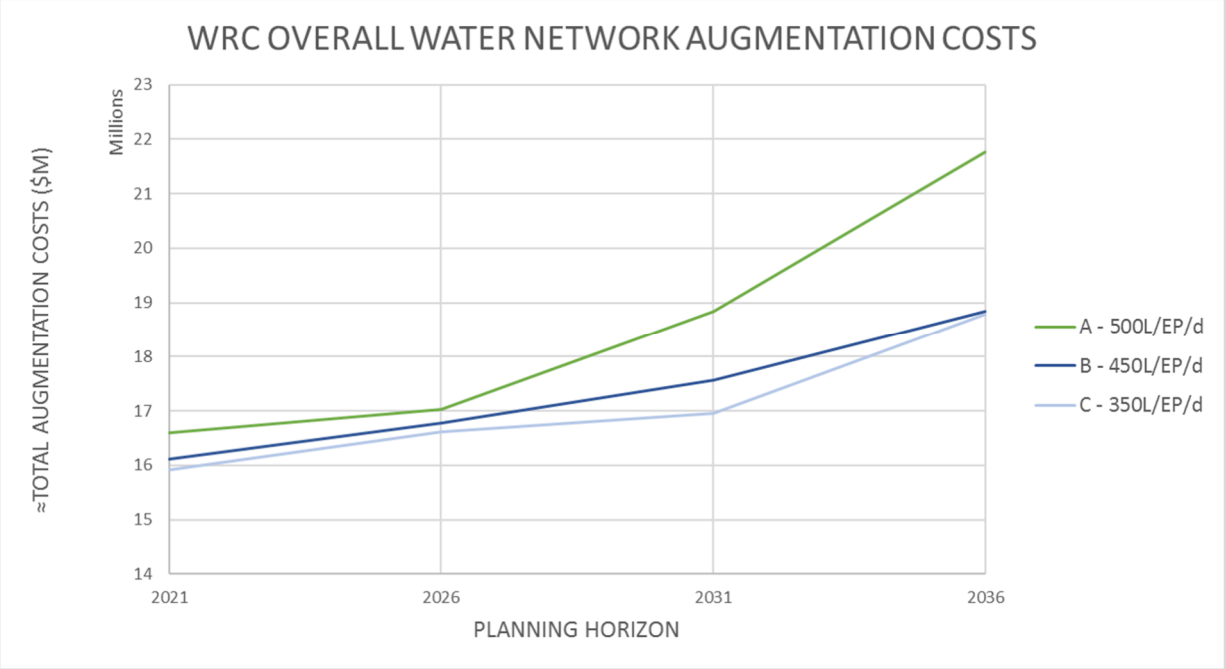
- The target will be relatively hard to achieve in a short time period;
- The target will result in drop in demand / revenue;
- In defining a numerical target user groups may splinter as the heavy lifting is born by one group vs another etc; and
- Residents and businesses may view the target as the long-term goal, rather than a journey to efficiency as we work together to deliver the necessary water and sewerage services as efficiently as possible

This option will more realistically involve a gradual progression to this target over time due to the above constraints and progression required to incorporate and integrate this target with the community.

12 CONCLUSION AND RECOMMENDATION

The above study has identified augmentations that may be required to the WRC water supply and sewer networks including assessment of varying water consumption profiles, yielding an updated 2020 LGIP set for all water and sewer networks. Water consumption option assessments serve to demonstrate the large impact that consumption assumptions have on network performance, infrastructure development and capital expenditure.

Augmentation requirements are observed to increase in direct proportion to the assigned demand per EP, with the following graph illustrating the overall water network augmentation costs per assessment option.

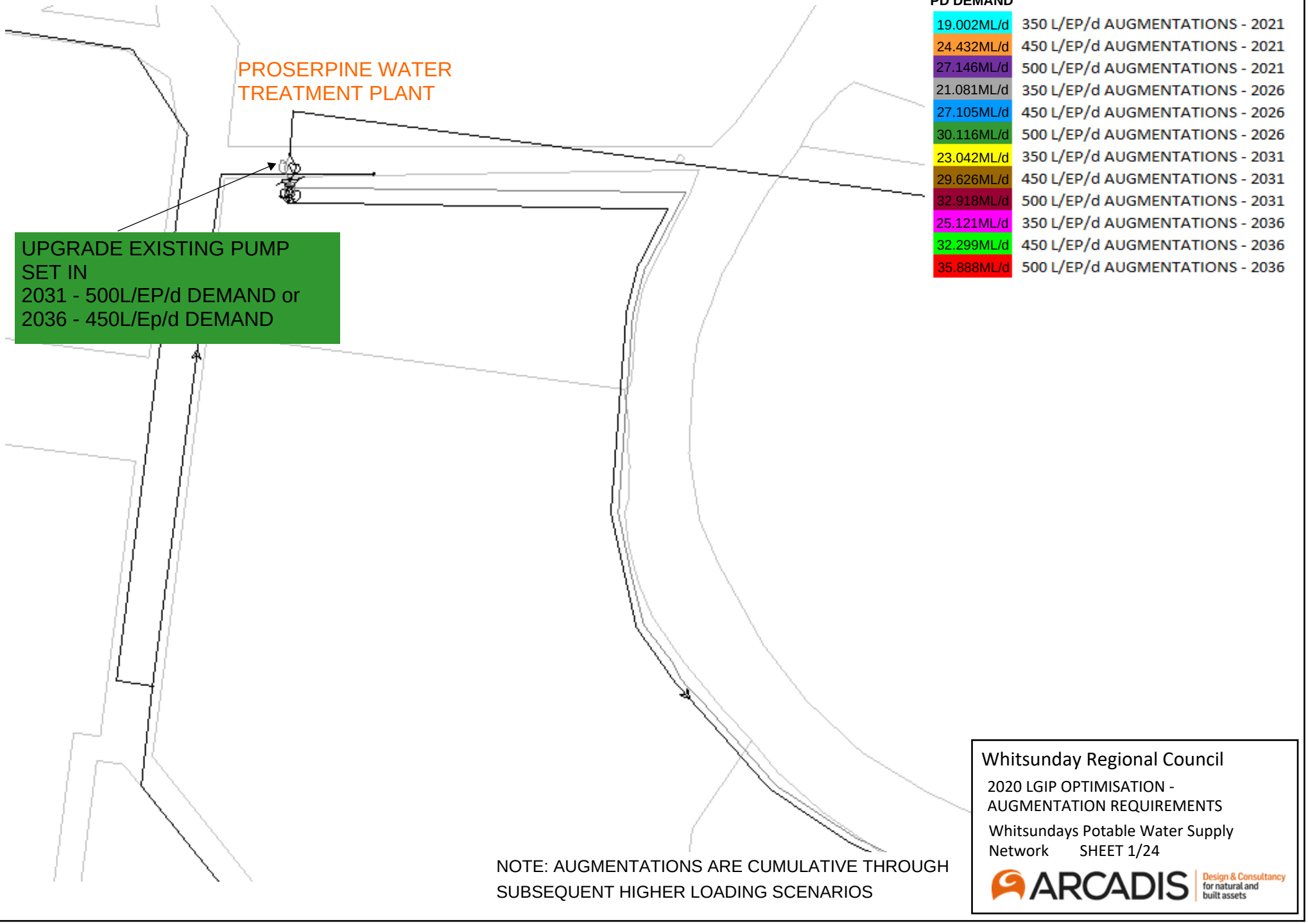


Assessment of the lower demand options demonstrated that the most notable augmentations required to the network may be implemented during later horizons or even omitted depending on the extent of the reduction, with progressively decreasing network augmentation requirements as demand decreases in the assessed option B (450L/EP/d) and option C (350L/EP/d).

When considering the substantial augmentation requirements, it is recommended that Council further investigate the opportunity to establish a water efficiency strategy which would allow for Council to delay a large number of augmentations to the network to later planning horizons. Depending on the adoption rate by the WRC community of the requested water demand targets, it may be possible to gradually decrease daily demand per person over a number of years, potentially achieving lower than 350L/EP/d. WRC note the potential saving of up to ≈$1M of pipework infrastructure CAPEX for the 2021 horizon if water consumption per EP is dropped by 150l/EP/D from 500 down to 350 L/EP/Day as an indication of effectiveness of water demand management, with increasing savings in augmentation requirements and CAPEX in future planning horizons

APPENDIX A

POTABLE WATER NETWORK AUGMENTATION MAPPING AND SUMMARY



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Whitsunday Regional Council
2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS
Whitsundays Potable Water Supply Network SHEET 2/24
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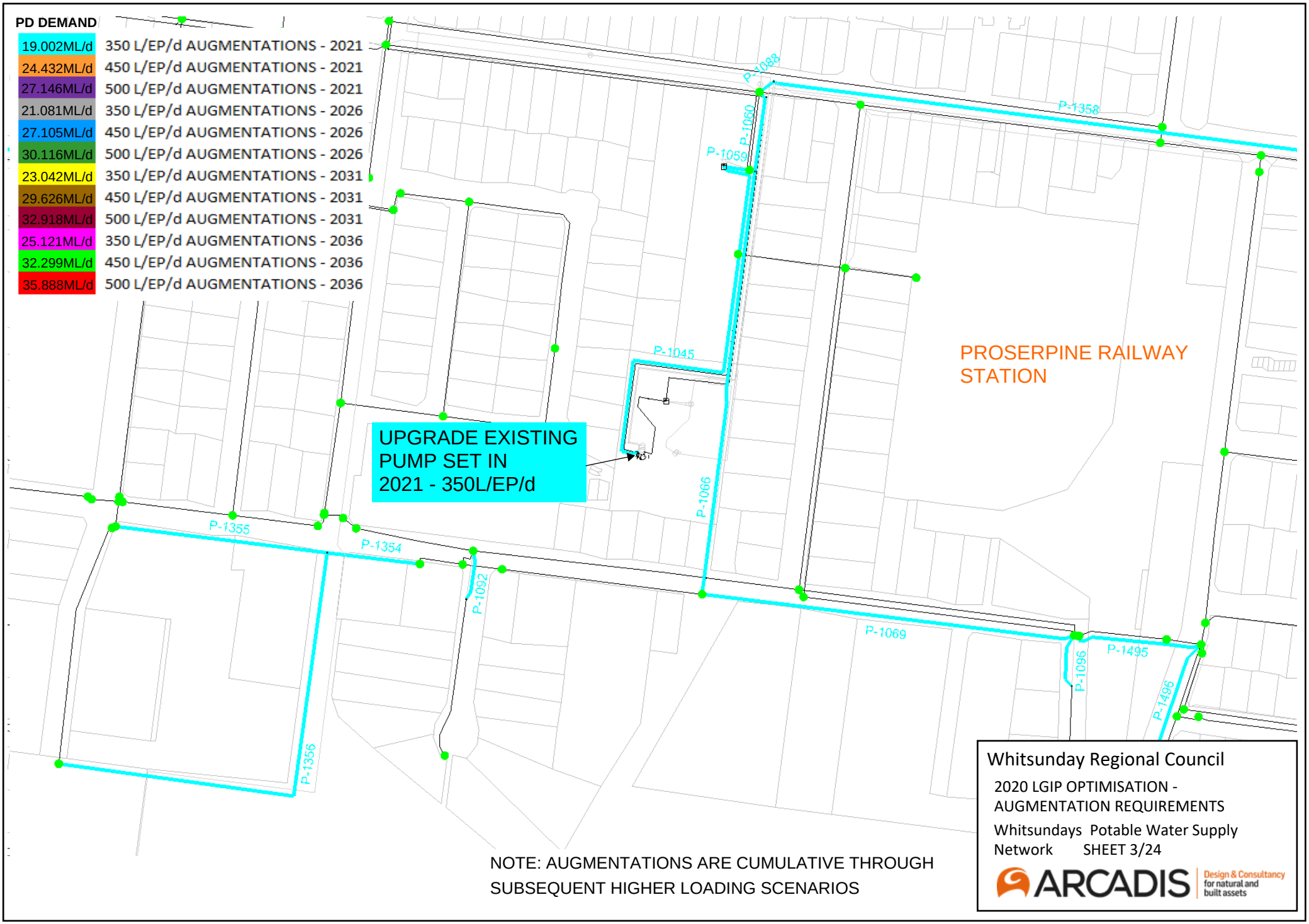

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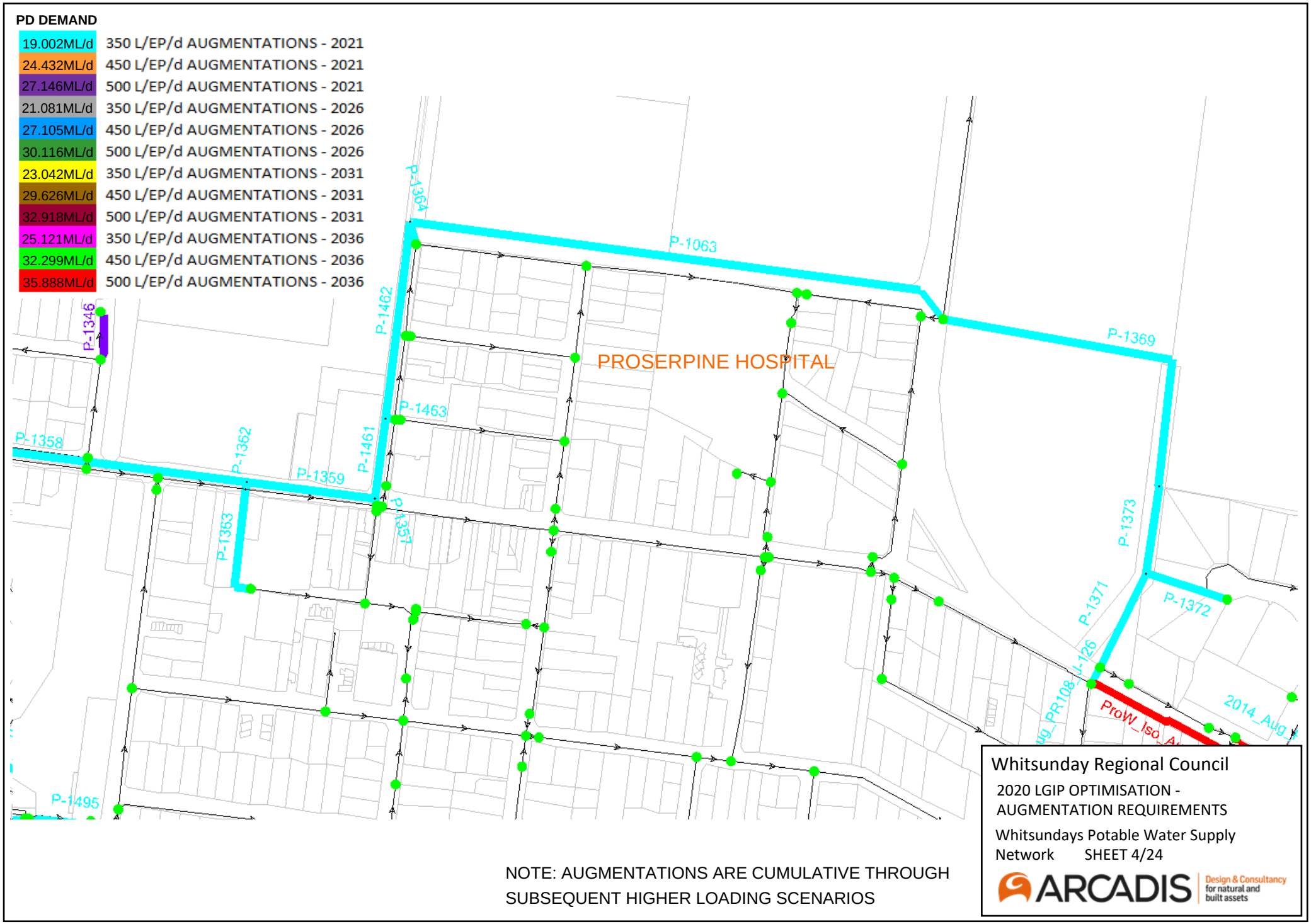
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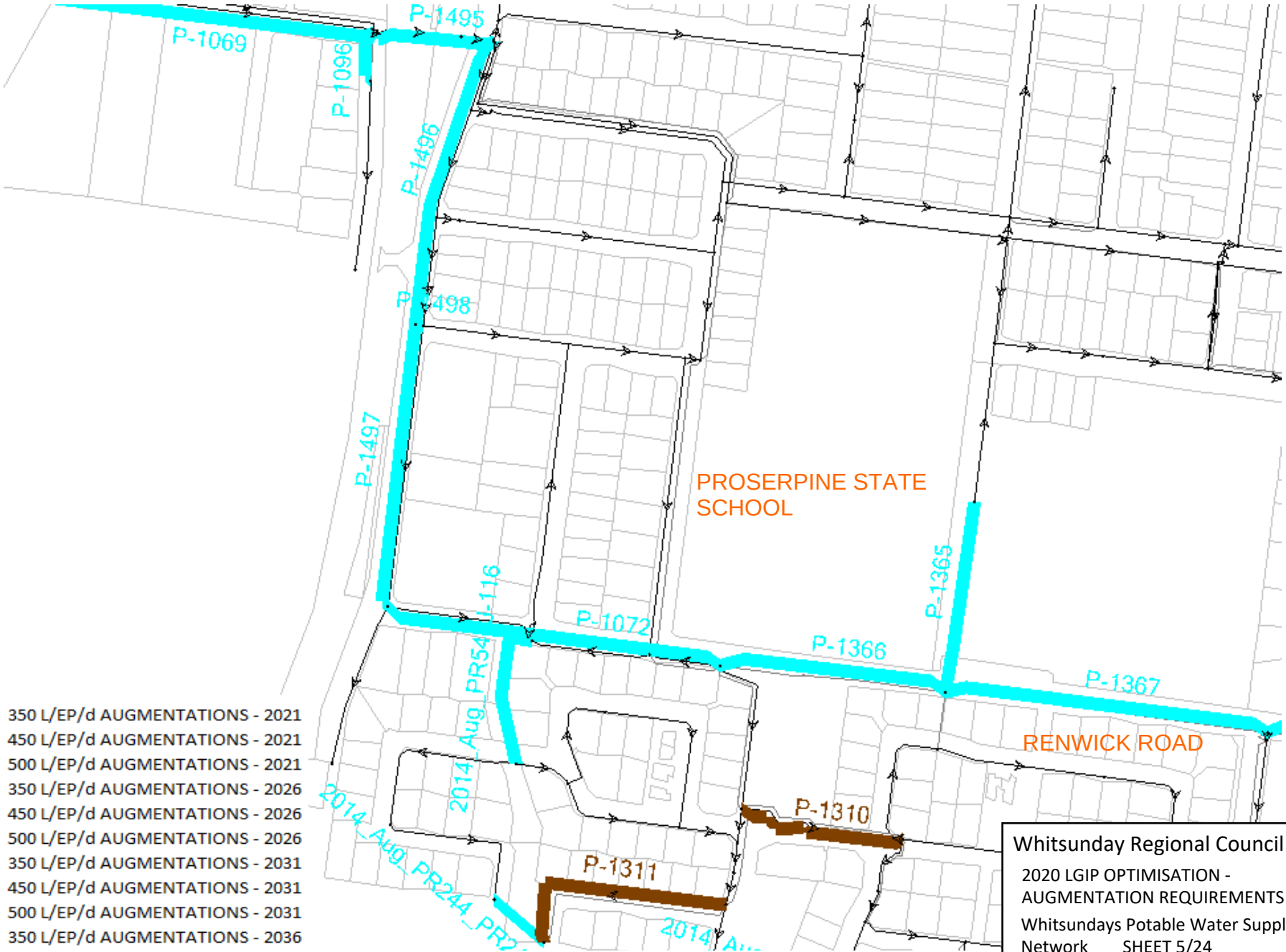

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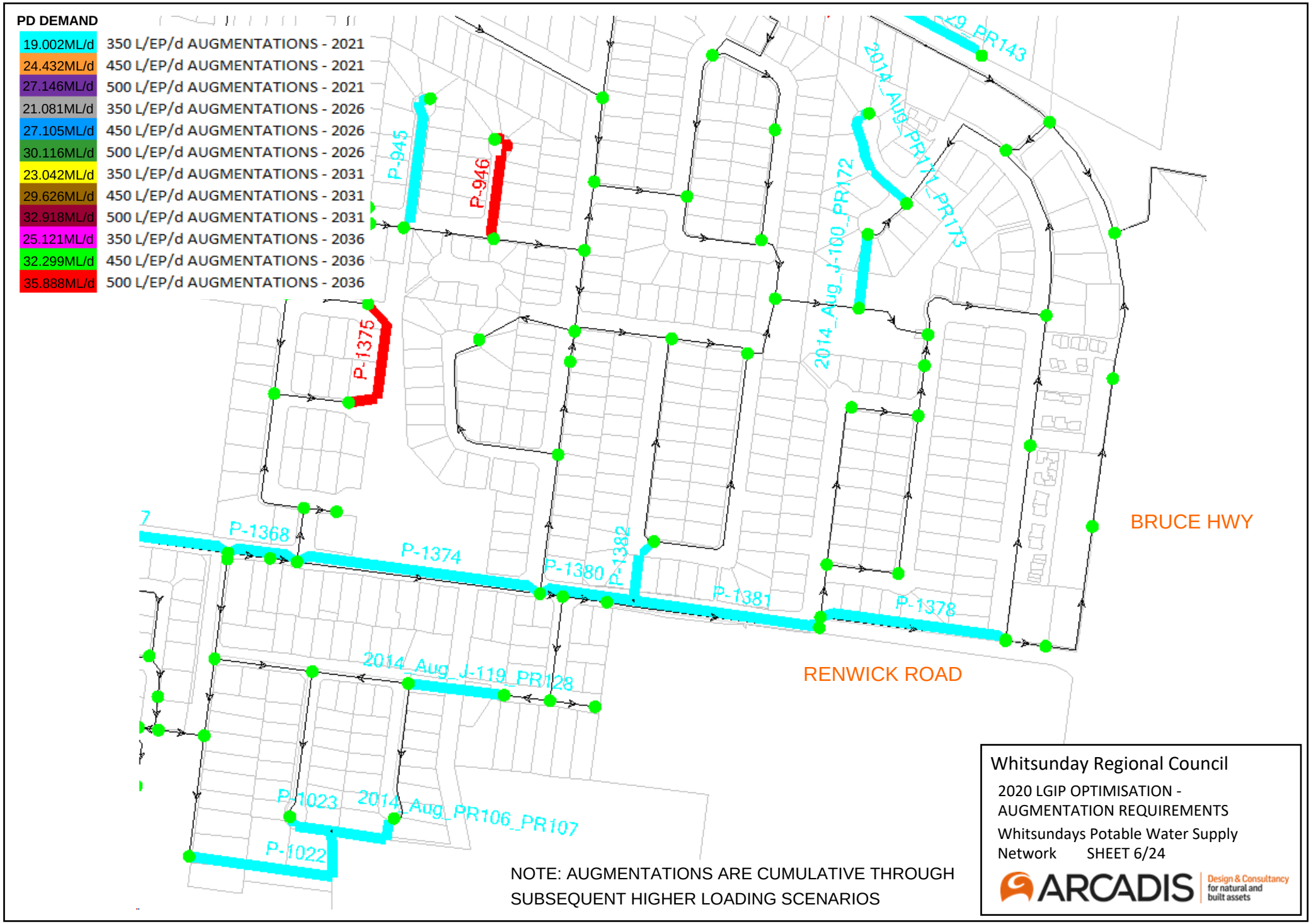
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Whitsundays Potable Water Supply Network SHEET 6/24
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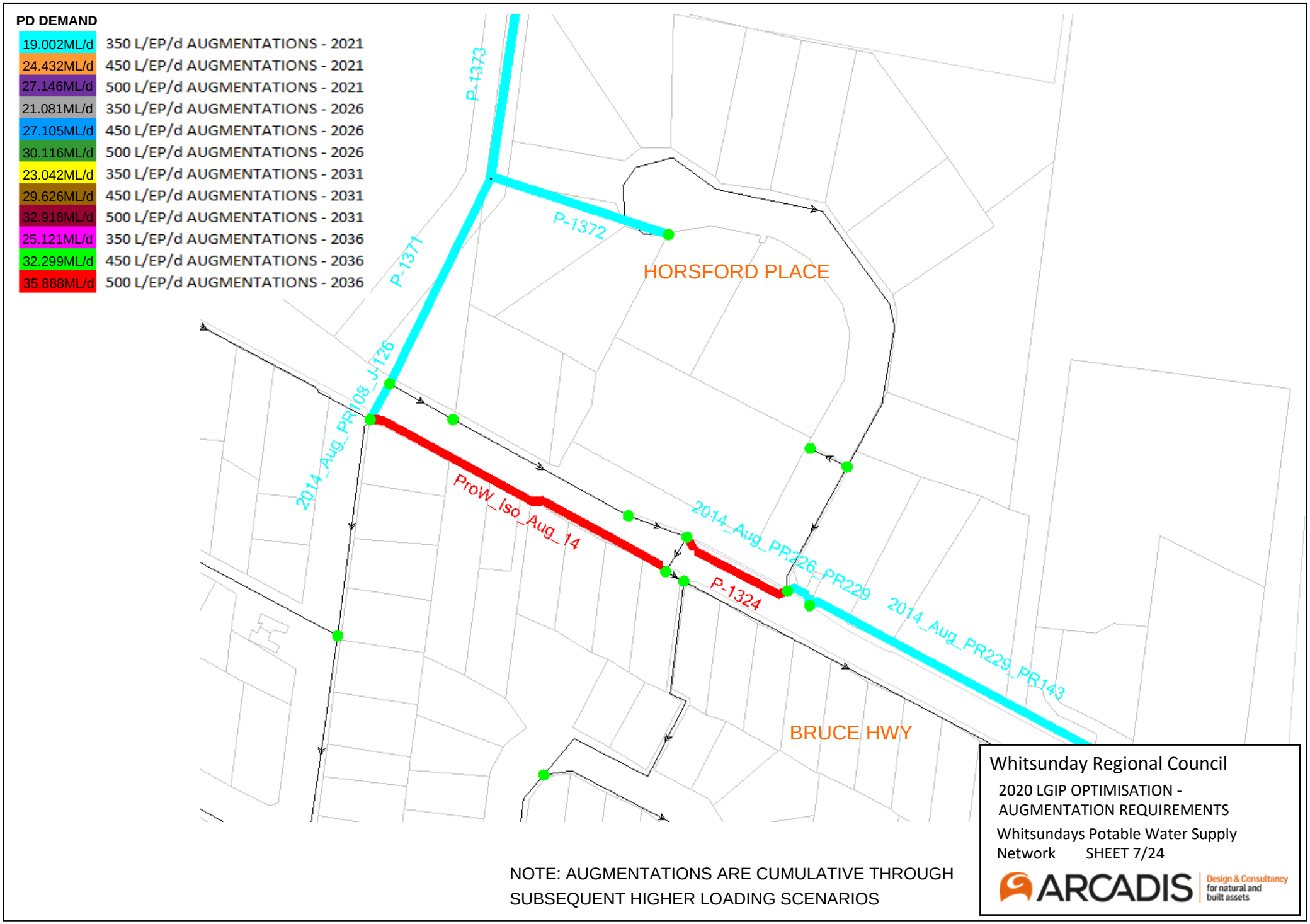
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2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS
Whitsundays Potable Water Supply Network SHEET 7/24
ARCADIS Design & Consultancy for natural and built assets

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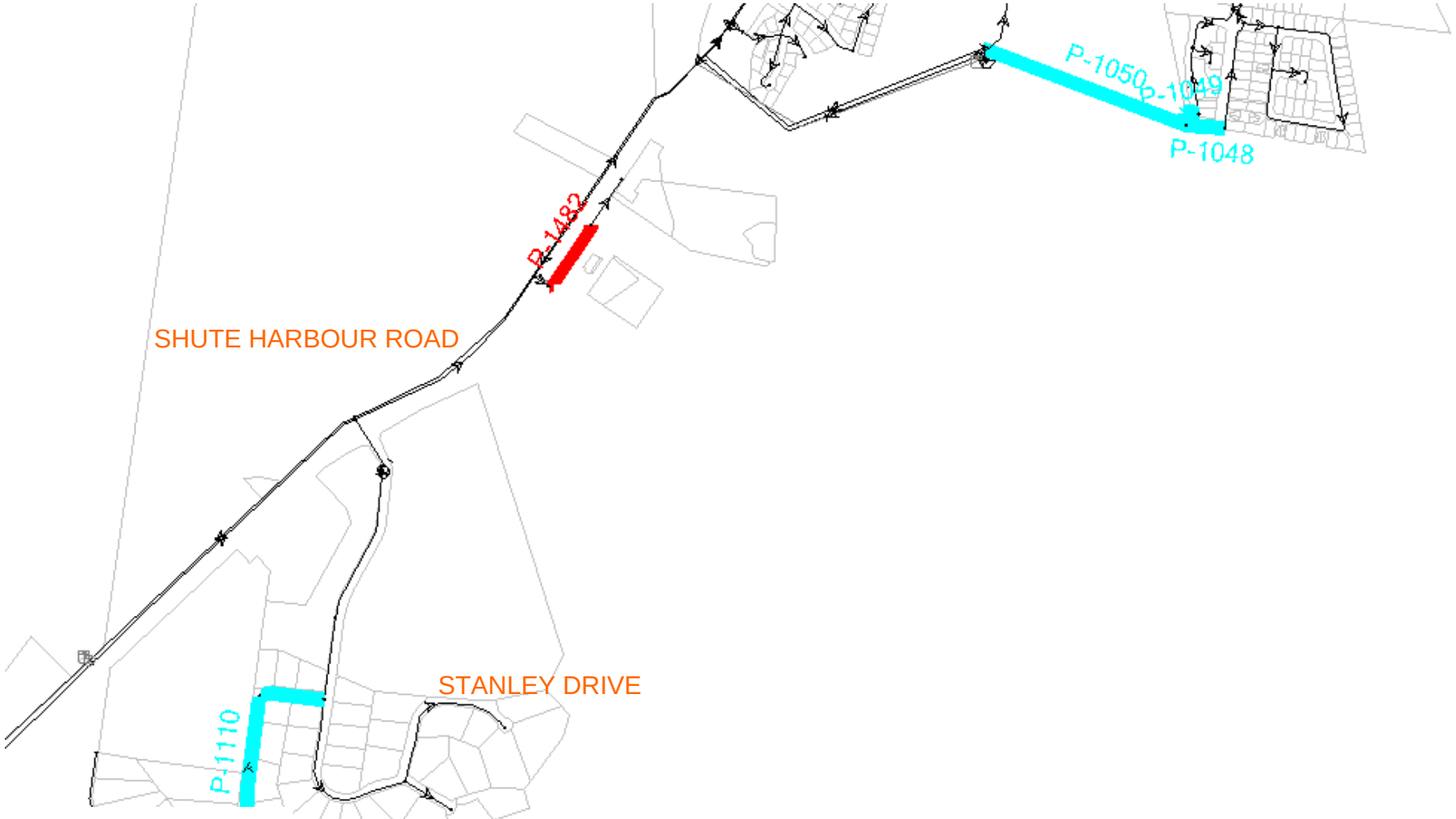

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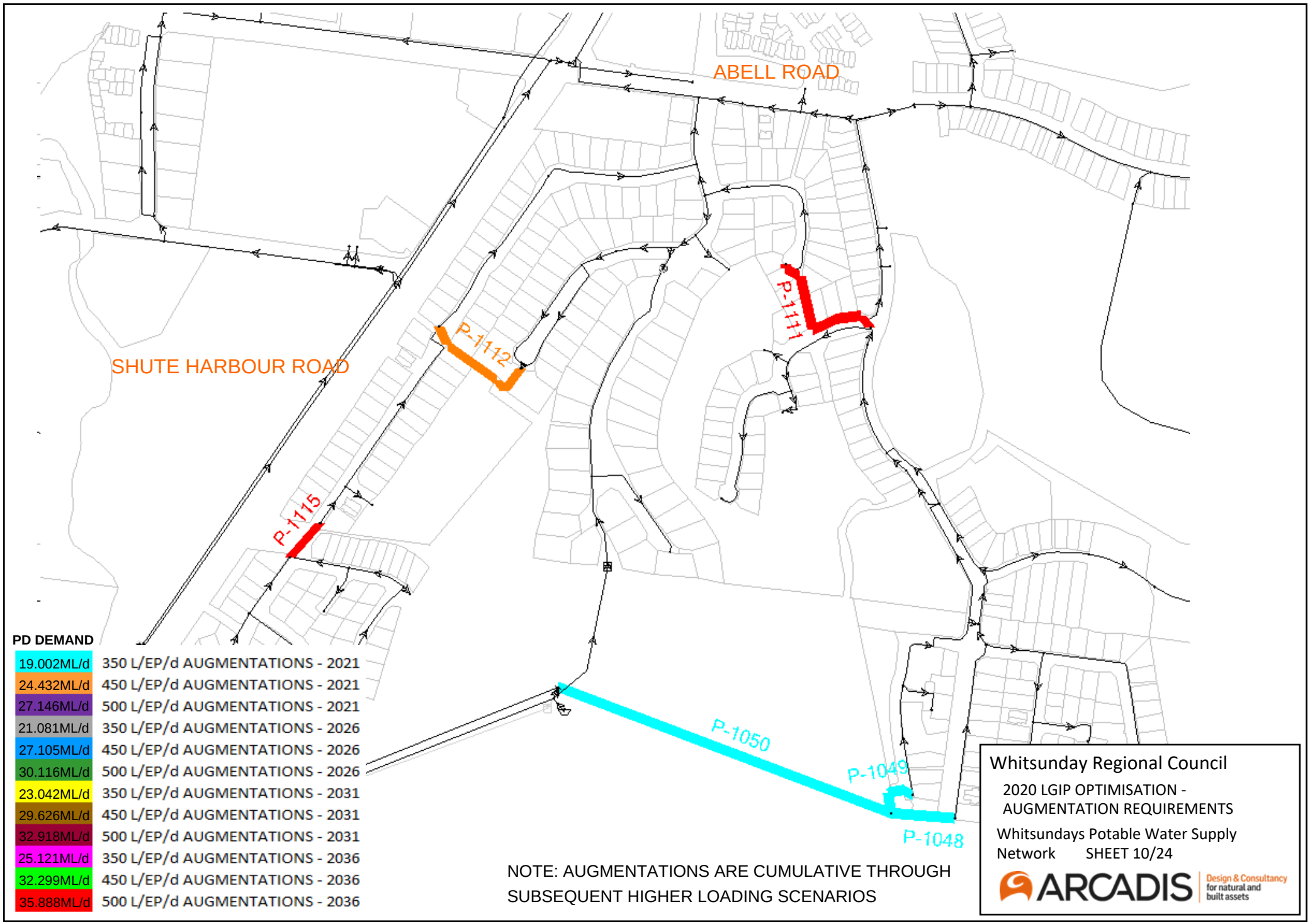

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Whitsundays Potable Water Supply Network SHEET 10/24

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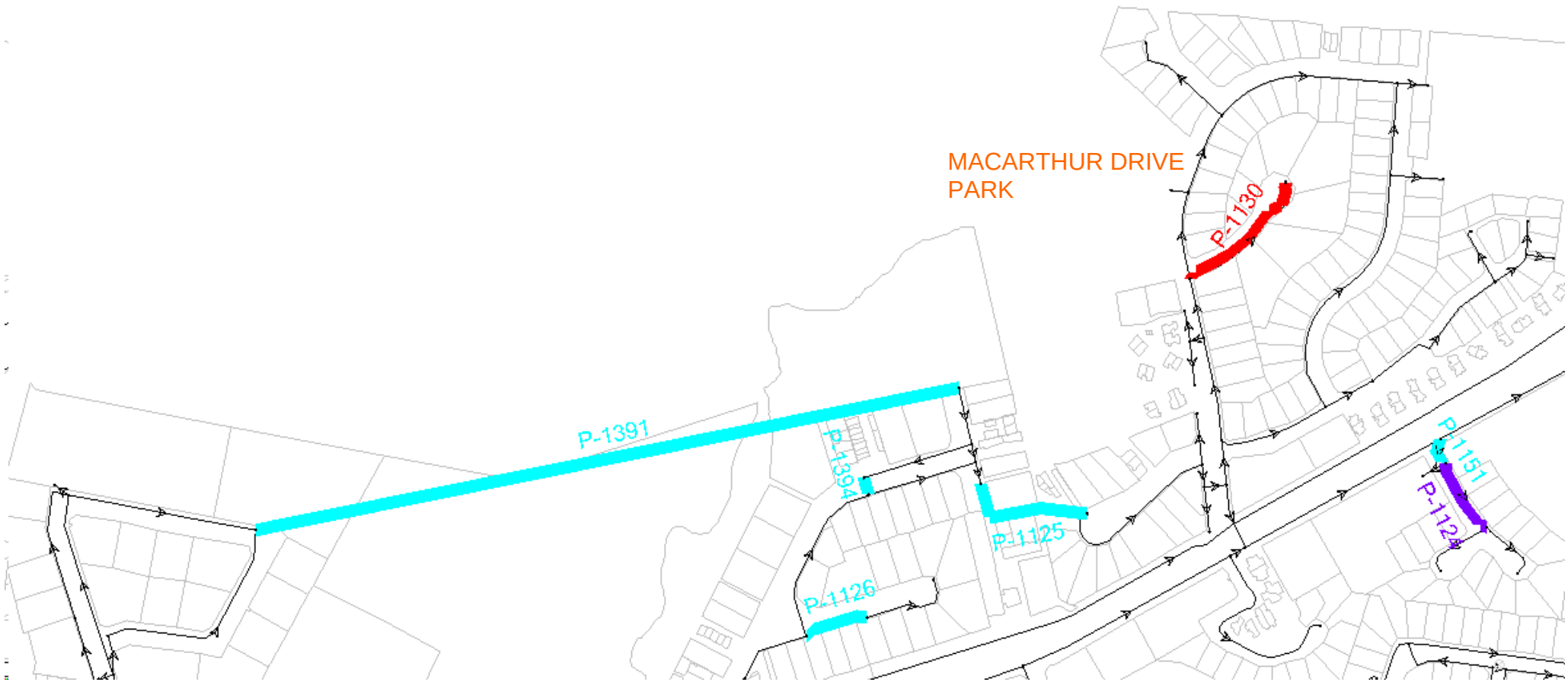

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Whitsundays Potable Water Supply Network SHEET 11/24

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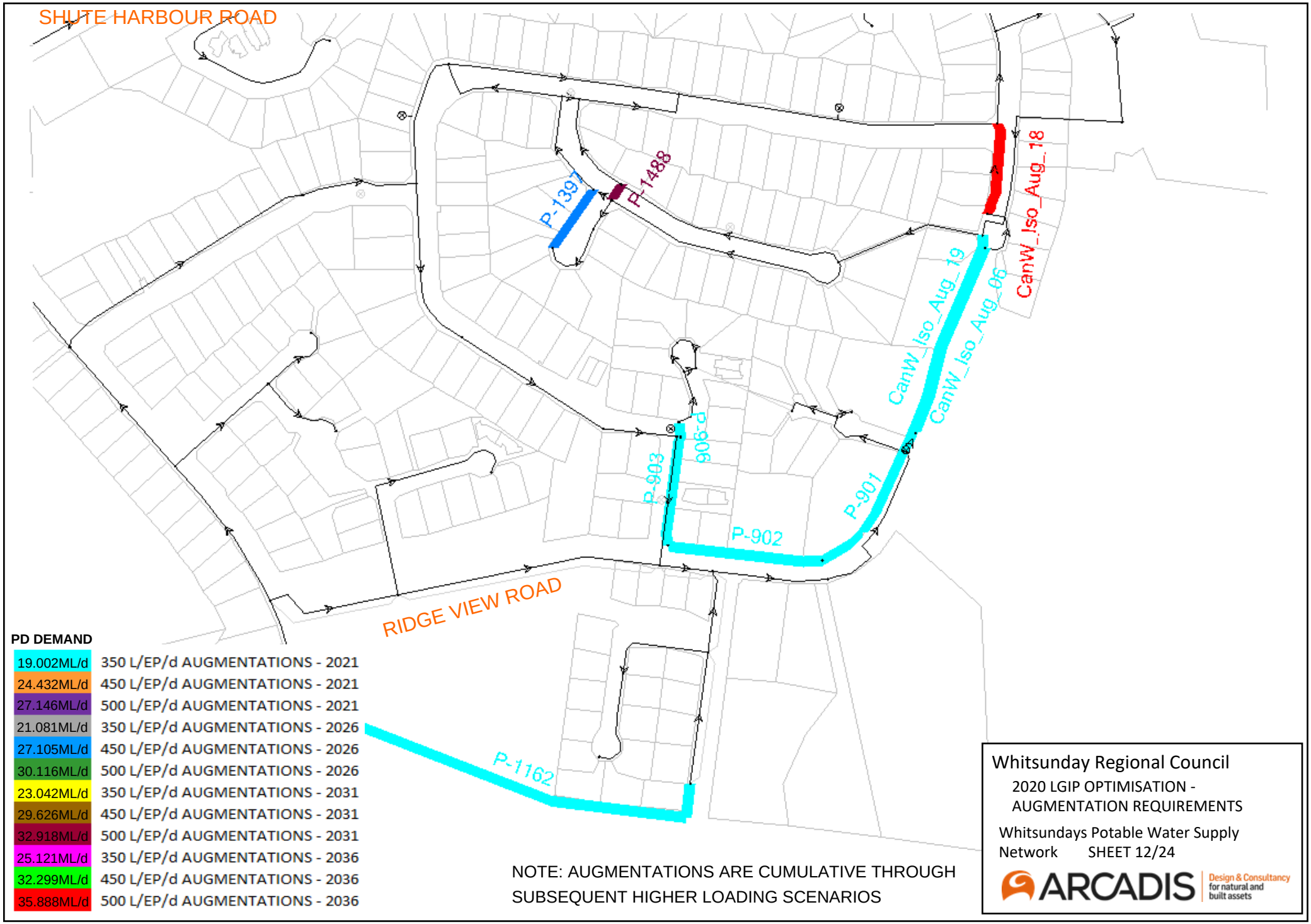

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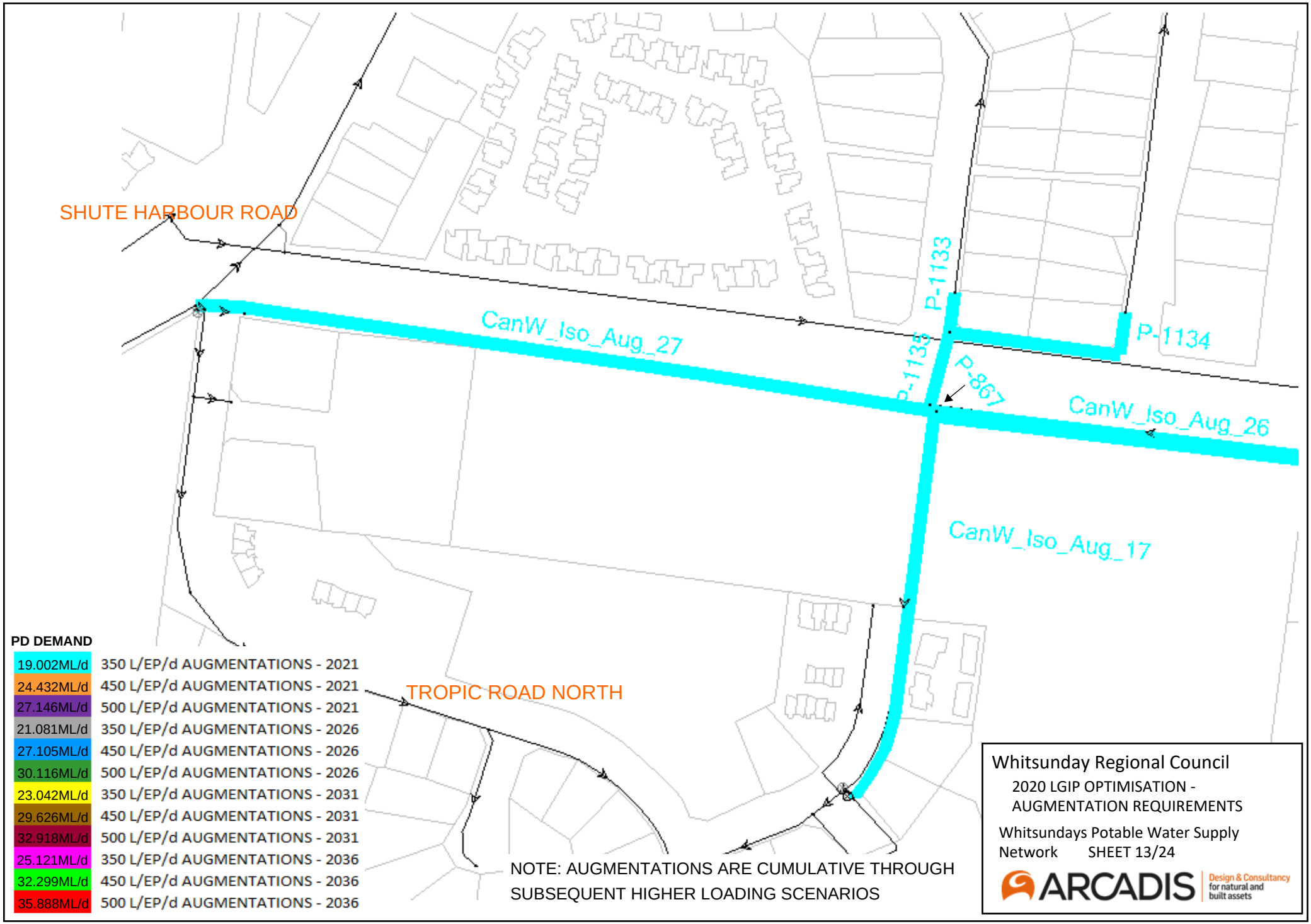

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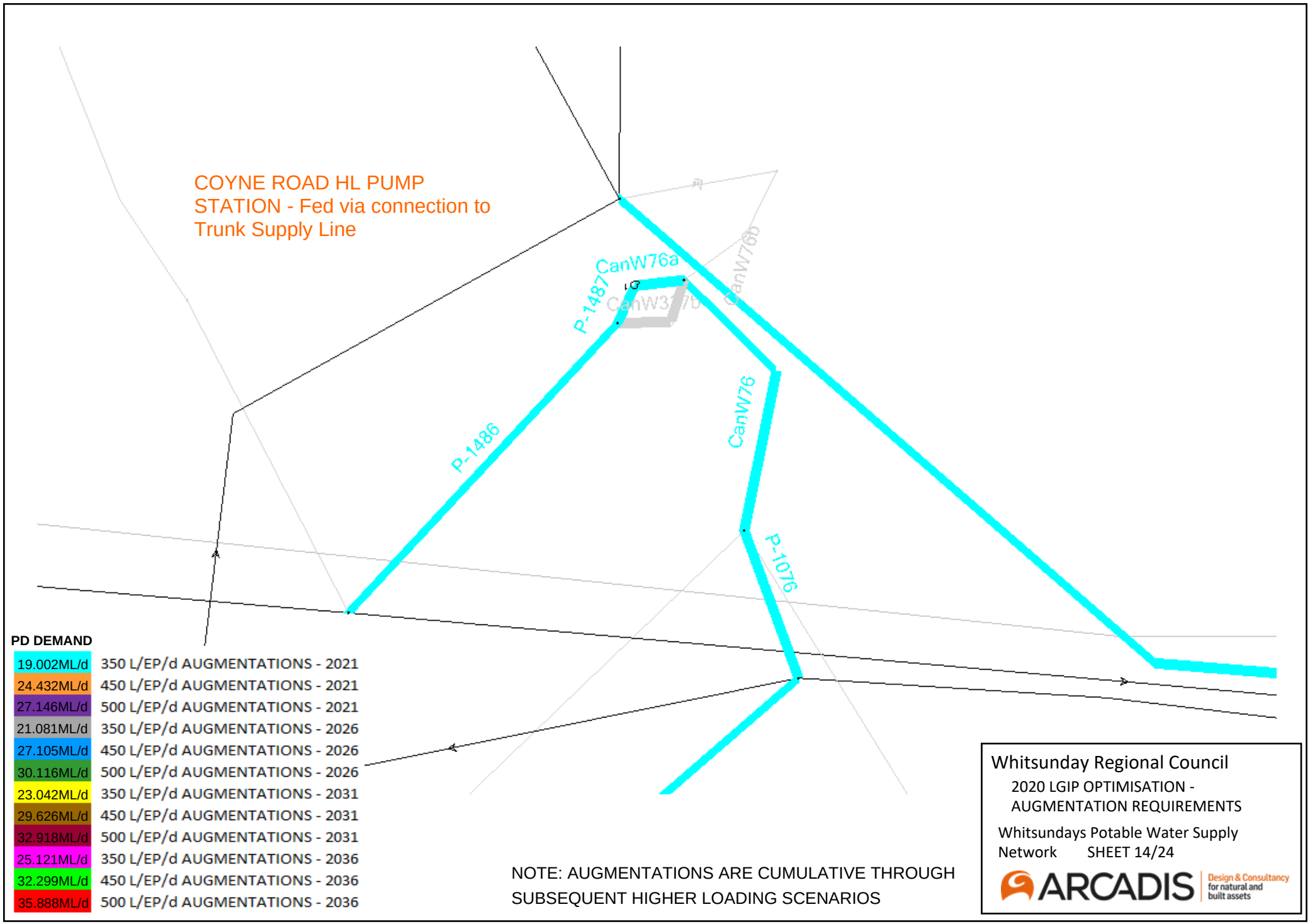

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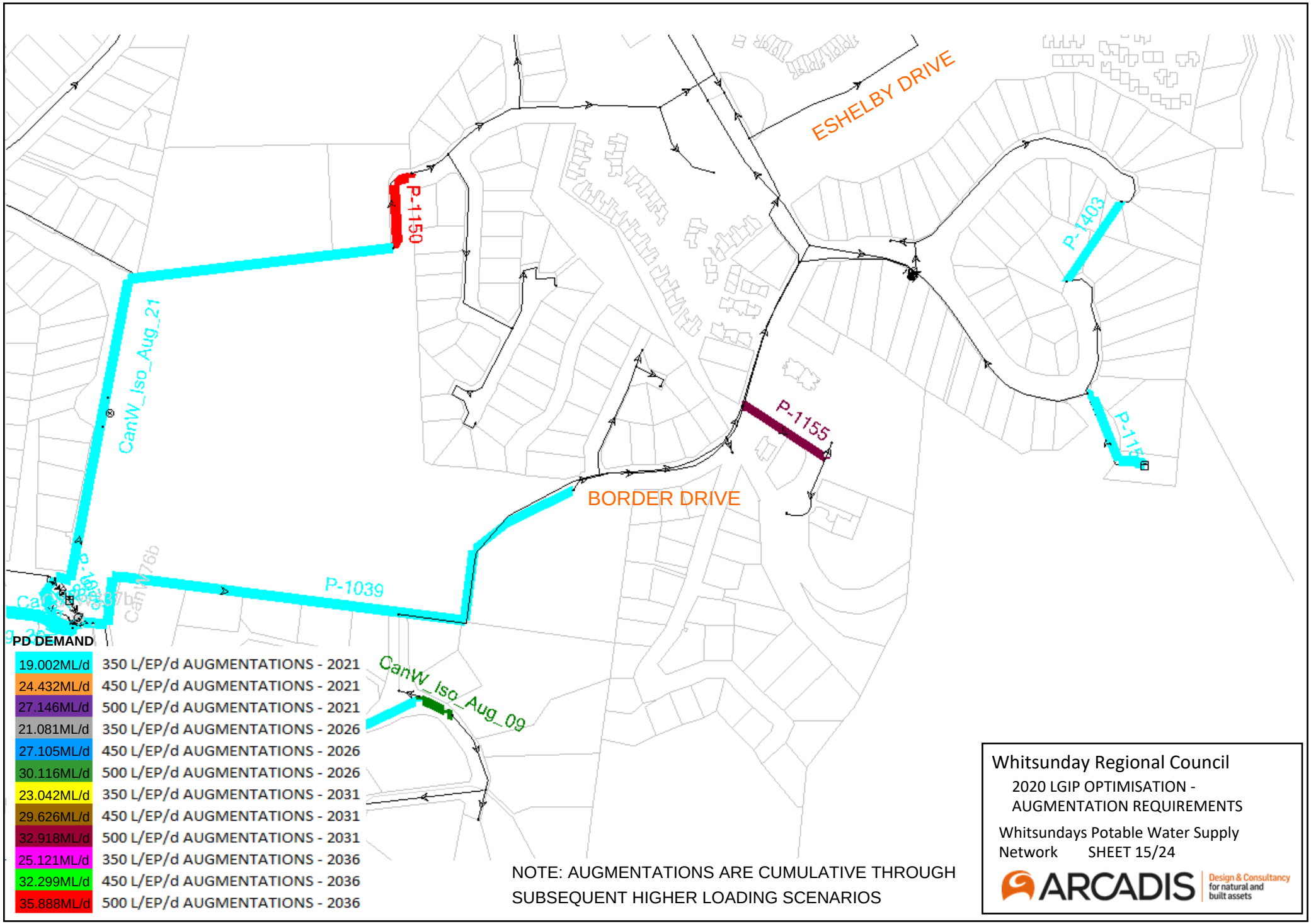
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Whitsundays Potable Water Supply Network SHEET 15/24
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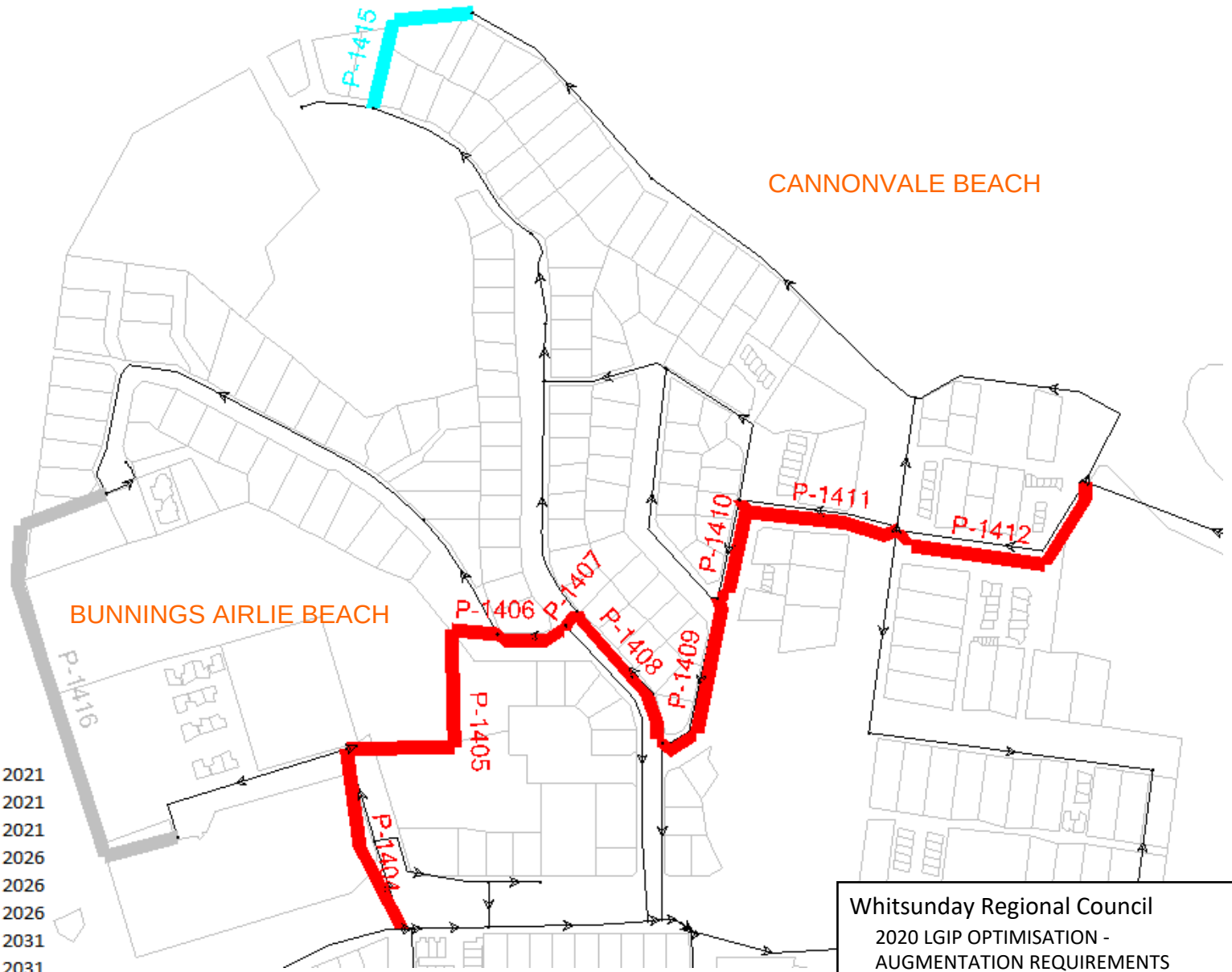

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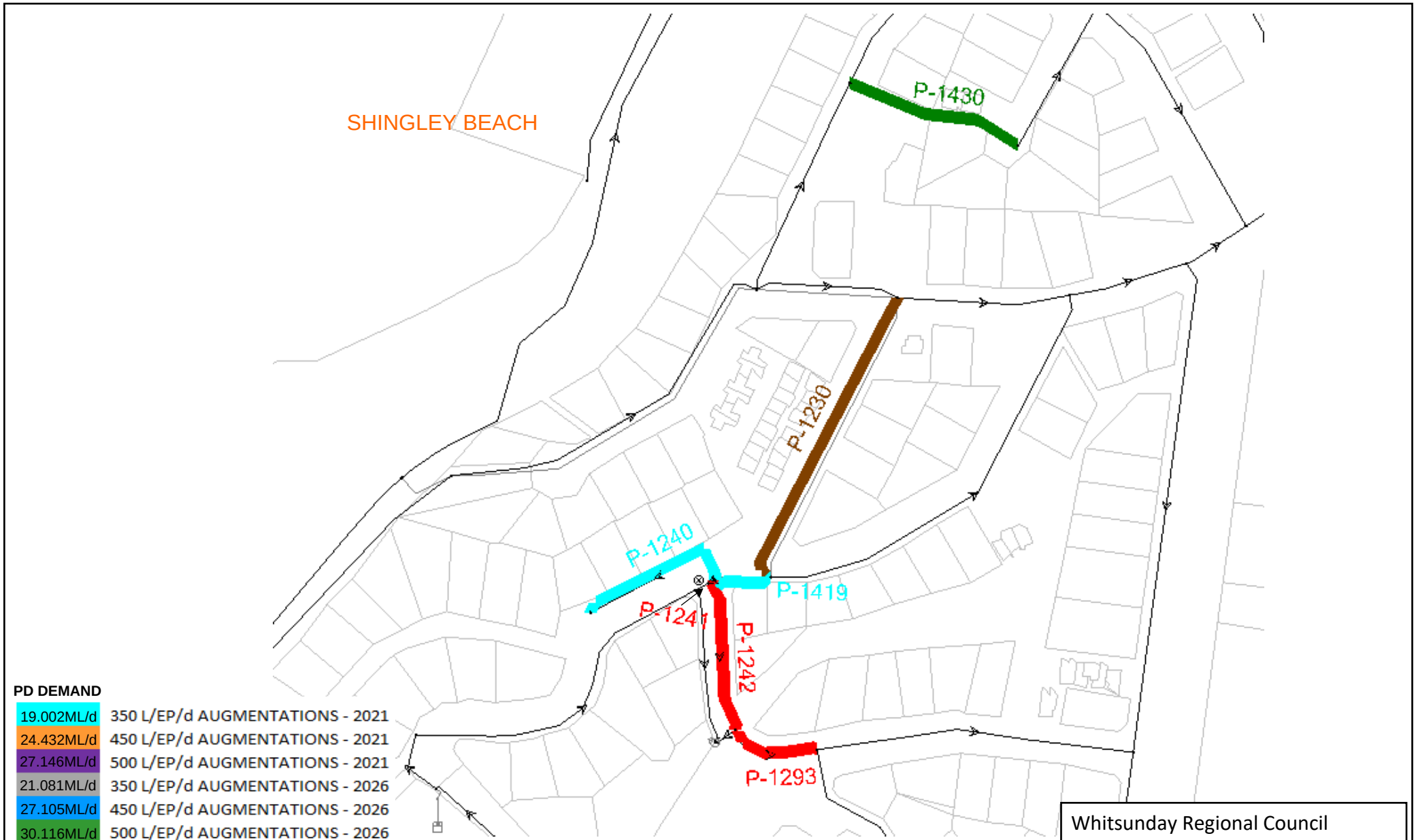

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27.105ML/d	450 L/EP/d AUGMENTATIONS - 2026
30.116ML/d	500 L/EP/d AUGMENTATIONS - 2026
23.042ML/d	350 L/EP/d AUGMENTATIONS - 2031
29.626ML/d	450 L/EP/d AUGMENTATIONS - 2031
32.918ML/d	500 L/EP/d AUGMENTATIONS - 2031
25.121ML/d	350 L/EP/d AUGMENTATIONS - 2036
32.299ML/d	450 L/EP/d AUGMENTATIONS - 2036
35.888ML/d	500 L/EP/d AUGMENTATIONS - 2036

NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

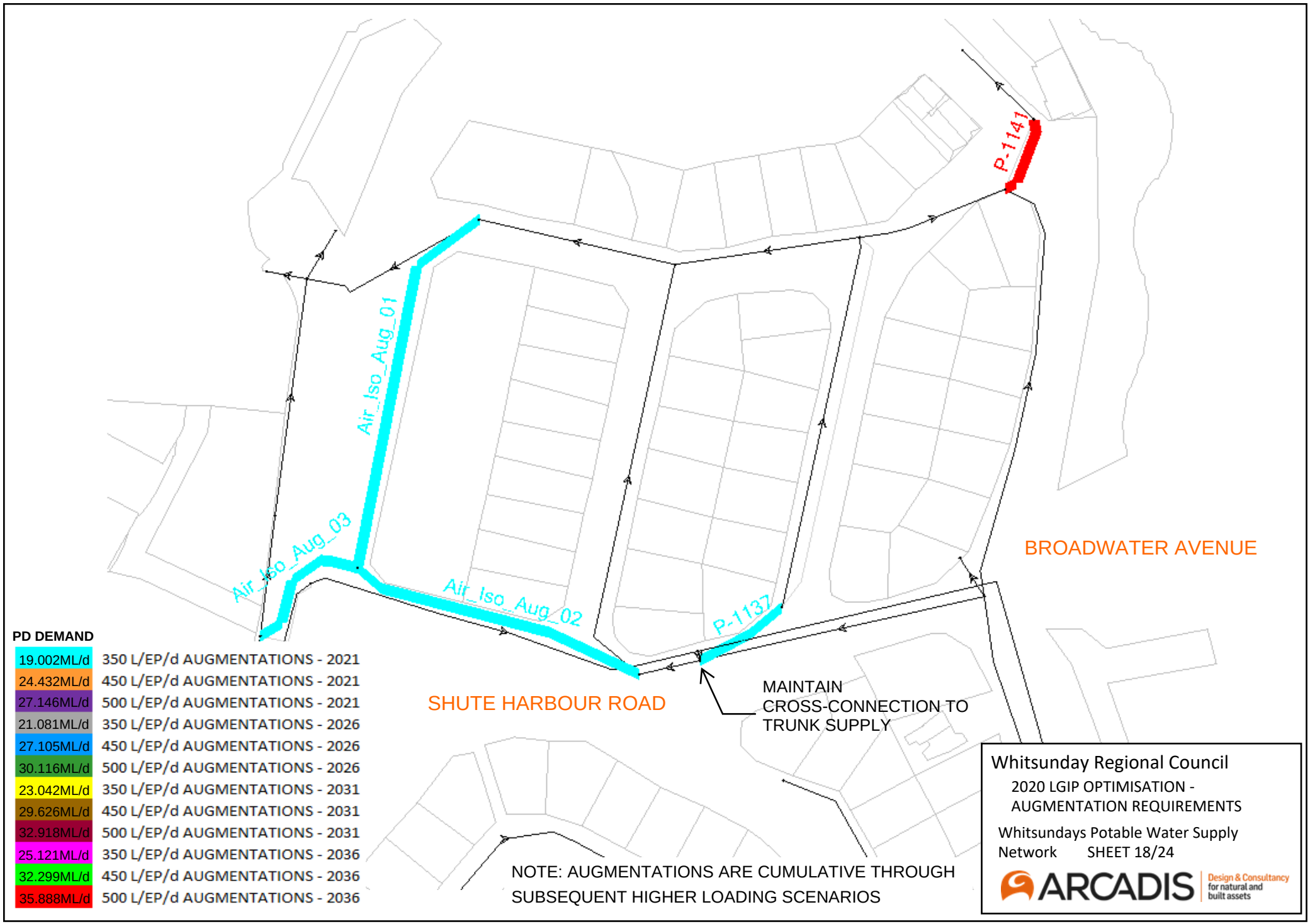
2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS

Whitsundays Potable Water Supply Network SHEET 17/24

ARCADIS Design & Consultancy for natural and built assets

30/01/2020

SK005-10027536-03



PD DEMAND

19.002ML/d	350 L/EP/d AUGMENTATIONS - 2021
24.432ML/d	450 L/EP/d AUGMENTATIONS - 2021
27.146ML/d	500 L/EP/d AUGMENTATIONS - 2021
21.081ML/d	350 L/EP/d AUGMENTATIONS - 2026
27.105ML/d	450 L/EP/d AUGMENTATIONS - 2026
30.116ML/d	500 L/EP/d AUGMENTATIONS - 2026
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35.888ML/d	500 L/EP/d AUGMENTATIONS - 2036

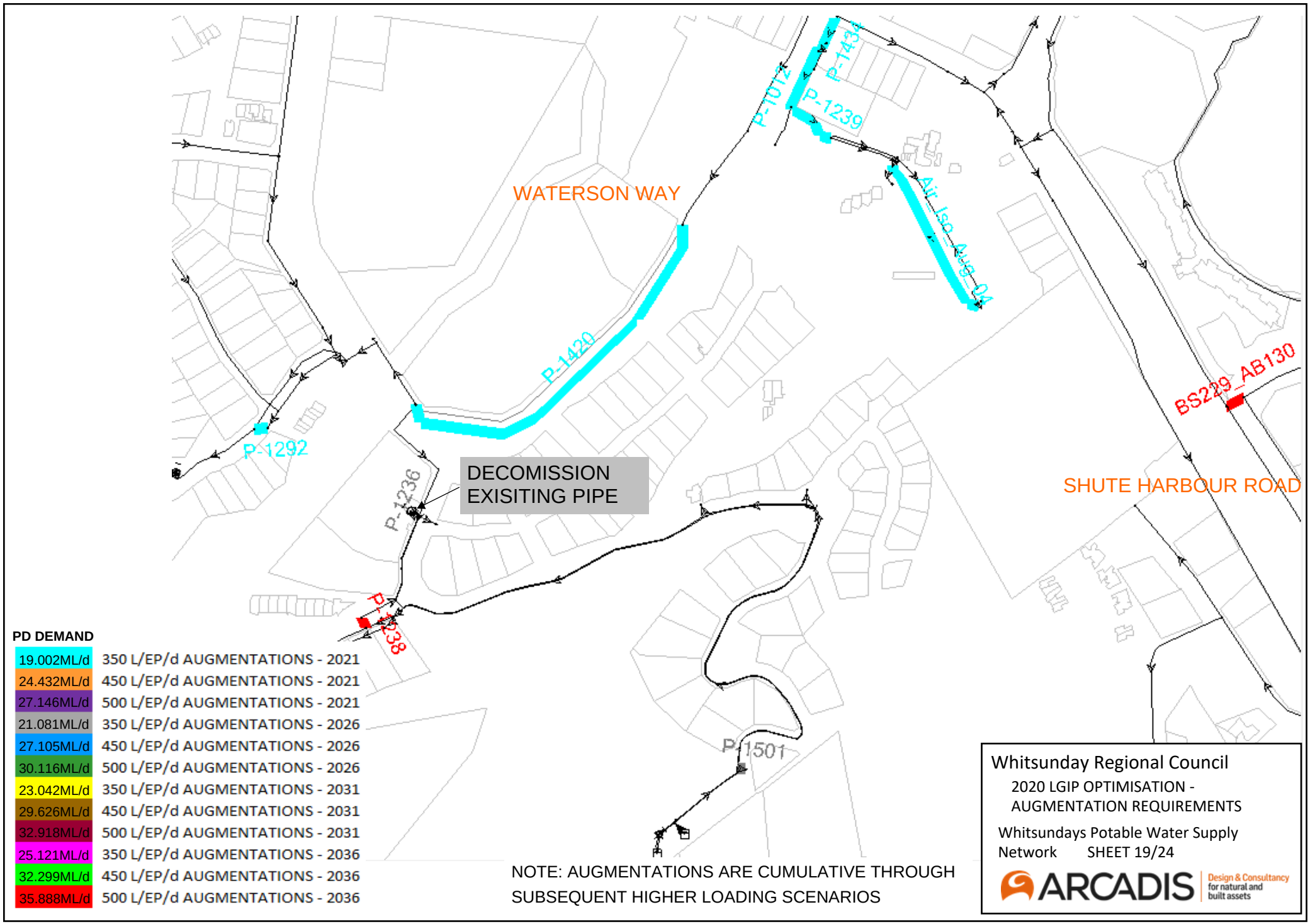
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS

Whitsundays Potable Water Supply Network SHEET 18/24

ARCADIS Design & Consultancy for natural and built assets



PD DEMAND

19.002ML/d	350 L/EP/d AUGMENTATIONS - 2021
24.432ML/d	450 L/EP/d AUGMENTATIONS - 2021
27.146ML/d	500 L/EP/d AUGMENTATIONS - 2021
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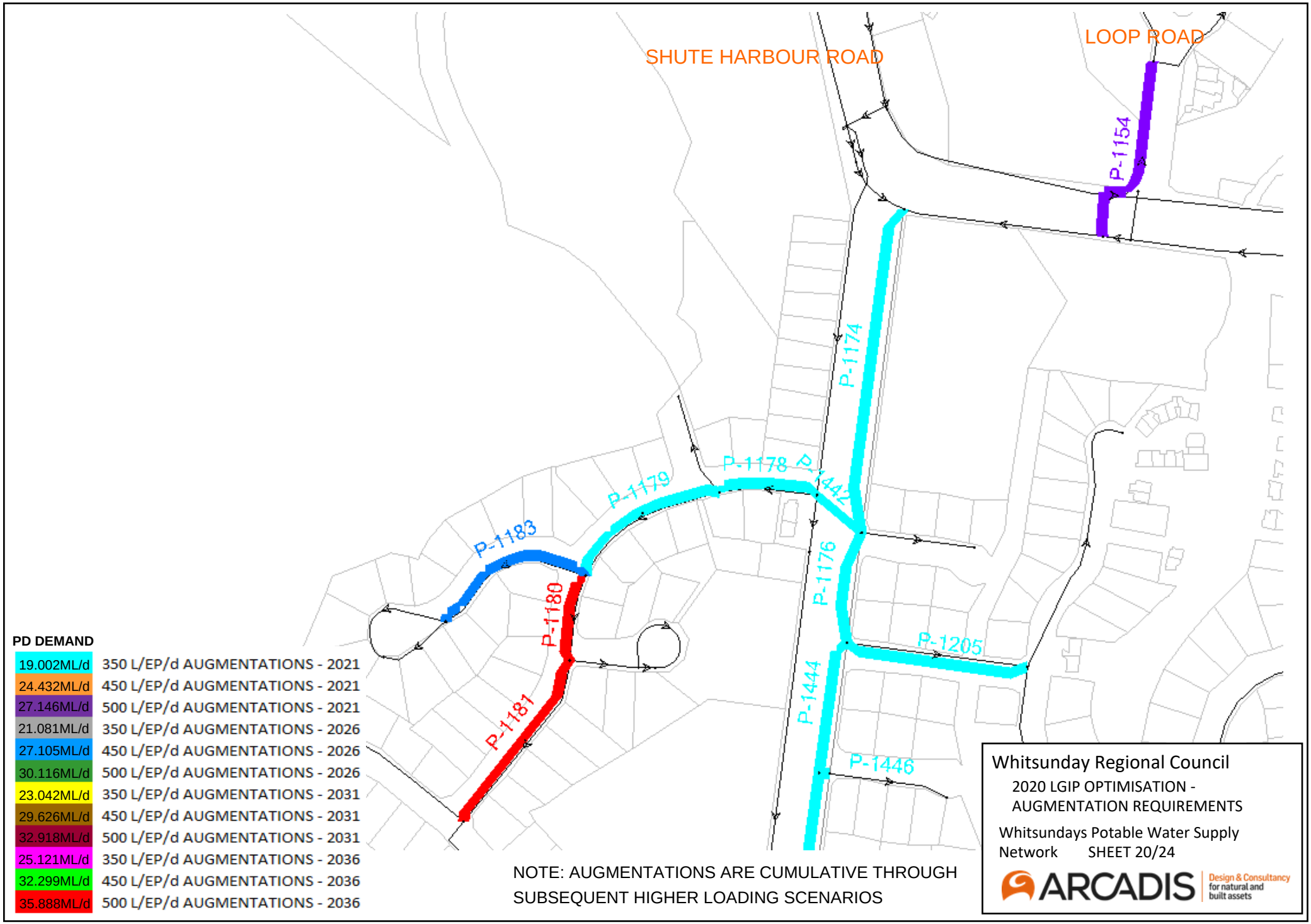
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS

Whitsundays Potable Water Supply Network SHEET 19/24

ARCADIS Design & Consultancy for natural and built assets


SHUTE HARBOUR ROAD
LOOP ROAD
P-1154
P-1174
P-1178
P-1179
P-1183
P-1180
P-1181
P-1176
P-1205
P-1444
P-1446
PD DEMAND
19.002ML/d 350 L/EP/d AUGMENTATIONS - 2021
24.432ML/d 450 L/EP/d AUGMENTATIONS - 2021
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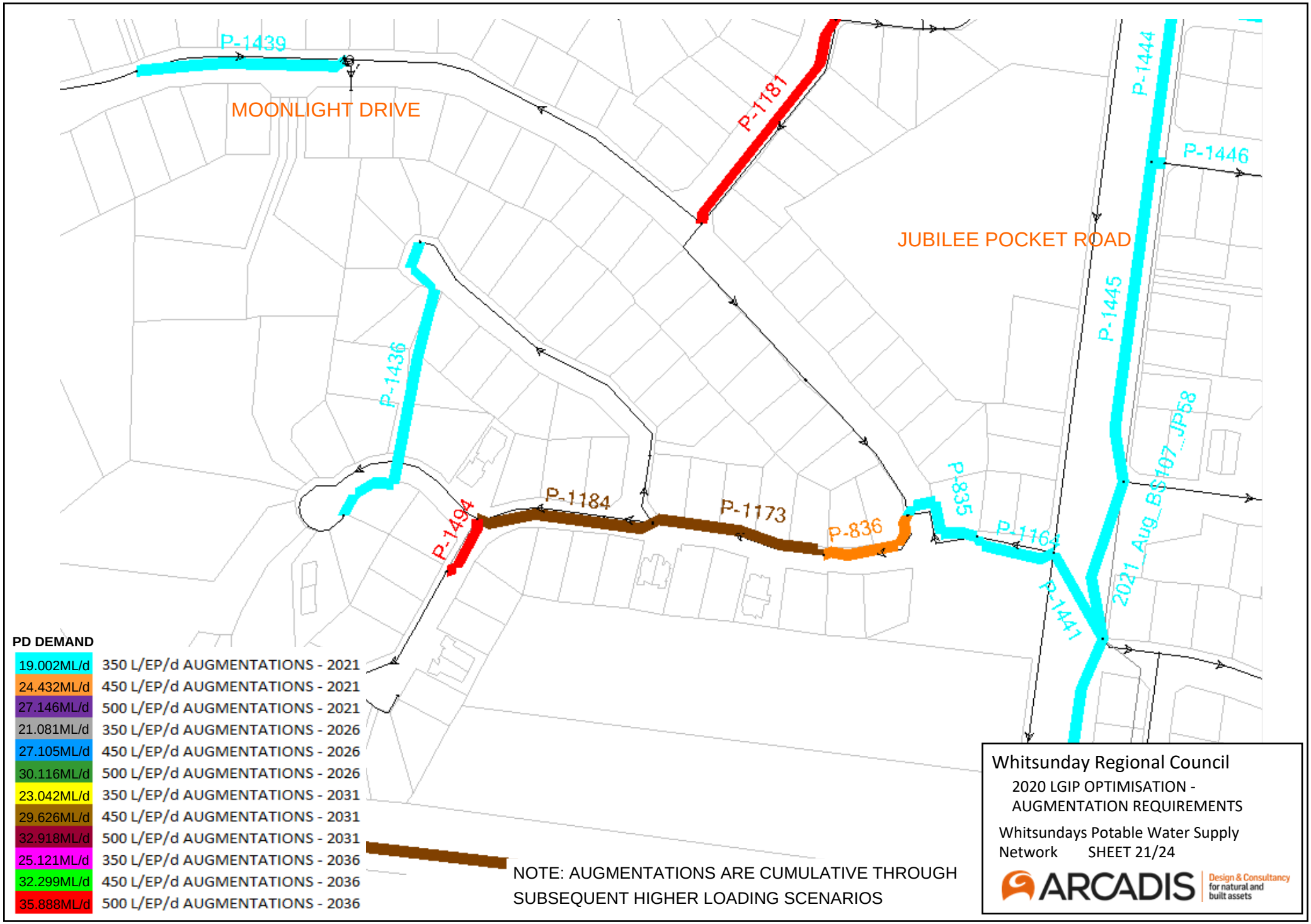
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS
Whitsunday Regional Council
2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS
Whitsundays Potable Water Supply Network SHEET 20/24
ARCADIS Design & Consultancy for natural and built assets



PD DEMAND

19.002ML/d	350 L/EP/d AUGMENTATIONS - 2021
24.432ML/d	450 L/EP/d AUGMENTATIONS - 2021
27.146ML/d	500 L/EP/d AUGMENTATIONS - 2021
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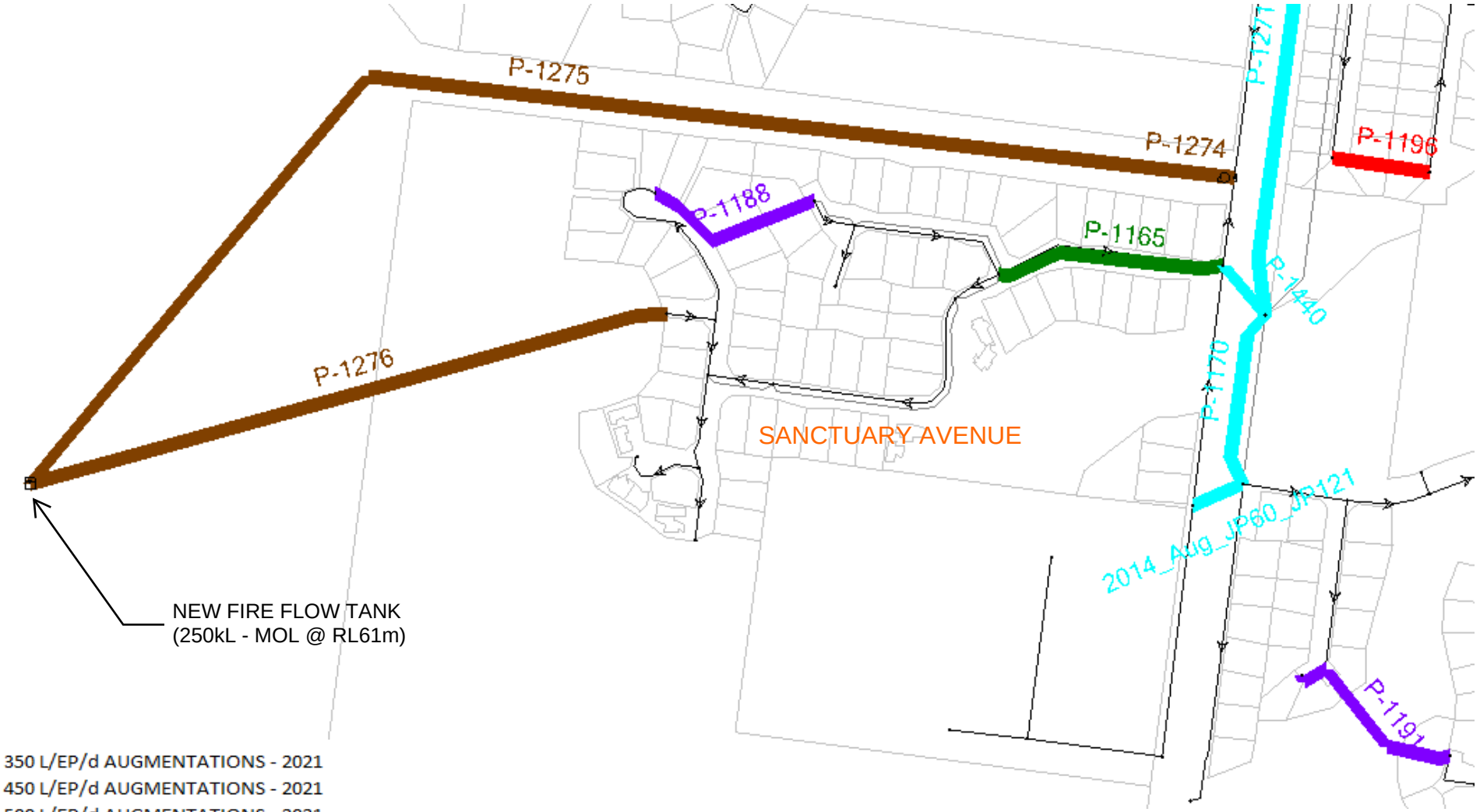
Whitsunday Regional Council

2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS

Whitsundays Potable Water Supply Network SHEET 21/24

ARCADIS Design & Consultancy for natural and built assets



PD DEMAND

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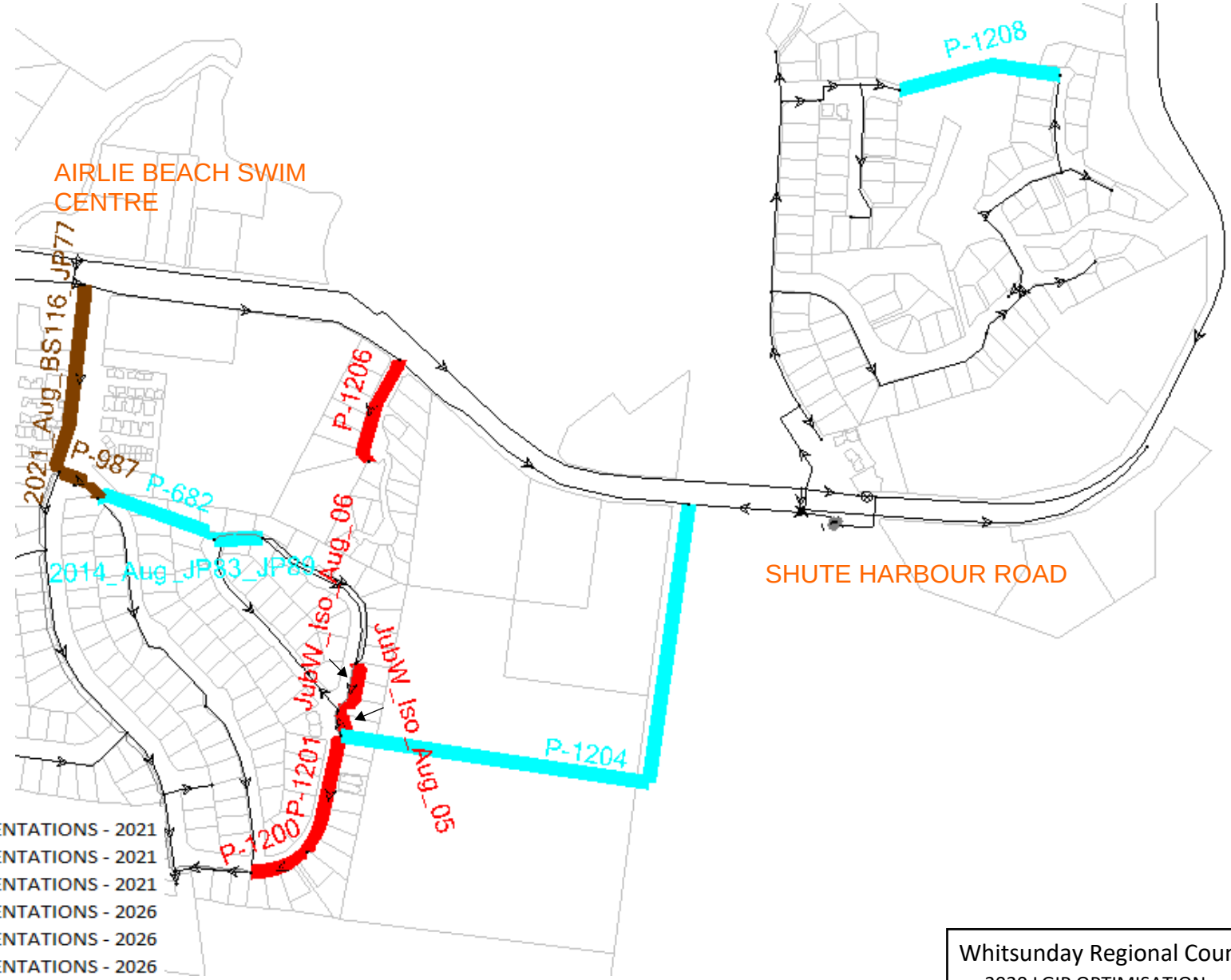
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS

Whitsundays Potable Water Supply Network SHEET 22/24

ARCADIS Design & Consultancy for natural and built assets



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Whitsunday Regional Council

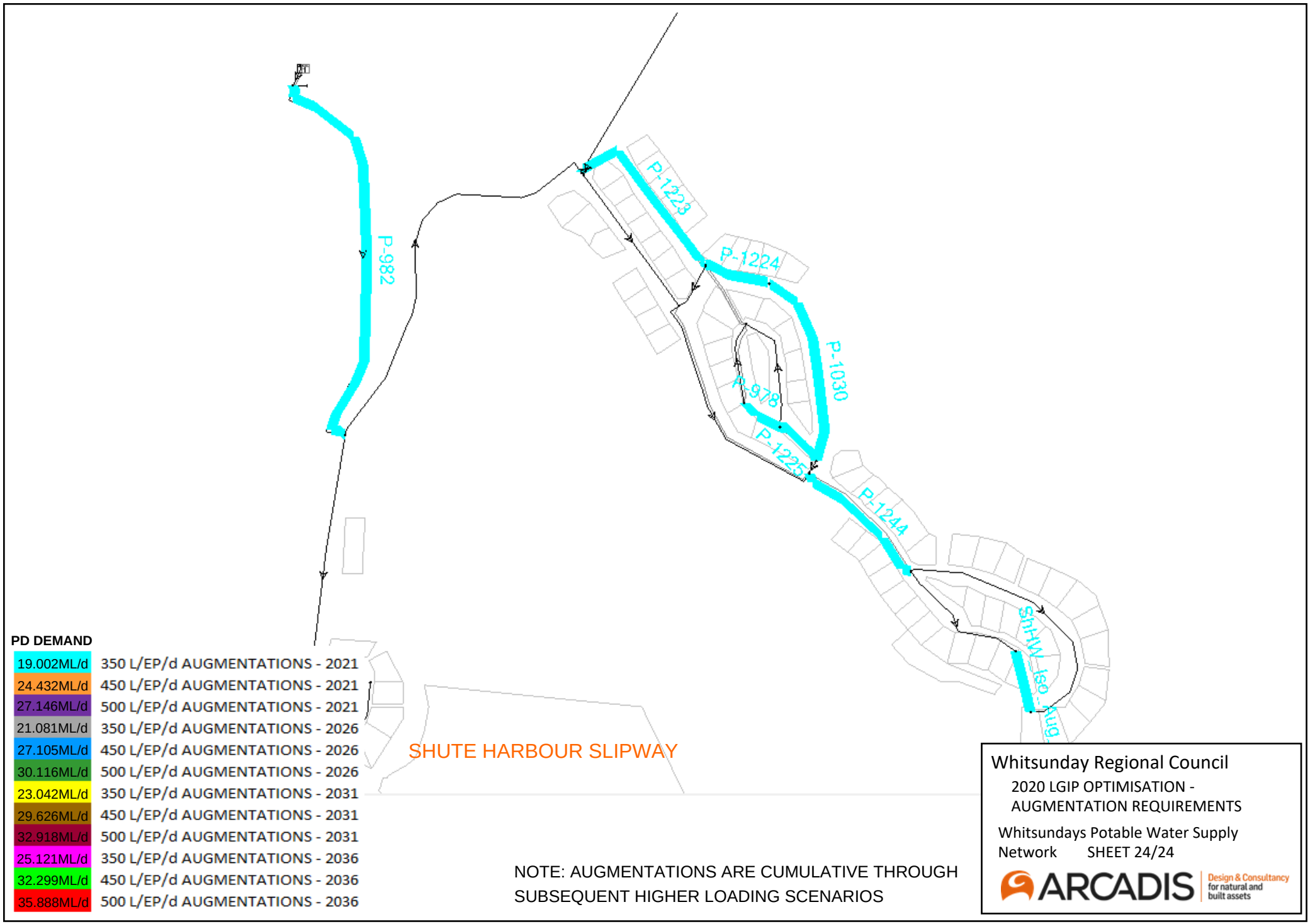
2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS

Whitsundays Potable Water Supply Network SHEET 23/24

ARCADIS Design & Consultancy for natural and built assets

10/02/2020

SK005-10027536-03



10/01/2020

SK005-10027536-03

PROJECT:	Whitsundays Potable Water Network Modelling	**Project Engineer:**	M.C
DOCUMENT NUMBER:	D005-10027536-AAC-04	**Software:**	WaterCad v8i
DATE:	25.02.2020		

ARCADIS Design & Consultancy for natural and built assets

WHITSUNDAYS POTABLE WATER NETWORK
2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENT SUMMARY - DATA

AUGMENTATION ID	LENGTH (m)	EXISTING PIPE SEGMENT		ID (mm)	COST - $/m	ADJUSTMENT FACTOR FOR SOIL	10% ADDITIONAL REGIONAL COSTS	30% CONTINGENCY	COST OF NEW/DUPLICATION	NON-LGIP AUGMENTATIONS	LGIP AUGMENTATIONS
		START NODE	END NODE								
2014_Aug_J-100_PR172	77.3	J-100	PR172	160	262	1.26	10%	30%	$ 35,725.59	$ 35,725.59	
2014_Aug_J-119_PR128	99.98	J-119	PR128	150	262	1.26	10%	30%	$ 46,207.56	$ 46,207.56	
2014_Aug_JP60_JP121	38.82	JP60	JP121	313	459	1.26	10%	30%	$ 31,431.62		$ 31,431.62
2014_Aug_JP83_JP89	52.57	JP83	JP89	157	262	1.26	10%	30%	$ 24,296.17	$ 24,296.17	
2014_Aug_PR106_PR107	82.95	J-216	PR107	160	262	1.26	10%	30%	$ 38,336.84	$ 38,336.84	
2014_Aug_PR108_J-126	19.5	PR108	J-126	212	310	1.26	10%	30%	$ 10,663.38	$ 10,663.38	
2014_Aug_PR171_PR173	120.09	PR171	PR173	160	262	1.26	10%	30%	$ 55,501.76	$ 55,501.76	
2014_Aug_PR226_PR229	16.41	PR226	PR229	160	262	1.26	10%	30%	$ 7,584.18	$ 7,584.18	
2014_Aug_PR229_PR143	175.58	PR229	PR143	160	262	1.26	10%	30%	$ 81,147.46	$ 81,147.46	
2014_Aug_PR242_PR237	104.53	PR242	PR237	100	205	1.26	10%	30%	$ 37,800.14	$ 37,800.14	
2014_Aug_PR244_PR243	51.04	PR244	PR243	100	205	1.26	10%	30%	$ 18,457.08	$ 18,457.08	
2014_Aug_PR24_PR25	104.98	PR24	PR25	160	262	1.26	10%	30%	$ 48,518.40	$ 48,518.40	
2014_Aug_PR25_PR27	81.6	PR25	J-315	160	262	1.26	10%	30%	$ 37,712.91	$ 37,712.91	
2014_Aug_PR54_J-116	118.46	PR54	J-116	150	262	1.26	10%	30%	$ 54,748.42	$ 54,748.42	
2021_Aug_BS107_JP58	92.75	JP17	JP70	313	459	1.26	10%	30%	$ 75,097.45		$ 75,097.45
2021_Aug_BS116_JP77	208.4	BS116	JP77	212	310	1.26	10%	30%	$ 113,961.46	$ 113,961.46	
Air_Iso_Aug_01	155.69	AB86	J-176	102	205	1.26	10%	30%	$ 56,300.62	$ 56,300.62	
Air_Iso_Aug_02	122.69	J-176	AB5	102	205	1.26	10%	30%	$ 44,367.16	$ 44,367.16	
Air_Iso_Aug_03	57.29	J-176	AB33	102	205	1.26	10%	30%	$ 20,717.21	$ 20,717.21	
Air_Iso_Aug_04	154.31	AB97	AB68	200	310	1.26	10%	30%	$ 84,382.88	$ 84,382.88	
BS229_AB130	17.48	AB130	BS229	200	310	1.26	10%	30%	$ 9,558.76	$ 9,558.76	
CanW76	2.8	BS200	BS195	175.6	272	1.26	10%	30%	$ 1,343.46	$ 1,343.46	
CanW76a	0.47	WCPS03/P2	BS200	175.6	272	1.26	10%	30%	$ 225.51	$ 225.51	
CanW76b	0.42	WCPS03/P1	BS200	175.6	272	1.26	10%	30%	$ 201.52	$ 201.52	
CanW337b	0.51	WCPS03/P1	J-322	157	262	1.26	10%	30%	$ 235.71	$ 235.71	
CanW_Iso_Aug_06	159.11	CA221	CA276	157	262	1.26	10%	30%	$ 73,535.55	$ 73,535.55	
CanW_Iso_Aug_09	33.02	J-168	J-319	160	262	1.26	10%	30%	$ 15,260.79	$ 15,260.79	
CanW_Iso_Aug_17	427.54	J-188	J-186	260	384	1.26	10%	30%	$ 289,605.34	$ 289,605.34	
CanW_Iso_Aug_18	74.77	CA51	CA52	160	262	1.26	10%	30%	$ 34,556.30	$ 34,556.30	
CanW_Iso_Aug_19	185.49	J-191	J-195	157	262	1.26	10%	30%	$ 85,727.54	$ 85,727.54	
CanW_Iso_Aug_21	561	CA243	CA189	250	384	1.26	10%	30%	$ 380,007.94	$ 380,007.94	
CanW_Iso_Aug_26	219.43	CA243	J-192	300	459	1.26	10%	30%	$ 177,667.20		$ 177,667.20
CanW_Iso_Aug_27	373.92	J-192	BS66	300	459	1.26	10%	30%	$ 302,754.05		$ 302,754.05
JubW_Iso_Aug_05	32.62	J-199	JP80	200	310	1.26	10%	30%	$ 17,837.92	$ 17,837.92	
JubW_Iso_Aug_06	64.79	JP80	JP82	200	310	1.26	10%	30%	$ 35,429.76	$ 35,429.76	
P-682	139.44	JP33	JP83	157	262	1.26	10%	30%	$ 64,444.71	$ 64,444.71	
P-835	57.87	JP69	JP67	210	310	1.26	10%	30%	$ 31,645.63	$ 31,645.63	
P-836	62.46	JP67	JP68	210	310	1.26	10%	30%	$ 34,155.63	$ 34,155.63	
P-867	4.67	J-192	J-193	250	384	1.26	10%	30%	$ 3,163.35	$ 3,163.35	
P-901	112.89	J-195	J-203	157	262	1.26	10%	30%	$ 52,174.15	$ 52,174.15	
P-902	124.94	J-203	J-204	157	262	1.26	10%	30%	$ 57,743.27	$ 57,743.27	
P-903	88.03	J-204	J-205	157	262	1.26	10%	30%	$ 40,684.65	$ 40,684.65	
P-906	11.82	J-205	J-206	157	262	1.26	10%	30%	$ 5,462.83	$ 5,462.83	
P-945	147.96	PR112	PR113	150	262	1.26	10%	30%	$ 68,382.38	$ 68,382.38	
P-946	118.5	PR114	pr115	150	262	1.26	10%	30%	$ 54,766.91	$ 54,766.91	
P-978	42.58	SH13	SH10	212	310	1.26	10%	30%	$ 23,284.45	$ 23,284.45	
P-982	388.7	BS129	BS128	300	459	1.26	10%	30%	$ 314,721.06	$ 314,721.06	
P-987	55.85	JP77	JP33	157	262	1.26	10%	30%	$ 25,812.08	$ 25,812.08	
P-1012	65.45	AB94	AB62	150	262	1.26	10%	30%	$ 30,248.90	$ 30,248.90	
P-1022	197.91	PR104	J-216	160	262	1.26	10%	30%	$ 91,467.67	$ 91,467.67	
P-1023	49.62	J-216	PR106	160	262	1.26	10%	30%	$ 22,932.78	$ 22,932.78	
P-1030	190.25	SH12	J-218	212	310	1.26	10%	30%	$ 104,036.31	$ 104,036.31	
P-1039	530.92	BS201	CA196	200	310	1.26	10%	30%	$ 290,328.29	$ 290,328.29	
P-1045	318.43	BS287	WPWT	386.9	878	1.26	10%	30%	$ 493,181.84		$ 493,181.84
P-1048	82.77	J-223	CA359	200	310	1.26	10%	30%	$ 45,261.95	$ 45,261.95	
P-1049	60.75	J-223	CA356	200	310	1.26	10%	30%	$ 33,220.53	$ 33,220.53	
P-1050	457.74	PRV-8	J-223	300	459	1.26	10%	30%	$ 370,621.09		$ 370,621.09
P-1059	23.36	WPWT	J-227	523	1278	1.26	10%	30%	$ 52,662.60		$ 52,662.60
P-1060	61.02	J-227	PR1	523	1278	1.26	10%	30%	$ 137,563.00		$ 137,563.00
P-1063	578.07	J-224	PR62	250	384	1.26	10%	30%	$ 391,570.74	$ 391,570.74	
P-1066	316.48	J-227	BS329	523	1278	1.26	10%	30%	$ 713,469.98		$ 713,469.98
P-1069	279	BS329	PR35	375	878	1.26	10%	30%	$ 432,128.46		$ 432,128.46
P-1072	266.01	PR48	PR208	375	878	1.26	10%	30%	$ 411,994.16		$ 411,994.16
P-1076	1.51	BS195	J-188	250	384	1.26	10%	30%	$ 1,022.84	$ 1,022.84	
P-1088	13.19	J-226	PR1	523	1278	1.26	10%	30%	$ 29,735.43		$ 29,735.43
P-1090	211.45	BS196	J-168	160.8	262	1.26	10%	30%	$ 97,725.42	$ 97,725.42	
P-1092	37.15	PR18	J-312	160	262	1.26	10%	30%	$ 17,169.54	$ 17,169.54	
P-1094	34.23	PR25	J-316	160	262	1.26	10%	30%	$ 15,820.01	$ 15,820.01	
P-1096	41.38	PR35	J-309	160	262	1.26	10%	30%	$ 19,124.51	$ 19,124.51	
P-1105	40.03	MJ5	J-317	160	262	1.26	10%	30%	$ 18,500.59	$ 18,500.59	
P-1110	584.37	CA169	J-238	160	262	1.26	10%	30%	$ 270,077.11	$ 270,077.11	
P-1111	184.41	CA181	CA322	150	262	1.26	10%	30%	$ 85,228.40	$ 85,228.40	
P-1112	155.83	CA177	CA180	150	262	1.26	10%	30%	$ 72,019.64	$ 72,019.64	
P-1115	58.58	J-239	CA340	100	205	1.26	10%	30%	$ 21,183.70	$ 21,183.70	
P-1124	85.43	CA241	CA222	150	262	1.26	10%	30%	$ 39,483.01	$ 39,483.01	
P-1125	144.67	CA22	CA25	150	262	1.26	10%	30%	$ 66,861.84	$ 66,861.84	
P-1126	70.8	CA17	J-321	160	262	1.26	10%	30%	$ 32,721.49	$ 32,721.49	
P-1130	155.38	CA35	CA36	160	262	1.26	10%	30%	$ 71,811.66	$ 71,811.66	
P-1133	19.66	CA86	J-241	150	262	1.26	10%	30%	$ 9,086.22	$ 9,086.22	
P-1134	107.5	J-241	CA87	150	262	1.26	10%	30%	$ 49,683.06	$ 49,683.06	
P-1135	37.61	J-241	J-193	150	262	1.26	10%	30%	$ 17,382.14	$ 17,382.14	
P-1137	39.85	AB10	AB76	160	262	1.26	10%	30%	$ 18,417.39	$ 18,417.39	
P-1141	32.75	AB28	AB29	160	262	1.26	10%	30%	$ 15,136.00	$ 15,136.00	
P-1149	52.17	CA92	CA281	150	262	1.26	10%	30%	$ 24,111.30	$ 24,111.30	
P-1150	73.62	CA189	CA245	200	310	1.26	10%	30%	$ 40,258.36	$ 40,258.36	
P-1151	31.27	BS65	CA241	150	262	1.26	10%	30%	$ 14,451.99	$ 14,451.99	
P-1154	146.01	BS231	JP55	160	262	1.26	10%	30%	$ 67,481.15	$ 67,481.15	
P-1155	85.07	CA97	CA99	150	262	1.26	10%	30%	$ 39,316.63	$ 39,316.63	
P-1156	88.21	WCGR07	BS84	200	310	1.26	10%	30%	$ 48,236.76	$ 48,236.76	
P-1162	349.99	CA213	CA402	200	310	1.26	10%	30%	$ 191,388.53	$ 191,388.53	
P-1164	48.29	JP58	JP69	210	310	1.26	10%	30%	$ 26,406.90	$ 26,406.90	
P-1165	165.4	JP59	JP61	200	310	1.26	10%	30%	$ 90,447.34	$ 90,447.34	
P-1170	128.77	JP19	JP121	313	459	1.26	10%	30%	$ 104,261.98		$ 104,261.98
P-1173	100.82	JP68	JP84	210	310	1.26	10%	30%	$ 55,132.41	$ 55,132.41	
P-1174	239.16	BS115	JP10	313	459	1.26	10%	30%	$ 193,642.11		$ 193,642.11
P-1176	82.24	JP10	JP12	313	459	1.26	10%	30%	$ 66,587.75		$ 66,587.75
P-1178	75.13	BS108	JP133	200	310	1.26	10%	30%	$ 41,084.09	$ 41,084.09	
P-1179	123.26	JP133	BS109	200	310	1.26	10%	30%	$ 67,403.50	$ 67,403.50	
P-1180	65.97	BS109	BS110	150	262	1.26	10%	30%	$ 30,489.22	$ 30,489.22	
P-1181	141.12	BS110	BS111	150	262	1.26	10%	30%	$ 65,221.15	$ 65,221.15	
P-1183	125.73	BS109	JP6	150	262	1.26	10%	30%	$ 58,108.38	$ 58,108.38	
P-1184	102.14	JP84	JP109	160	262	1.26	10%	30%	$ 47,205.84	$ 47,205.84	
P-1188	132.65	JP96	JP65	150	262	1.26	10%	30%	$ 61,306.59	$ 61,306.59	
P-1191	140.5	JP124	JP129	100	205	1.26	10%	30%	$ 50,807.61	$ 50,807.61	
P-1196	70.61	JP72	JP74	100	205	1.26	10%	30%	$ 25,533.99	$ 25,533.99	
P-1200	67.98	JP78	JP79	200	310	1.26	10%	30%	$ 37,174.18	$ 37,174.18	
P-1201	133.36	JP79	J-199	200	310	1.26	10%	30%	$ 72,926.58	$ 72,926.58	
P-1204	648.04	J-199	J-197	300	459	1.26	10%	30%	$ 524,702.44		$ 524,702.44
P-1205	133.87	JP12	JP13	150	262	1.26	10%	30%	$ 61,870.43	$ 61,870.43	
P-1206	122.47	BS117	JP4	150	262	1.26	10%	30%	$ 56,601.71	$ 56,601.71	
P-1208	179.63	JP111	JP54	100	205	1.26	10%	30%	$ 64,957.80	$ 64,957.80	
P-1223	181.7	BS130	SH15	212	310	1.26	10%	30%	$ 99,360.83	$ 99,360.83	
P-1224	64.76	SH15	SH12	212	310	1.26	10%	30%	$ 35,413.36	$ 35,413.36	
P-1225	49.94	SH10	J-218	212	310	1.26	10%	30%	$ 27,309.19	$ 27,309.19	
P-1230	166.9	BS224	BS283	313.5	459	1.26	10%	30%	$ 135,134.92		$ 135,134.92
P-1236	0.49	AB46	J-247	134.7	262	1.26	10%	30%	$ 226.46	$ 226.46	
P-1238	10.74	AB47	J-246	150	262	1.26	10%	30%	$ 4,963.68	$ 4,963.68	
P-1239	49.08	AB62	AB95	212.6	310	1.26	10%	30%	$ 26,838.91	$ 26,838.91	
P-1240	86.93	AB80	AB79	200	310	1.26	10%	30%	$ 47,536.80	$ 47,536.80	

P-1241	5.11	AB79	AB14	200	310	1.26	10%	30%	$ 2,794.35	$ 2,794.35	
P-1242	80.9	AB14	AB15	200	310	1.26	10%	30%	$ 44,239.36	$ 44,239.36	
P-1244	140.3	SH9	SH8	160	262	1.26	10%	30%	$ 64,842.17	$ 64,842.17	
P-1271	263.71	JP70	JP19	313	459	1.26	10%	30%	$ 213,519.66		$ 213,519.66
P-1274	7.53	J-270	PMP-29	250	384	1.26	10%	30%	$ 5,100.64	$ 5,100.64	
P-1275	997.71	PMP-29	T-10	250	384	1.26	10%	30%	$ 675,824.81	$ 675,824.81	
P-1276	473.22	T-10	JP95	250	384	1.26	10%	30%	$ 320,547.87	$ 320,547.87	
P-1292	12.09	AB84	CA323	150	262	1.26	10%	30%	$ 5,587.61	$ 5,587.61	
P-1293	48.7	AB15	AB44	150	262	1.26	10%	30%	$ 22,507.58	$ 22,507.58	
P-1310	135.29	PR210	PR217	150	262	1.26	10%	30%	$ 62,526.71	$ 62,526.71	
P-1311	188.55	PR241	PR243	100	205	1.26	10%	30%	$ 68,183.45	$ 68,183.45	
P-1324	57.05	PR141	PR226	160	262	1.26	10%	30%	$ 26,366.68	$ 26,366.68	
P-1346	52.88	PR39	PR37	160	262	1.26	10%	30%	$ 24,439.44	$ 24,439.44	
P-1354	69.41	BS326	J-286	212	310	1.26	10%	30%	$ 37,956.16	$ 37,956.16	
P-1355	158.42	J-286	PR272	212	310	1.26	10%	30%	$ 86,630.39	$ 86,630.39	
P-1356	358.49	J-286	PR157	175.6	272	1.26	10%	30%	$ 172,006.37	$ 172,006.37	
P-1357	7.69	BS28	PR57A	265	384	1.26	10%	30%	$ 5,209.02	$ 5,209.02	
P-1358	459.35	J-226	J-287	210.9	310	1.26	10%	30%	$ 251,190.95	$ 251,190.95	
P-1359	135.22	J-287	BS28	210.9	310	1.26	10%	30%	$ 73,943.70	$ 73,943.70	
P-1362	7.45	J-287	J-326	152.4	262	1.26	10%	30%	$ 3,443.15	$ 3,443.15	
P-1363	120.46	J-326	PR73	160.8	262	1.26	10%	30%	$ 55,672.76	$ 55,672.76	
P-1364	24.26	PR206	J-224	209	310	1.26	10%	30%	$ 13,266.34	$ 13,266.34	
P-1365	149.89	J-117	PR86	162.5	262	1.26	10%	30%	$ 69,274.36	$ 69,274.36	
P-1366	180.04	PR208	J-117	313.5	459	1.26	10%	30%	$ 145,774.07		$ 145,774.07
P-1367	255.3	J-117	PR102	313.5	459	1.26	10%	30%	$ 206,710.28		$ 206,710.28
P-1368	75.31	PR102	PR101	313	459	1.26	10%	30%	$ 60,976.70		$ 60,976.70
P-1369	378.47	PR62	J-289	250	384	1.26	10%	30%	$ 256,366.49	$ 256,366.49	
P-1371	109.29	J-126	J-290	212	310	1.26	10%	30%	$ 59,764.14	$ 59,764.14	
P-1372	90.82	J-290	PR227	212	310	1.26	10%	30%	$ 49,664.01	$ 49,664.01	
P-1373	92.74	J-289	J-290	250	384	1.26	10%	30%	$ 62,819.85	$ 62,819.85	
P-1374	257.97	PR101	PR165	313	459	1.26	10%	30%	$ 208,872.12		$ 208,872.12
P-1375	135.69	PR98	PR96	110	216	1.26	10%	30%	$ 51,701.15	$ 51,701.15	
P-1378	195.52	PR132	PR138	313	459	1.26	10%	30%	$ 158,307.85		$ 158,307.85
P-1380	99.3	PR165	J-292	313	459	1.26	10%	30%	$ 80,400.83		$ 80,400.83
P-1381	202.51	J-292	PR132	313	459	1.26	10%	30%	$ 163,967.49		$ 163,967.49
P-1382	68.43	PR126	J-292	160	262	1.26	10%	30%	$ 31,626.16	$ 31,626.16	
P-1391	774.13	CA182	CA23	160	262	1.26	10%	30%	$ 357,778.11	$ 357,778.11	
P-1394	18.9	CA265	J-296	160	262	1.26	10%	30%	$ 8,734.98	$ 8,734.98	
P-1397	57.74	CA280	J-297	160	262	1.26	10%	30%	$ 26,685.58	$ 26,685.58	
P-1403	82.57	CA248	CA95	160	262	1.26	10%	30%	$ 38,161.21	$ 38,161.21	
P-1404	140.44	BS70	CA73	313	459	1.26	10%	30%	$ 113,710.90		$ 113,710.90
P-1405	199.21	CA73	J-261	313	459	1.26	10%	30%	$ 161,295.56		$ 161,295.56
P-1406	56.66	J-261	J-264	313	459	1.26	10%	30%	$ 45,876.24		$ 45,876.24
P-1407	13.41	J-264	J-265	313	459	1.26	10%	30%	$ 10,857.76		$ 10,857.76
P-1408	119.63	J-265	CA68	313	459	1.26	10%	30%	$ 96,861.54		$ 96,861.54
P-1409	132.4	CA68	CA67	313	459	1.26	10%	30%	$ 107,201.10		$ 107,201.10
P-1410	80.4	CA67	CA66	313	459	1.26	10%	30%	$ 65,097.95		$ 65,097.95
P-1411	122.48	CA66	BS76	313	459	1.26	10%	30%	$ 99,169.12		$ 99,169.12
P-1412	184	BS76	BS77	313	459	1.26	10%	30%	$ 148,980.38		$ 148,980.38
P-1415	124.15	J-301	CA61	110	205	1.26	10%	30%	$ 44,895.12	$ 44,895.12	
P-1416	374.96	CA329	CA71	110	205	1.26	10%	30%	$ 135,593.04	$ 135,593.04	
P-1419	31.95	BS283	AB79	313.5	459	1.26	10%	30%	$ 25,869.15	$ 25,869.15	
P-1420	350.53	AB39	AB40	210.7	310	1.26	10%	30%	$ 191,683.83		$ 191,683.83
P-1430	95.72	AB9	J-303	110	205	1.26	10%	30%	$ 34,614.27	$ 34,614.27	
P-1434	33.35	AB94	BS95	152.4	262	1.26	10%	30%	$ 15,413.30	$ 15,413.30	
P-1436	184.65	JP120	JP108	160	262	1.26	10%	30%	$ 85,339.32	$ 85,339.32	
P-1439	120.32	BS113	J-305	160	262	1.26	10%	30%	$ 55,608.05	$ 55,608.05	
P-1440	46.65	JP19	JP59	313	459	1.26	10%	30%	$ 37,771.39		$ 37,771.39
P-1441	56.39	JP70	JP58	313	459	1.26	10%	30%	$ 45,657.63		$ 45,657.63
P-1442	41.74	JP10	BS108	313	459	1.26	10%	30%	$ 33,795.88		$ 33,795.88
P-1444	98.19	JP12	J-308	313	459	1.26	10%	30%	$ 79,502.09		$ 79,502.09
P-1445	183.28	J-308	JP17	313	459	1.26	10%	30%	$ 148,397.42		$ 148,397.42
P-1446	7.68	J-308	JP16	110	205	1.26	10%	30%	$ 2,777.24	$ 2,777.24	
P-1461	84.77	BS28	J-313	210.9	310	1.26	10%	30%	$ 46,355.63	$ 46,355.63	
P-1462	207.26	J-313	J-224	210.9	310	1.26	10%	30%	$ 113,338.06	$ 113,338.06	
P-1463	10.2	J-313	PR187	160	262	1.26	10%	30%	$ 4,714.11	$ 4,714.11	
P-1482	160.42	CA183	J-320	160	262	1.26	10%	30%	$ 74,140.99	$ 74,140.99	
P-1486	3.8	BS203	J-322	150	262	1.26	10%	30%	$ 1,756.24	$ 1,756.24	
P-1487	0.4	J-322	WCPS03/P2	150	262	1.26	10%	30%	$ 184.87	$ 184.87	
P-1488	14.62	J-170	CA278	152.4	262	1.26	10%	30%	$ 6,756.90	$ 6,756.90	
P-1494	36.87	JP109	J-324	160	262	1.26	10%	30%	$ 17,040.13	$ 17,040.13	
P-1495	97.41	PR35	PR33	375	878	1.26	10%	30%	$ 150,867.83		$ 150,867.83
P-1496	232.15	PR33	J-325	375	878	1.26	10%	30%	$ 359,552.06		$ 359,552.06
P-1497	223.23	J-325	PR48	375	878	1.26	10%	30%	$ 345,736.84		$ 345,736.84
P-1498	6.2	J-325	PR47	375	878	1.26	10%	30%	$ 9,602.51		$ 9,602.51
P-1501	8.17	AB51	AB52	160	262	1.26	10%	30%	$ 3,775.91	$ 3,775.91	
ProW_Iso_Aug_14	160.52	PR108	PR140	265	384	1.26	10%	30%	$ 108,732.40	$ 108,732.40	
ShHW_Iso_Aug_03	59.96	SH7	SH6	102	205	1.26	10%	30%	$ 21,682.74	$ 21,682.74	
								TOTAL	**$ 17,639,715.93**	**$ 9,896,932.85**	**$ 7,742,783.08**

PROJECT:	Whitsundays Potable Water Network Modelling	**Project Engineer:**	M.C
DOCUMENT NUMBER:	D005-10027536-AAC-04	**Software:**	WaterCad v8i
DATE:	25.02.2020		

ARCADIS Design & Consultancy for natural and built assets

WHITSUNDAYS POTABLE WATER NETWORK
2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENT SUMMARY - TIMING

AUGMENTATION ID	350 L/EP/d DEMAND - 2021	450 L/EP/d DEMAND - 2021	BASELINE 500 L/EP/d DEMAND - 2021	350 L/EP/d DEMAND - 2026	450 L/EP/d DEMAND - 2026	BASELINE 500 L/EP/d DEMAND - 2026	350 L/EP/d DEMAND - 2031	450 L/EP/d DEMAND - 2031	BASELINE 500 L/EP/d DEMAND - 2031	350 L/EP/d DEMAND - 2036	450 L/EP/d DEMAND - 2036	BASELINE 500 L/EP/d DEMAND - 2036
2014_Aug_J-100_PR172												
2014_Aug_J-119_PR128												
2014_Aug_JP60_JP121												
2014_Aug_JP83_JP89												
2014_Aug_PR106_PR107												
2014_Aug_PR108_J-126												
2014_Aug_PR171_PR173												
2014_Aug_PR226_PR229												
2014_Aug_PR229_PR143												
2014_Aug_PR242_PR237												
2014_Aug_PR244_PR243												
2014_Aug_PR24_PR25												
2014_Aug_PR25_PR27												
2014_Aug_PR54_J-116												
2021_Aug_BS107_JP58												
2021_Aug_BS116_JP77												
Air_Iso_Aug_01												
Air_Iso_Aug_02												
Air_Iso_Aug_03												
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BS229_AB130												
CanW76												
CanW76a												
CanW76b												
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CanW_Iso_Aug_06												
CanW_Iso_Aug_09												
CanW_Iso_Aug_17												
CanW_Iso_Aug_18												
CanW_Iso_Aug_19												
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CanW_Iso_Aug_26												
CanW_Iso_Aug_27												
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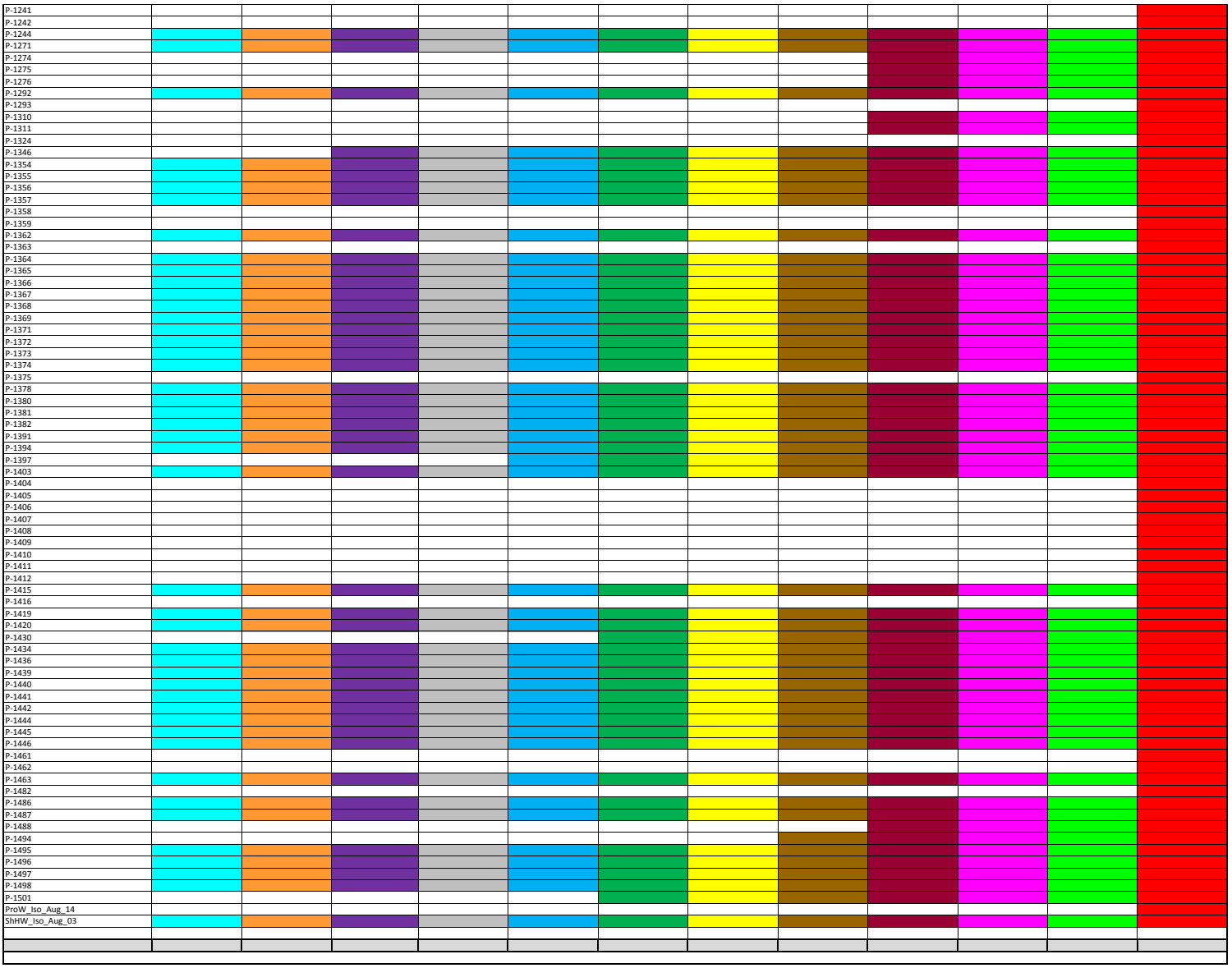
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ProW_Iso_Aug_14
ShHW_Iso_Aug_03

REFERENCE

ACID SULFATE SOILS (ASS)[1] ON RELATIVELY UNDISTURBED LAND

Depth	Depth Code	Depth to Actual Acid Sulfate Soil[2] (pH ≤4.0)	Depth to Strongly Acidic Soil layer[2] (pH >4.0 to ≤5.0)	Depth to Potential Acid Sulfate Soil[2]
0 - 0.5m	0	A0	a0	S0
0.5 - 1m	1	A1	a1	S1
1 - 2m	2	A2	a2	S2
2 - 3m	3	A3	a3	S3
3 - 4m	4	A4	a4	S4
4 - 5m	5	A5	a5	S5
>5m	5+	A5+	a5+	S5+

NOTE:

- The depth codes above imply that a predominance of profiles in the map unit fall within the nominated depth range.
- Actual acid sulfate soil layers (designated with an A code) often overlie potential acid sulfate soil layers (designated with an S code). Where this occurs eg. AS52 the map unit is coloured according to the depth of the upper surface of the 'actual' layer (A5) and overlayed with yellow dots. An 'a' preceding the soil depth code indicates a strong acid soil layer with field pH ranging from > 4.0 to ≤ 5.0. This may or may not be a result of sulfide oxidation. While 'a' depth code is shown on the map, no colour is assigned to it.
- In areas where there is varying depth to an ASS layer that cannot be separately mapped at the operative scale, two colours are used to designate the dominant depths. This appears as equal width striped colours. e.g. S1/S2
- P as a superscript indicates sediments of Pleistocene ageS^{P} , so that $S^{P}5+$ indicates sulfidic sediments (of Pleistocene age) deeper than 5m.
- W as a subscript indicates areas associated with Melaleuca sp. wetlands and occasionally Casuarina glauca communities. Oxidisable sulfur % in surface layers may be highly variable and often exceeds the 'Action Criteria'. This may include sulfur from organic compounds and modern accretion of sulfides in a wet, organic rich environment. ASS typically occurs at depth. Where this occurs e.g. S_{DW} or $S2_{W}$ or $A1_{W}$ the map is coloured as per the actual or potential depth category and is overlayed with ⁙ pattern.
- N as a subscript indicates areas with oxidisable sulfur values that exceed the action criteria[3] but contain varying amounts of carbonate materials that may compensate for the potential acidity. Commonly the carbonate materials are naturally occurring shell fragments, coral fragments or Foraminifera. Depth codes are as above e.g. a potential acid sulfate soil (rich in carbonate) occuring at 1 to 2m depth is designated $S0_{N}$. The map unit is coloured as S2 and overlayed with green dots.

S_{LA} Limited field assessment but occurs in a landscape position where there is a reasonable probability of ASS occurrence. This is usually land where the present use precludes any disturbance eg. National Parks, Reserves etc., or land where accessibility is severely restricte

ACID SULFATE ON DISTURBED LAND[4]

S_{DL} Disturbed land, eg. Canal estate, Marina, Aquaculture, Quarry, Urban, Industrial likely to contain ASS. (In some cases partial or full treatment may have been undertaken).

LAND WITH A LOW PROBABILITY OF ACID SULFATE SOIL OCCURRENCE

LP Land between the 5m AHD contour and the outer limit of Holocene, estuarine ASS (ie. land below 5m AHD) as mapped at this scale, with low probability of ASS occurrence[5]. Limited field investigation.

LAND NOT ASSESSED

NA Land not assessed for ASS as part of this survey. It may include non ASS land beyond the boundary established as the limit of Holocene, estuarine, sulfidic sediments[6] but insufficient or no field testing was carried out[7].

5m AHD[8] CONTOUR - NORMAL LIMIT OF FIELD INVESTIGATION

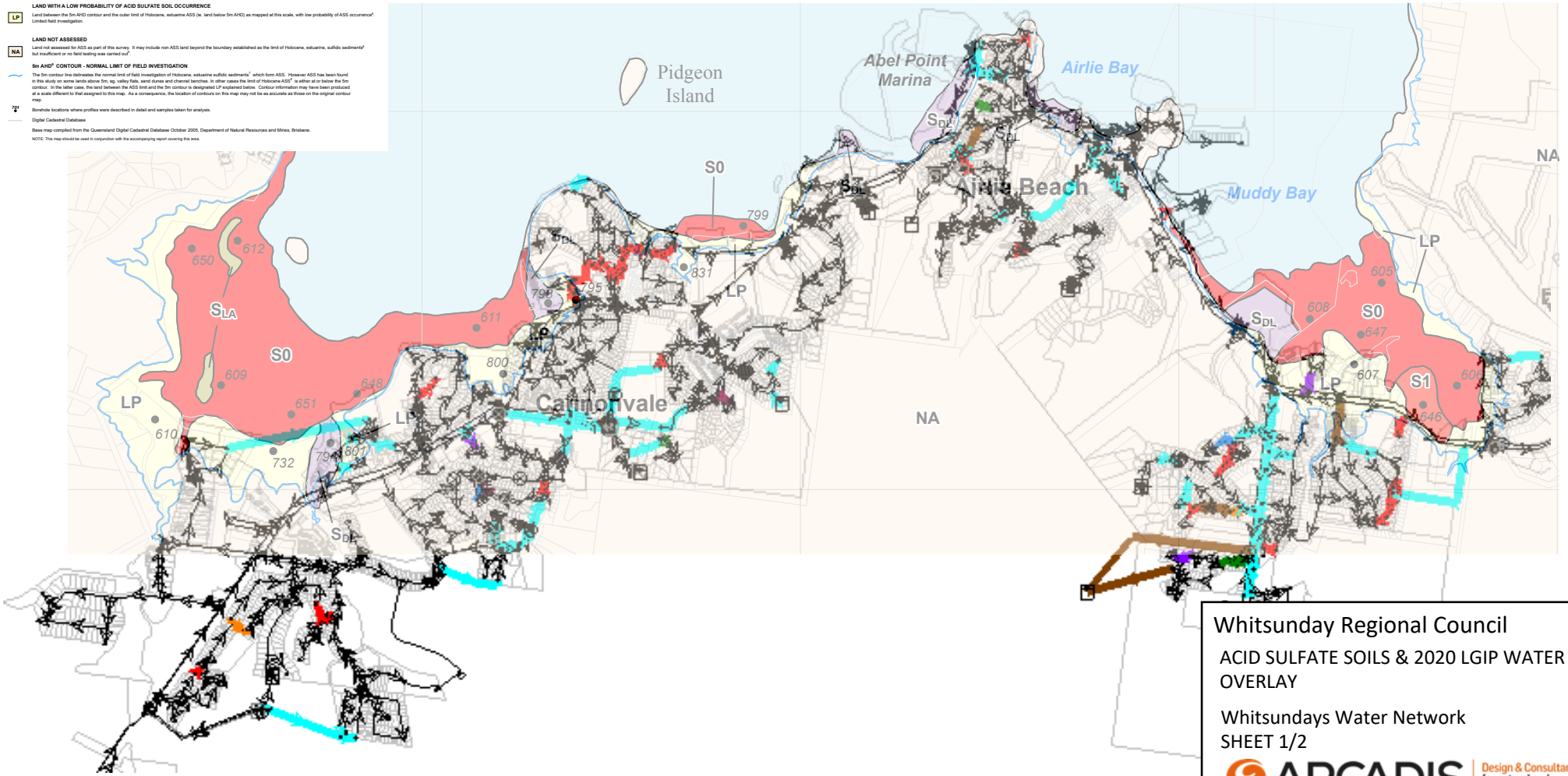
The 5m contour line delineates the normal limit of field investigation of Holocene, estuarine sulfidic sediments[7] which form ASS. However ASS has been found in this study on some lands above 5m, eg. valley flats, sand dunes and channel benches. In other cases the limit of Holocene ASS[7] is either at or below the 5m contour. In the latter case, the land between the ASS limit and the 5m contour is designated LP explained below. Contour information may have been produced at a scale different to that assigned to this map. As a consequence, the location of contours on this map may not be as accurate as those on the original contour map.

797 Borehole locations where profiles were described in detail and samples taken for analysis.

Digital Cadastral Database

Base map compiled from the Queensland Digital Cadastral Database October 2005, Department of Natural Resources and Mines, Brisbane.

NOTE: This map should be used in conjunction with the accompanying report covering this area.



ACID SULFATE SOILS OVERLAY AND LEGEND SOURCED FROM QUEENSLAND GOVERMENT

Whitsunday Regional Council

ACID SULFATE SOILS & 2020 LGIP WATER OVERLAY

Whitsundays Water Network
SHEET 1/2

ARCADIS Design & Consultancy for natural and built assets

REFERENCE

ACID SULFATE SOILS (ASS)[1] ON RELATIVELY UNDISTURBED LAND

	Depth	Depth Code	Depth to Actual Acid Sulfate Soil[2] (pH ≤4.0)	Depth to Strongly Acidic Soil layer[2] (pH >4.0 to ≤5.0)	Depth to Potential Acid Sulfate Soil[2]
	0 - 0.5m	0	A0	a0	S0
	0.5 - 1m	1	A1	a1	S1
	1 - 2m	2	A2	a2	S2
	2 - 3m	3	A3	a3	S3
	3 - 4m	4	A4	a4	S4
	4 - 5m	5	A5	a5	S5
	>5m	5+	A5+	a5+	S5+

NOTE:

- The depth codes above imply that a predominance of profiles in the map unit fall within the nominated depth range.
- Actual acid sulfate soil layers (designated with an A code) often overlie potential acid sulfate soil layers (designated with an S code). Where this occurs eg. AS2 the map unit is coloured according to the depth of the upper surface of the 'actual' layer (A2) and overlayed with yellow dots. An 'a' preceding the soil depth code indicates a strong acid soil layer with field pH ranging from > 4.0 to ≤ 5.0. This may or may not be a result of sulfide oxidation. While 'a' depth code is shown on the map, no colour is assigned to it.
- In areas where there is varying depth to an ASS layer that cannot be separately mapped at the operative scale, two colours are used to designate the dominant depths. This appears as equal width striped colours. e.g. S1/S2
- P as a superscript indicates sediments of Pleistocene age[3] , so that S^{P}5+ indicates sulfidic sediments (of Pleistocene age) deeper than 5m.
- W as a subscript indicates areas associated with Melaleuca sp. wetlands and occasionally Casuarina glauca communities. Oxidizable sulfur % in surface layers may be highly variable and often exceeds the 'Action Criteria'[4] . This may include sulfur from organic compounds and modern accretion of sulfides in a wet, organic rich environment. ASS typically occurs at depth. Where this occurs e.g. S_{A5W} or $S2_{A0}$ or $A1_{S2}$ the map is coloured as per the actual or potential depth category and is overlayed with △ pattern.
- N as a subscript indicates areas with oxidisable sulfur values that exceed the action criteria[4] but contain varying amounts of carbonate materials that may compensate for the potential acidity. Commonly the carbonate materials are naturally occurring shell fragments, coral fragments or Foraminifera. Depth codes are as above e.g. a potential acid sulfate soil (rich in carbonate) occuring at 1 to 2m depth is designated $S2_N$. The map unit is coloured as S2 and overlayed with green dots.

S_{LF} Limited field assessment but occurs in a landscape position where there is a reasonable probability of ASS occurrence. This is usually land where the present use precludes any disturbance eg. National Parks, Reserves etc., or land where accessibility is severely restricte

ACID SULFATE ON DISTURBED LAND[5]

S_{DL} Disturbed land, eg. Canal estate, Marina, Aquaculture, Quarry, Urban, Industrial likely to contain ASS. (In some cases partial or full treatment may have been undertaken).

LAND WITH A LOW PROBABILITY OF ACID SULFATE SOIL OCCURRENCE

LP Land between the 5m AHD contour and the outer limit of Holocene, estuarine ASS (ie. land below 5m AHD) as mapped at this scale, with low probability of ASS occurrence[6]. Limited field investigation.

LAND NOT ASSESSED

NA Land not assessed for ASS as part of this survey. It may include non ASS land beyond the boundary established as the limit of Holocene, estuarine, sulfidic sediments[6] but insufficient or no field testing was carried out[6].

5m AHD[6] CONTOUR - NORMAL LIMIT OF FIELD INVESTIGATION

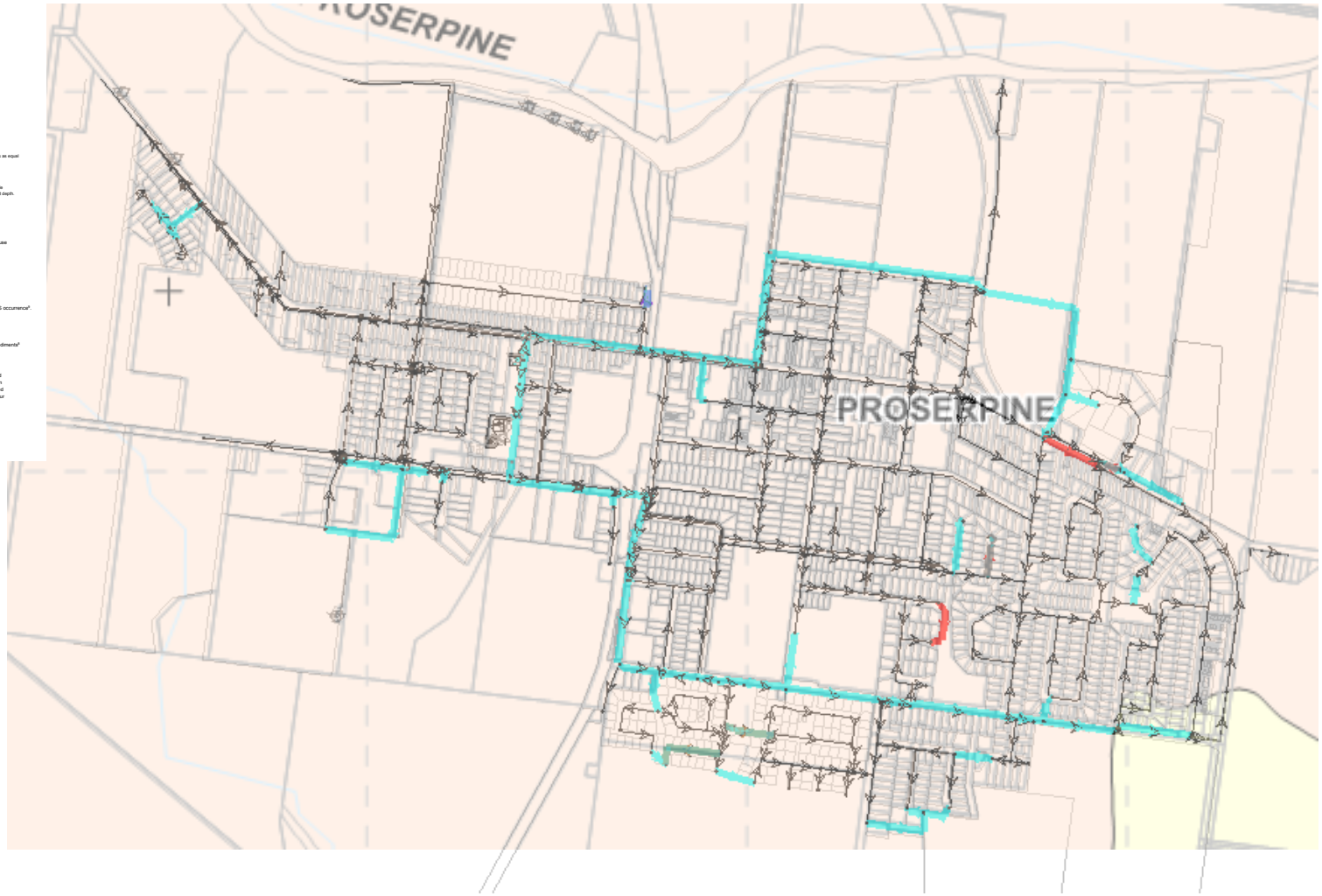
The 5m contour line delineates the normal limit of field investigation of Holocene, estuarine sulfidic sediments[7] which form ASS. However ASS has been found in this study on some lands above 5m, eg. valley flats, sand dunes and channel benches. In other cases the limit of Holocene ASS[7] is either at or below the 5m contour. In the latter case, the land between the ASS limit and the 5m contour is designated LP explained below. Contour information may have been produced at a scale different to that assigned to this map. As a consequence, the location of contours on this map may not be as accurate as those on the original contour map.

707 Borehole locations where profiles were described in detail and samples taken for analysis.

Digital Cadastral Database

Base map compiled from the Queensland Digital Cadastral Database October 2005, Department of Natural Resources and Mines, Brisbane.

NOTE: This map should be used in conjunction with the accompanying report covering this area.



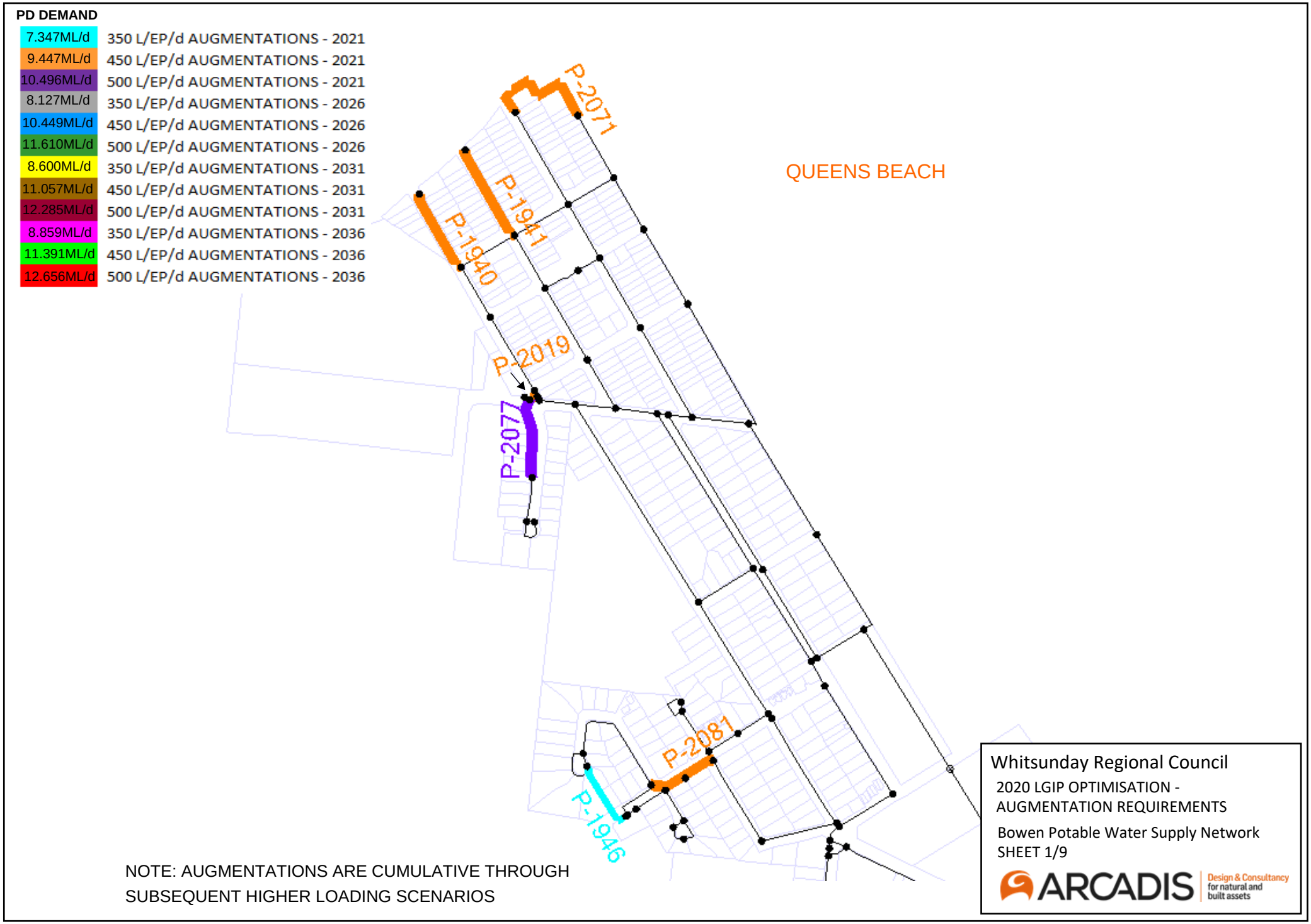
Whitsunday Regional Council

ACID SULFATE SOILS & 2020 LGIP WATER OVERLAY

Whitsundays Water Network
SHEET 2/2

ARCADIS Design & Consultancy for natural and built assets

ACID SULFATE SOILS OVERLAY AND LEGEND SOURCED FROM QUEENSLAND GOVERMENT



31/01/2020

SK003-10027536-02

PD DEMAND

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9.447ML/d	450 L/EP/d AUGMENTATIONS - 2021
10.496ML/d	500 L/EP/d AUGMENTATIONS - 2021
8.127ML/d	350 L/EP/d AUGMENTATIONS - 2026
10.449ML/d	450 L/EP/d AUGMENTATIONS - 2026
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8.859ML/d	350 L/EP/d AUGMENTATIONS - 2036
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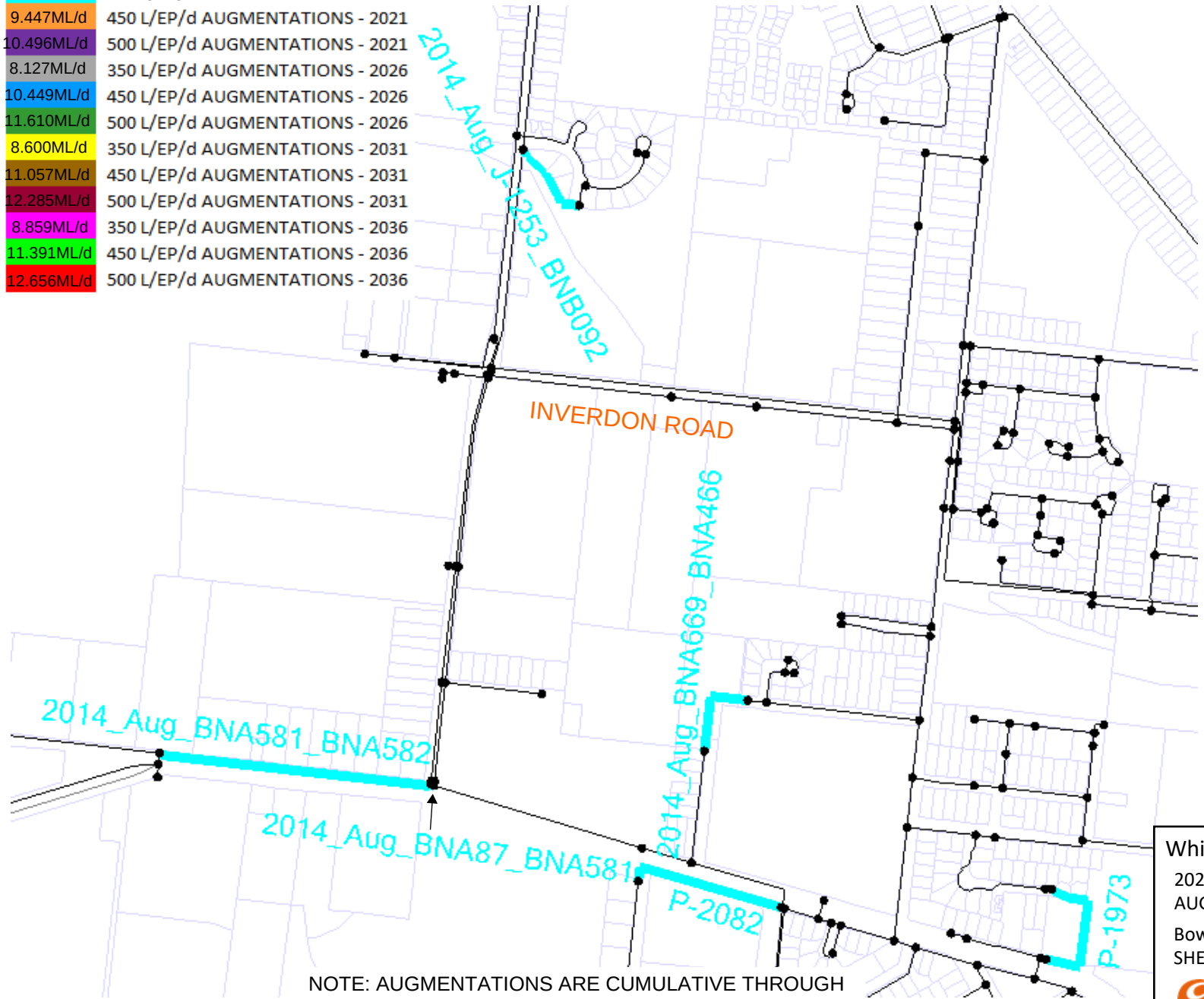


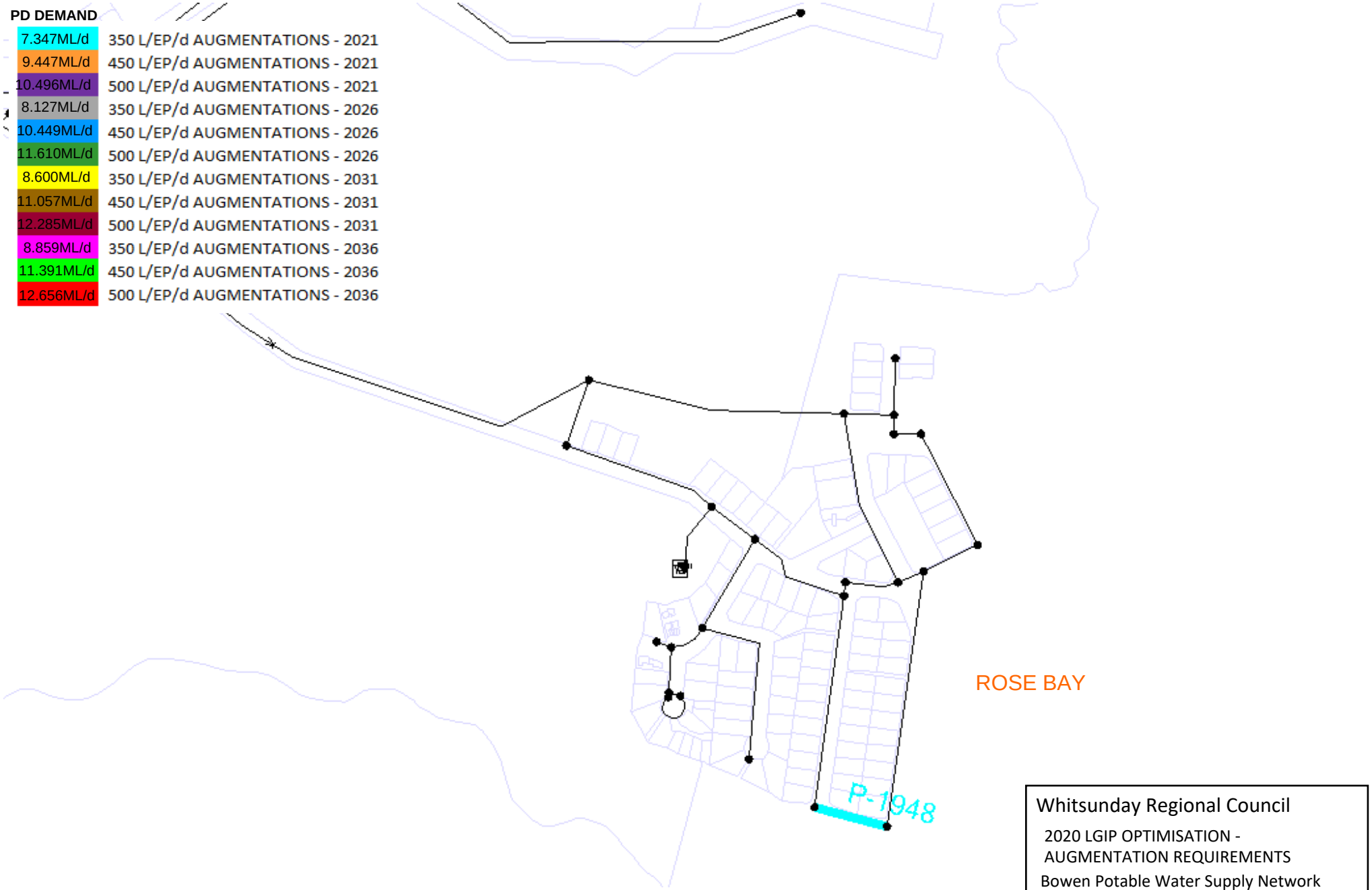
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS

Bowen Potable Water Supply Network
SHEET 2/9

ARCADIS Design & Consultancy for natural and built assets



NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

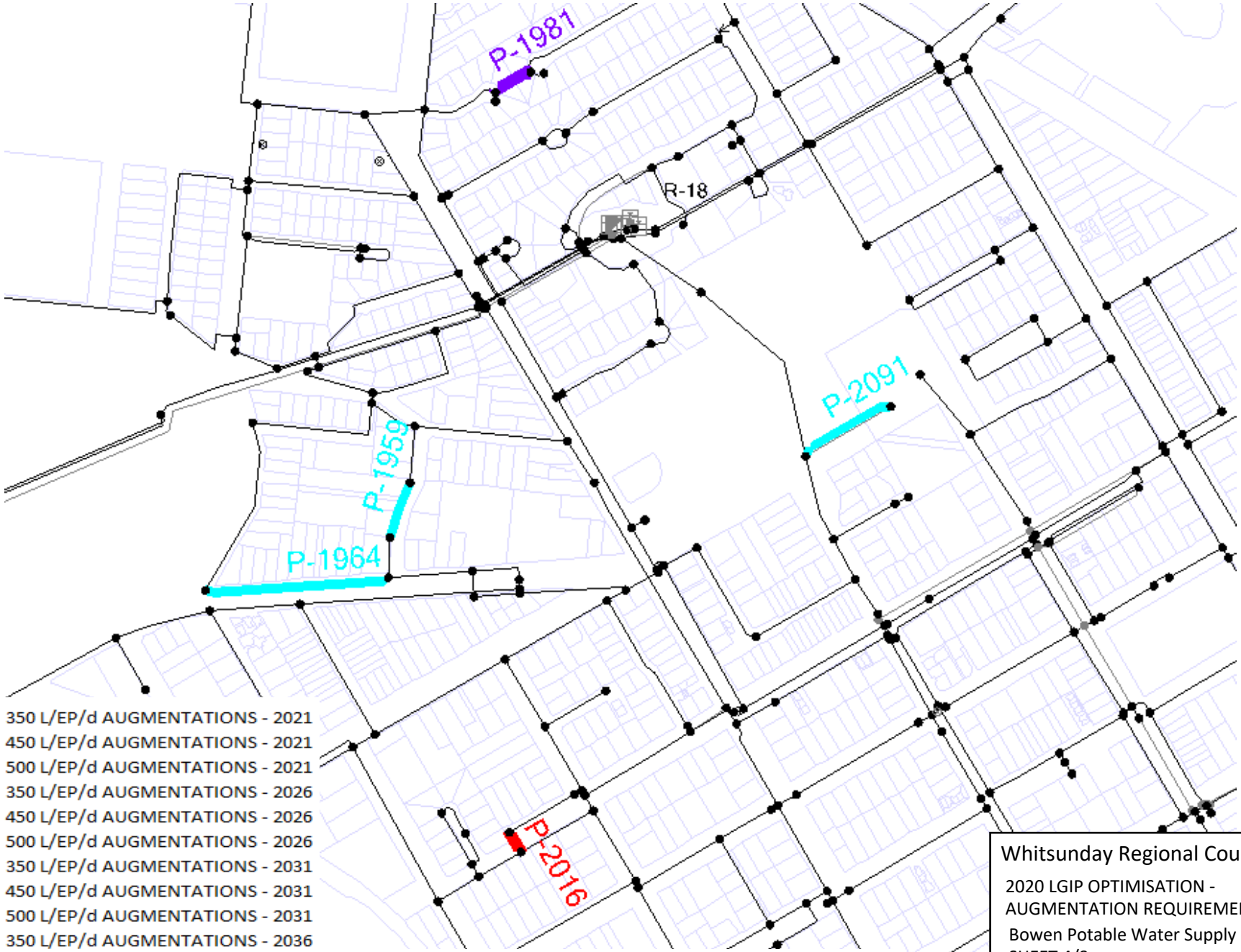
Whitsunday Regional Council

2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS

Bowen Potable Water Supply Network

SHEET 3/9

ARCADIS Design & Consultancy for natural and built assets



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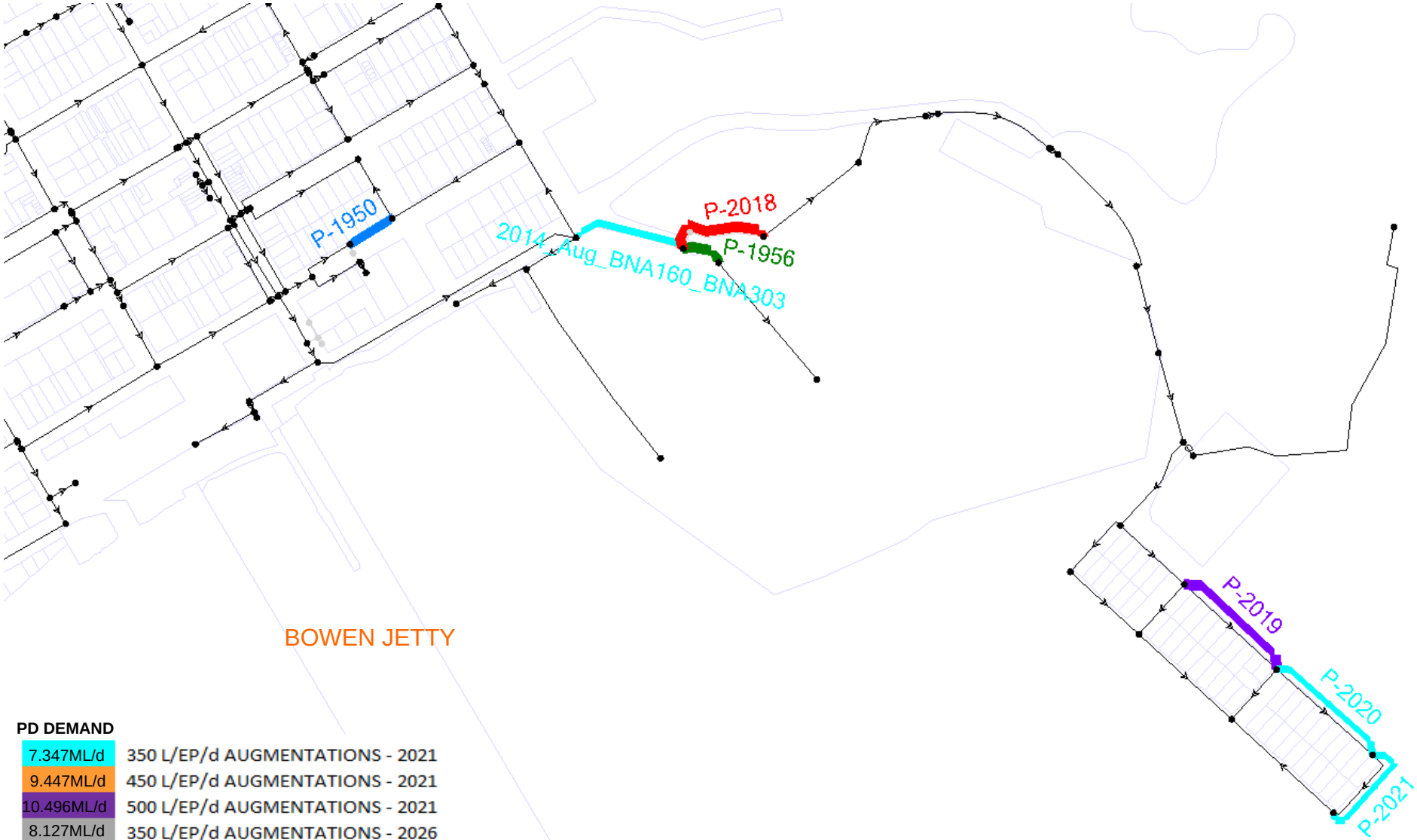
Whitsunday Regional Council

2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS

Bowen Potable Water Supply Network

SHEET 4/9

ARCADIS Design & Consultancy for natural and built assets



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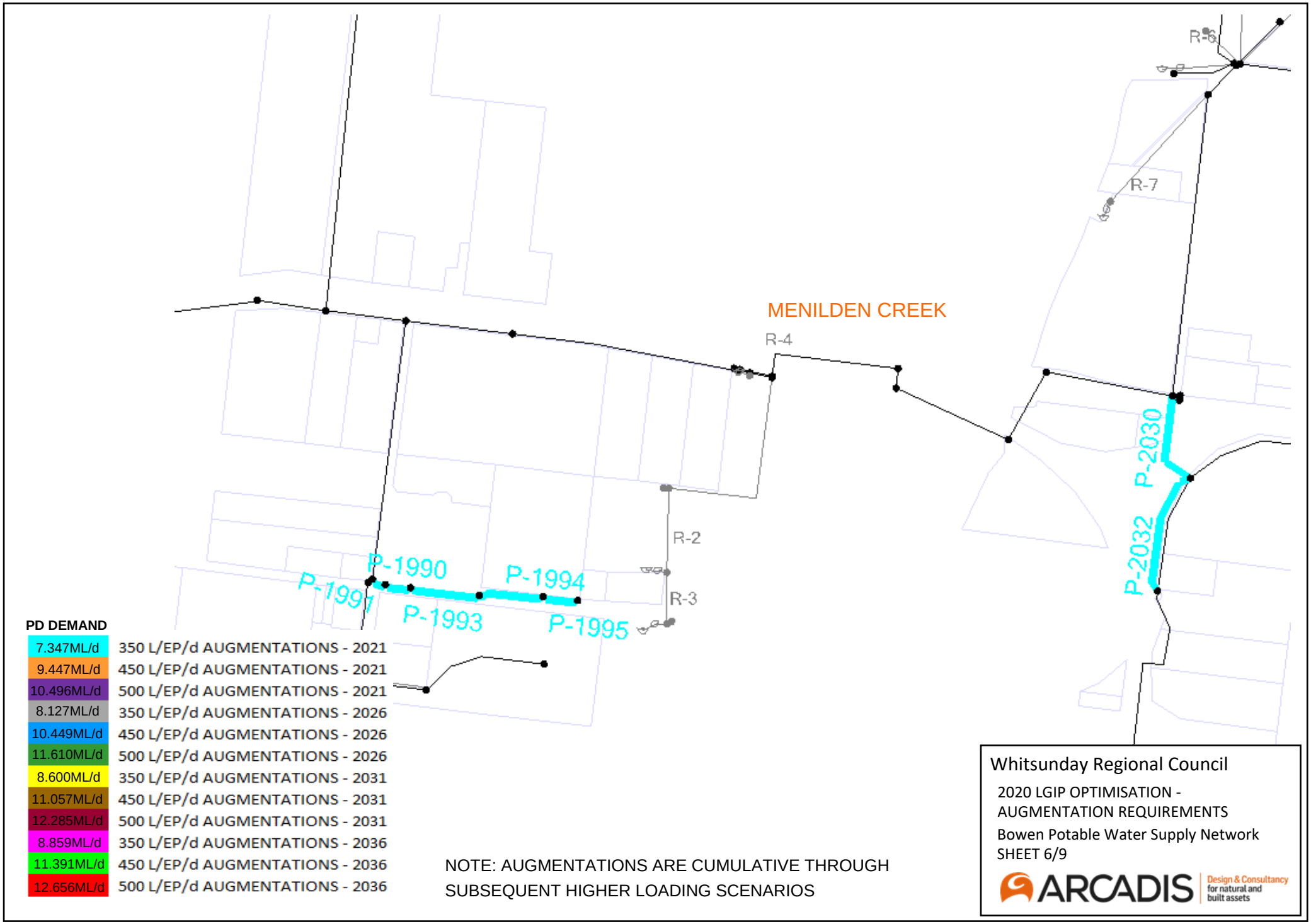
Whitsunday Regional Council

2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS

Bowen Potable Water Supply Network

SHEET 5/9

ARCADIS Design & Consultancy for natural and built assets



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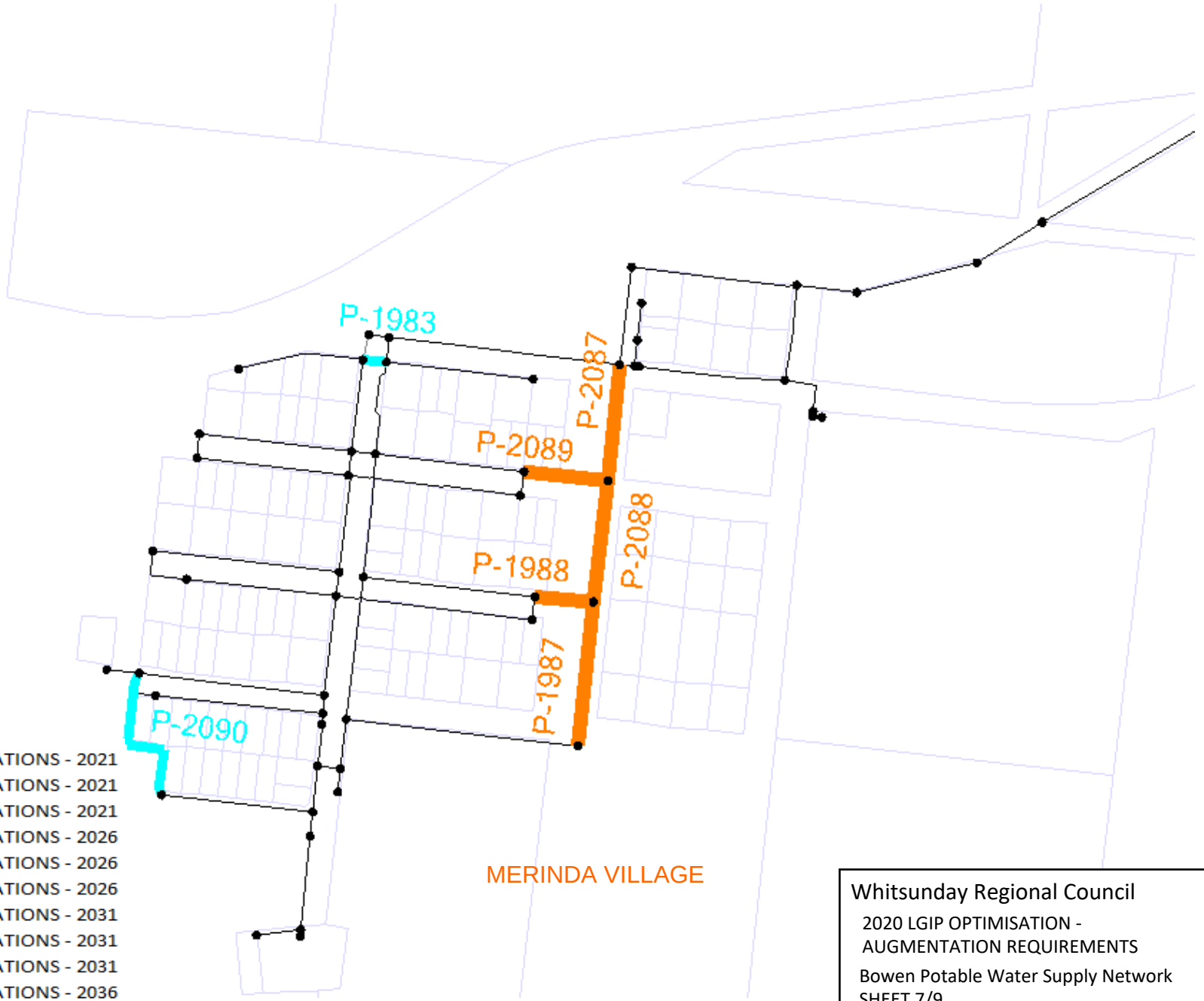
Whitsunday Regional Council

2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS

Bowen Potable Water Supply Network

SHEET 6/9

ARCADIS Design & Consultancy for natural and built assets



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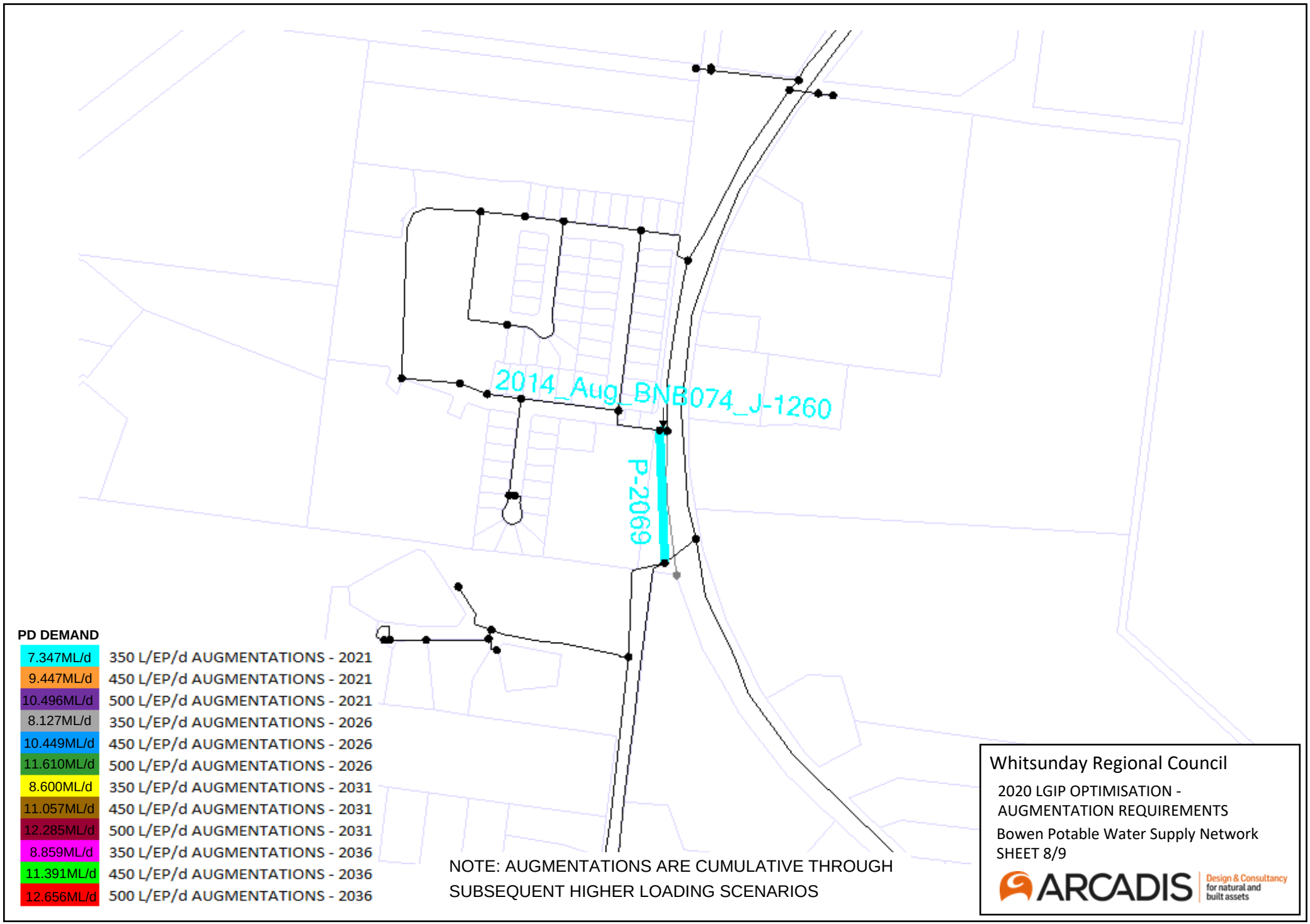
Whitsunday Regional Council

2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS

Bowen Potable Water Supply Network
SHEET 7/9

ARCADIS Design & Consultancy for natural and built assets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P-2069
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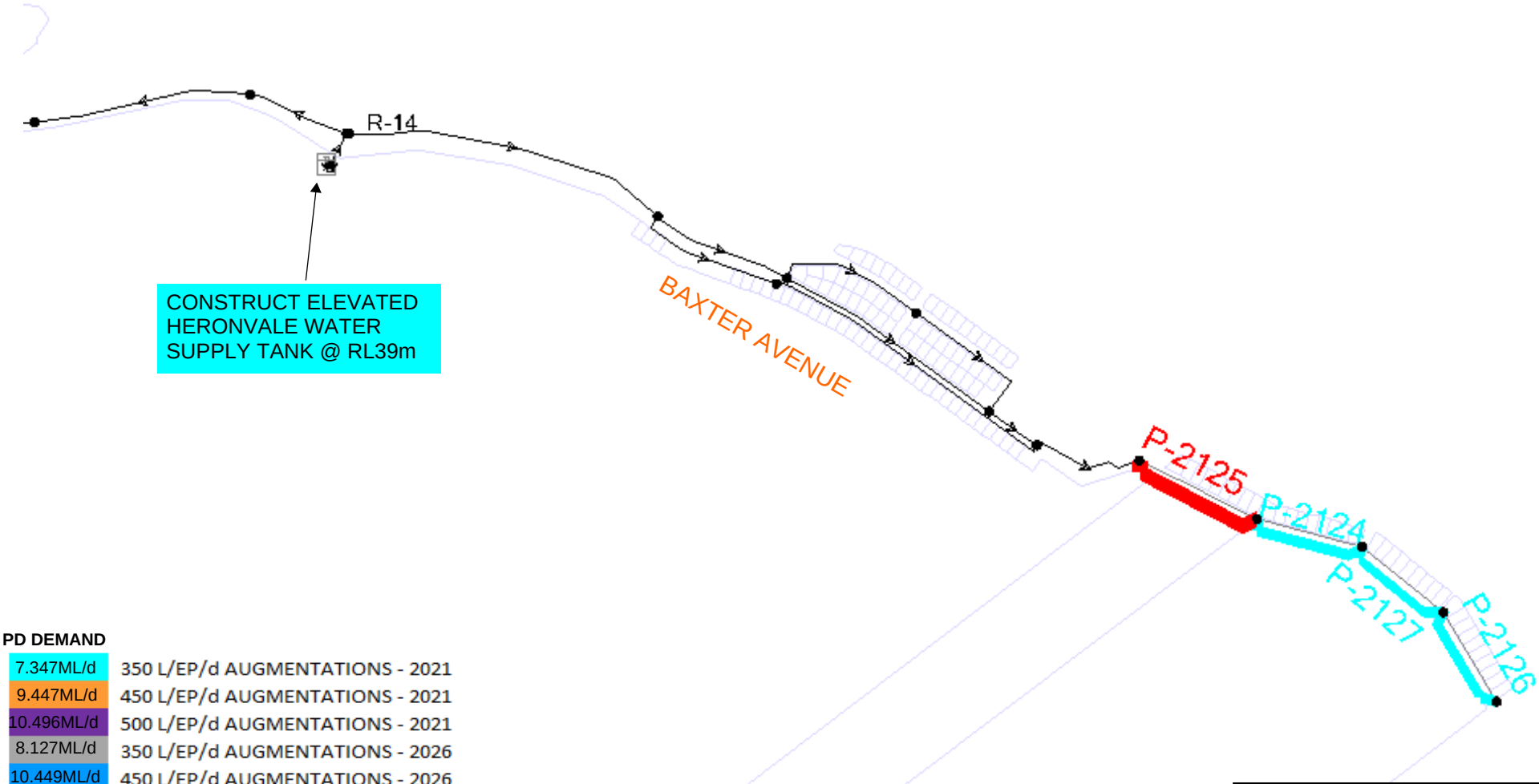
Whitsunday Regional Council
2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS
Bowen Potable Water Supply Network
SHEET 8/9
ARCADIS
Design & Consultancy for natural and built assets



PD DEMAND

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Whitsunday Regional Council

2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS

Bowen Potable Water Supply Network

SHEET 9/9

ARCADIS Design & Consultancy for natural and built assets

PROJECT: Whitsundays Potable Water Network Modelling **Project Engineer:** M.C/S.H

DOCUMENT NUMBER: D003-10027536-AAC-03 **Software:** WaterCad v8i

DATE: 11.02.2020

ARCADIS Design & Consultancy for natural and built assets

WHITSUNDAYS BOWEN POTABLE WATER NETWORK
DEMAND MANAGEMENT ASSESSMENT - AUGMENTATION REQUIREMENT SUMMARY

AUGMENTATION ID	LENGTH (m)	EXISTING PIPE SEGMENT		DUPLICATION DN	NEW PIPE DN	COST - $/m	ADJUSTMENT FACTOR FOR SOIL	10% ADDITIONAL REGIONAL COSTS	30% CONTINGENCY	COST OF NEW/DUPLICATION	AC/PIPE REPLACEMENT						NON-LGIP AUGMENTATIONS	LGIP AUGMENTATIONS
		START NODE	END NODE								YEAR INSTALLED	AC/PIPE DN	REPLACEMENT DN	COST - $/m	CAP & GROUT @ $20/M	TOTAL COST OF DECOMMISSIONING AND REPLACEMENT		
2014_Aug_BNA160_BNA303	191	625: BNA160	1157: BNA303				1.26	10%	30%		1983	96.5	150	$ 262.00	$ 3,820.00	$ 98,399.38	$ 98,399.38	
2014_Aug_BNA581_BNA582	477	1098: BNA581	1322: BNA582				1.26	10%	30%			96.5	200	$ 310.00	$ 9,540.00	$ 289,014.30		$ 289,014.30
2014_Aug_BNA669_BNA466	160	628: BNA668	1310: BNA466		100	$ 205.00	1.26	10%	30%	$ 57,859.20							$ 57,859.20	
2014_Aug_BNA87_BNA581	8	1233: BNA87	1098: BNA581		200	$ 310.00	1.26	10%	30%		1962	96.5	200	$ 310.00	$ 160.00	$ 4,847.20	$ 4,847.20	
2014_Aug_BNB074_J-1260	10	6923: J-1260	3595: BNB074		200	$ 310.00	1.26	10%	30%	$ 5,468.40							$ 5,468.40	
2014_Aug_J-1253_BNB092	150	6900: J-1253	3838: BNB092		100	$ 205.00	1.26	10%	30%	$ 54,243.00							$ 54,243.00	
P-1940	145	682: BNA63	667: BNA62				1.26	10%	30%			96.5	150	$ 262.00	$ 2,900.00	$ 74,701.10	$ 74,701.10	
P-1941	169	960: BNA59	1069: BNA58				1.26	10%	30%			96.5	150	$ 262.00	$ 3,380.00	$ 87,065.42	$ 87,065.42	
P-1946	123	3124: BNA362	4177: BNA361		100	$ 310.00	1.26	10%	30%	$ 67,261.32							$ 67,261.32	
P-1948	89	548: BNA519	643: BNA520				1.26	10%	30%		1964	96.5	200	$ 310.00	$ 1,780.00	$ 53,925.10	$ 53,925.10	
P-1950	81	1112: BNA136	3718: BNB151		150	$ 205.00	1.26	10%	30%	$ 29,291.22							$ 29,291.22	
P-1956	71	1157: BNA303	7341: J-1300				1.26	10%	30%		1964	96.5	150	$ 262.00	$ 1,420.00	$ 36,577.78	$ 36,577.78	
P-1959	82	983: BNA276	521: BNA274		150	$ 262.00	1.26	10%	30%	$ 37,897.78							$ 37,897.78	
P-1964	258	398: BNA273	962: BNA270				1.26	10%	30%			96.5	150	$ 262.00	$ 5,160.00	$ 132,916.44	$ 132,916.44	
P-1973	243	3760: BNA532	3727: BNA158		100	$ 205.00	1.26	10%	30%	$ 87,873.66							$ 87,873.66	
P-1981	58	559: BNA249	1287: BNA248				1.26	10%	30%			50 PVC	100	$ 205.00		$ 22,472.10	$ 22,472.10	
P-1983	26	1253: BNA416	1269: BNA405		150	$ 262.00	1.26	10%	30%	$ 12,016.37							$ 12,016.37	
P-1987	158	7069: J-1268	1266: BNA410		200	$ 310.00	1.26	10%	30%	$ 86,400.72							$ 86,400.72	
P-1988	64	7069: J-1268	1281: BNA422		150	$ 262.00	1.26	10%	30%	$ 29,578.75							$ 29,578.75	
P-1990	58	986: BNA812	1193: BNA816	150		$ 262.00	1.26	10%	30%	$ 26,805.74							$ 26,805.74	
P-1991	36	1076: BNA801	986: BNA812	150		$ 262.00	1.26	10%	30%	$ 16,638.05							$ 16,638.05	
P-1993	148	1193: BNA816	972: BNA817	150		$ 262.00	1.26	10%	30%	$ 68,400.86							$ 68,400.86	
P-1994	136	972: BNA817	561: BNA818	150		$ 262.00	1.26	10%	30%	$ 62,854.85							$ 62,854.85	
P-1995	76	561: BNA818	609: BNA819	150		$ 262.00	1.26	10%	30%	$ 35,124.77							$ 35,124.77	
P-2016	32	921: BNA211	7104: J-1275		150	$ 205.00	1.26	10%	30%	$ 11,571.84							$ 11,571.84	
P-2018	175	1157: BNA303	1186: BNA305				1.26	10%	30%			140 PVC	251	$ 205.00	$ 3,500.00	$ 71,303.75		$ 71,303.75
P-2019	217	825: BNA311	640: BNA312	150		$ 262.00	1.26	10%	30%	$ 100,290.46							$ 100,290.46	
P-2020	220	640: BNA312	1227: BNA313	150		$ 262.00	1.26	10%	30%	$ 101,676.96							$ 101,676.96	
P-2021	191	1227: BNA313	1288: BNA314	150		$ 262.00	1.26	10%	30%	$ 88,274.09							$ 88,274.09	
P-2030	200	1212: BNA323	7122: J-1279		200	$ 310.00	1.26	10%	30%	$ 109,368.00							$ 109,368.00	
P-2032	263	7122: J-1279	7118: J-1277		150	$ 262.00	1.26	10%	30%	$ 121,550.18							$ 121,550.18	
P-2057	218	1067: BNA225	7243: J-1287		150	$ 262.00	1.26	10%	30%	$ 100,752.62							$ 100,752.62	
P-2069	163	7269: J-1288	3595: BNB074		200	$ 310.00	1.26	10%	30%	$ 89,134.92							$ 89,134.92	
P-2071	215	1275: BNA54	1153: BNA50		100	$ 205.00	1.26	10%	30%	$ 77,748.30							$ 77,748.30	
P-2077	135	3116: BNA529	7280: J-1291	150		$ 262.00	1.26	10%	30%	$ 62,392.68							$ 62,392.68	
P-2078	15	3116: BNA529	3122: BNA527	150		$ 262.00	1.26	10%	30%	$ 6,932.52							$ 6,932.52	
P-2081	117	943: BNA73	7285: J-1292		100	$ 205.00	1.26	10%	30%	$ 42,309.54							$ 42,309.54	
P-2082	280	1364: BNA285	7289: J-1293		100	$ 205.00	1.26	10%	30%	$ 101,253.60							$ 101,253.60	
P-2087	127	569: BNA800	7298: J-1294		200	$ 310.00	1.26	10%	30%	$ 69,448.68							$ 69,448.68	
P-2088	133	7298: J-1294	7069: J-1268		200	$ 310.00	1.26	10%	30%	$ 72,729.72							$ 72,729.72	
P-2089	92	917: BNA418	7298: J-1294		150	$ 262.00	1.26	10%	30%	$ 42,519.46							$ 42,519.46	
P-2090	171	392: BNA822	1024: BNA428		100	$ 205.00	1.26	10%	30%	$ 61,837.02							$ 61,837.02	
P-2091	142	1110: BNA117	1229: BNA235				1.26	10%	30%			96.5	210	$ 310.00	$ 2,840.00	$ 86,037.80		$ 86,037.80
Isolation Valves Added																		
	6123						**TOTAL**			**$ 1,937,505.28**						**$ 957,260.37**	**$ 2,448,409.80**	**$ 446,355.85**

PROJECT:	Whitsundays Potable Water Network Modelling	**Project Engineer:**	M.C/S.H
DOCUMENT NUMBER:	D003-10027536-AAC-03	**Software:**	WaterCad v8i
DATE:	11.02.2020		

ARCADIS Design & Consultancy for natural and built assets

WHITSUNDAYS BOWEN POTABLE WATER NETWORK
DEMAND MANAGEMENT ASSESSMENT - AUGMENTATION REQUIREMENT SUMMARY

AUGMENTATION ID	350 L/EP/d DEMAND - 2021	450 L/EP/d DEMAND - 2021	BASELINE 500 L/EP/d DEMAND - 2021	350 L/EP/d DEMAND - 2026	450 L/EP/d DEMAND - 2026	BASELINE 500 L/EP/d DEMAND - 2026	350 L/EP/d DEMAND - 2031	450 L/EP/d DEMAND - 2031	BASELINE 500 L/EP/d DEMAND - 2031	350 L/EP/d DEMAND - 2036	450 L/EP/d DEMAND - 2036	BASELINE 500 L/EP/d DEMAND - 2036
2014_Aug_BNA160_BNA303												
2014_Aug_BNA581_BNA582												
2014_Aug_BNA669_BNA466												
2014_Aug_BNA87_BNA581												
2014_Aug_BNB074_J-1260												
2014_Aug_J-1253_BNB092												
P-1940												
P-1941												
P-1946												
P-1948												
P-1950												
P-1956												
P-1959												
P-1964												
P-1973												
P-1981												
P-1983												
P-1987												
P-1988												
P-1990												
P-1991												
P-1993												
P-1994												
P-1995												
P-2016												
P-2018												
P-2019												
P-2020												
P-2021												
P-2030												
P-2032												
P-2057												
P-2069												
P-2071												
P-2077												
P-2078												
P-2081												
P-2082												
P-2087												
P-2088												
P-2089												
P-2090												
P-2091												
Isolation Valves Added												

REFERENCE

ACID SULFATE SOILS (ASS)[1] ON RELATIVELY UNDISTURBED LAND

	Depth	Depth Code	Depth to Actual Acid Sulfate Soil[2] (pH ≤4.0)	Depth to Strongly Acidic Soil layer[2] (pH >4.0 to ≤5.0)	Depth to Potential Acid Sulfate Soil[2]
	0 - 0.5m	0	A0	a0	S0
	0.5 - 1m	1	A1	a1	S1
	1 - 2m	2	A2	a2	S2
	2 - 3m	3	A3	a3	S3
	3 - 4m	4	A4	a4	S4
	4 - 5m	5	A5	a5	S5
	>5m	5+	A5+	a5+	S5+

NOTE:

- The depth codes above imply that a predominance of profiles in the map unit fall within the nominated depth range.
- Actual acid sulfate soil layers (designated with an A code) often overlie potential acid sulfate soil layers (designated with an S code). Where this occurs eg. ASS2 the map unit is coloured according to the depth of the upper surface of the 'actual' layer (A2) and overlayed with yellow dots. An 'a' preceding the soil depth code indicates a strong acid soil layer with field pH ranging from > 4.0 to ≤ 5.0. This may or may not be a result of sulfide oxidation. While 'a' depth code is shown on the map, no colour is assigned to it.
- In areas where there is varying depth to an ASS layer that cannot be separately mapped at the operative scale, two colours are used to designate the dominant depths. This appears as equal width striped colours. e.g. S1/S2
- P as a superscript indicates sediments of Pleistocene age[3] , so that S^{P}5+ indicates sulfidic sediments (of Pleistocene age) deeper than 5m.
- W as a subscript indicates areas associated with Melaleuca sp. wetlands and occasionally Casuarina glauca communities. Oxidizable sulfur % in surface layers may be highly variable and often exceeds the 'Action Criteria'[4] . This may include sulfur from organic compounds and modern accretion of sulfides in a wet, organic rich environment. ASS typically occurs at depth. Where this occurs e.g. S_{5W} or $S2_{W}$ or $A1_{W}$, the map is coloured as per the actual or potential depth category and is overlayed with ⁙ pattern.
- N as a subscript indicates areas with oxidisable sulfur values that exceed the action criteria[4] but contain varying amounts of carbonate materials that may compensate for the potential acidity. Commonly the carbonate materials are naturally occurring shell fragments, coral fragments or Foraminifera. Depth codes are as above e.g. a potential acid sulfate soil (rich in carbonate) occuring at 1 to 2m depth is designated $S2_{N}$. The map unit is coloured as S2 and overlayed with green dots.

S_{LC} Limited field assessment but occurs in a landscape position where there is a reasonable probability of ASS occurrence. This is usually land where the present use precludes any disturbance eg. National Parks, Reserves etc., or land where accessibility is severely restricte

ACID SULFATE ON DISTURBED LAND[5]

S_{DL} Disturbed land, eg. Canal estate, Marina, Aquaculture, Quarry, Urban, Industrial likely to contain ASS. (In some cases partial or full treatment may have been undertaken).

LAND WITH A LOW PROBABILITY OF ACID SULFATE SOIL OCCURRENCE

LP Land between the 5m AHD contour and the outer limit of Holocene, estuarine ASS (ie. land below 5m AHD) as mapped at this scale, with low probability of ASS occurrence[6]. Limited field investigation.

LAND NOT ASSESSED

NA Land not assessed for ASS as part of this survey. It may include non ASS land beyond the boundary established as the limit of Holocene, estuarine, sulfidic sediments[6] but insufficient or no field testing was carried out[7].

5m AHD[8] CONTOUR - NORMAL LIMIT OF FIELD INVESTIGATION

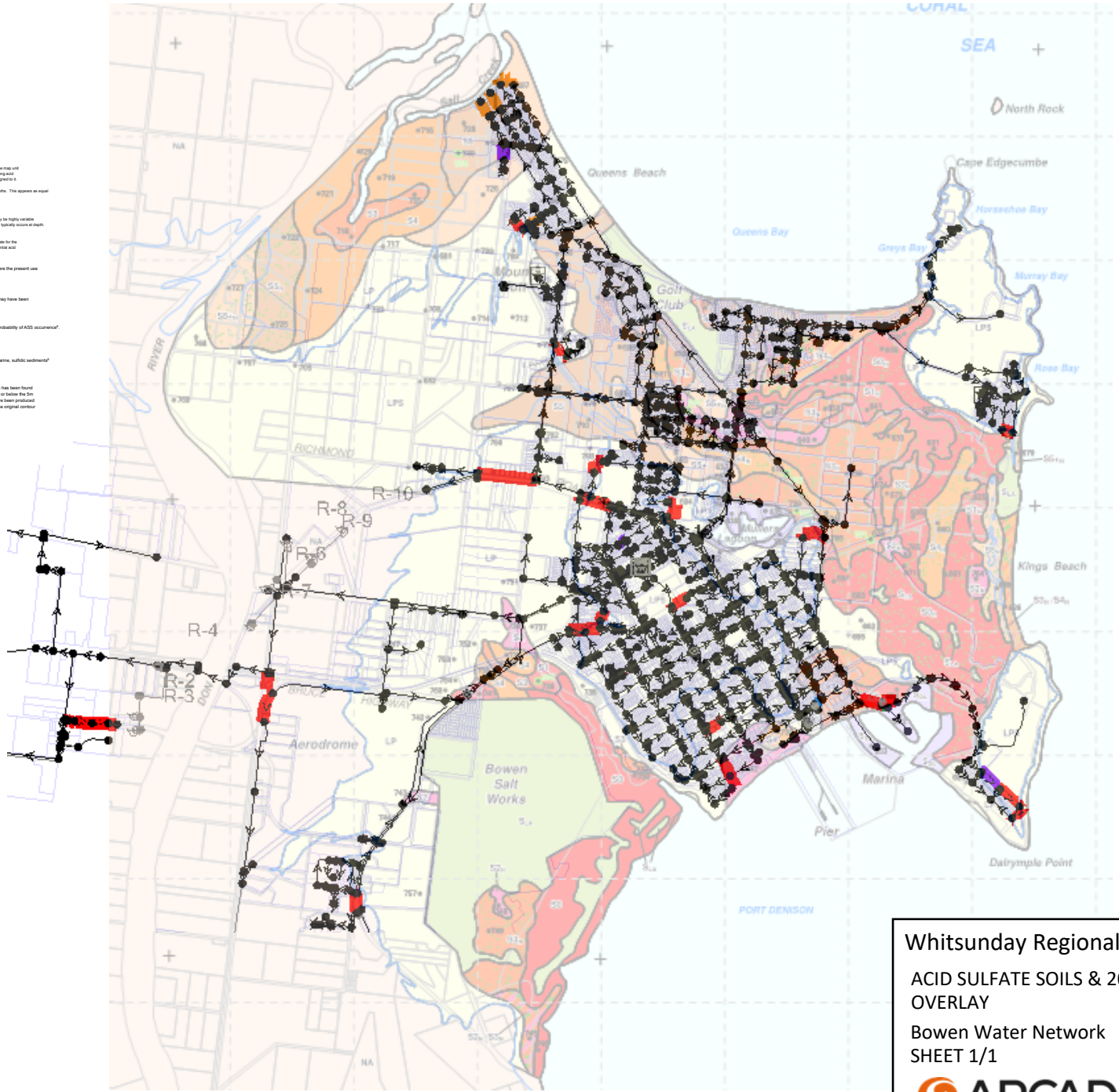
The 5m contour line delineates the normal limit of field investigation of Holocene, estuarine sulfidic sediments[7] which form ASS. However ASS has been found in this study on some lands above 5m, eg. valley flats, sand dunes and channel benches. In other cases the limit of Holocene ASS[7] is either at or below the 5m contour. In the latter case, the land between the ASS limit and the 5m contour is designated LP explained below. Contour information may have been produced at a scale different to that assigned to this map. As a consequence, the location of contours on this map may not be as accurate as those on the original contour map.

707 Borehole locations where profiles were described in detail and samples taken for analysis.

Digital Cadastral Database

Base map compiled from the Queensland Digital Cadastral Database October 2005, Department of Natural Resources and Mines, Brisbane.

NOTE: This map should be used in conjunction with the accompanying report covering this area.



ACID SULFATE SOILS OVERLAY AND LEGEND SOURCED FROM QUEENSLAND GOVERMENT

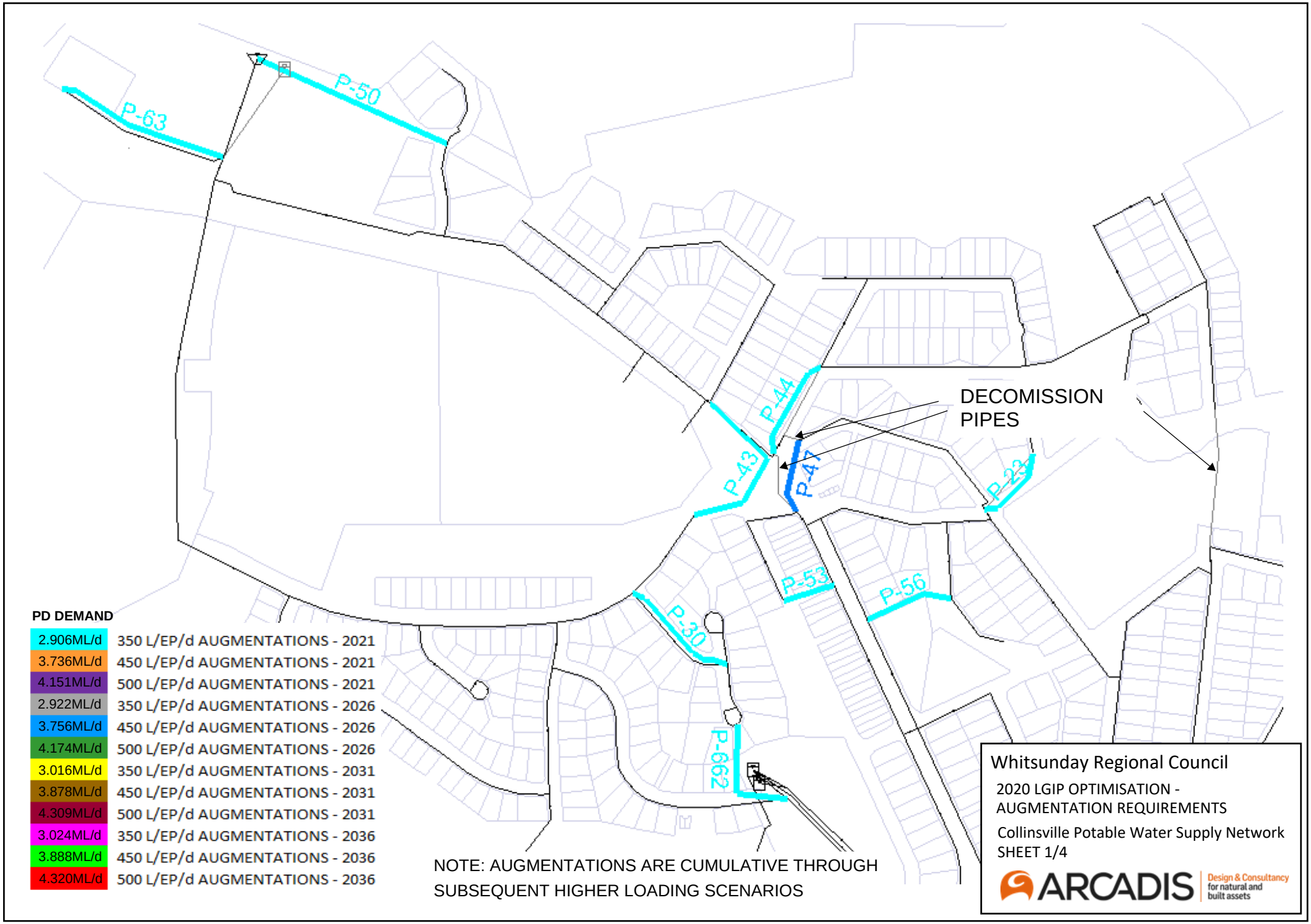
Whitsunday Regional Council

ACID SULFATE SOILS & 2020 LGIP WATER OVERLAY

Bowen Water Network

SHEET 1/1

ARCADIS Design & Consultancy for natural and built assets


P-63
P-50
P-44
P-43
P-47
P-22
P-53
P-56
P-30
P-662
DECOMISSION PIPES
PD DEMAND
2.906ML/d 350 L/EP/d AUGMENTATIONS - 2021
3.736ML/d 450 L/EP/d AUGMENTATIONS - 2021
4.151ML/d 500 L/EP/d AUGMENTATIONS - 2021
2.922ML/d 350 L/EP/d AUGMENTATIONS - 2026
3.756ML/d 450 L/EP/d AUGMENTATIONS - 2026
4.174ML/d 500 L/EP/d AUGMENTATIONS - 2026
3.016ML/d 350 L/EP/d AUGMENTATIONS - 2031
3.878ML/d 450 L/EP/d AUGMENTATIONS - 2031
4.309ML/d 500 L/EP/d AUGMENTATIONS - 2031
3.024ML/d 350 L/EP/d AUGMENTATIONS - 2036
3.888ML/d 450 L/EP/d AUGMENTATIONS - 2036
4.320ML/d 500 L/EP/d AUGMENTATIONS - 2036
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS
Whitsunday Regional Council
2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS
Collinsville Potable Water Supply Network
SHEET 1/4
ARCADIS
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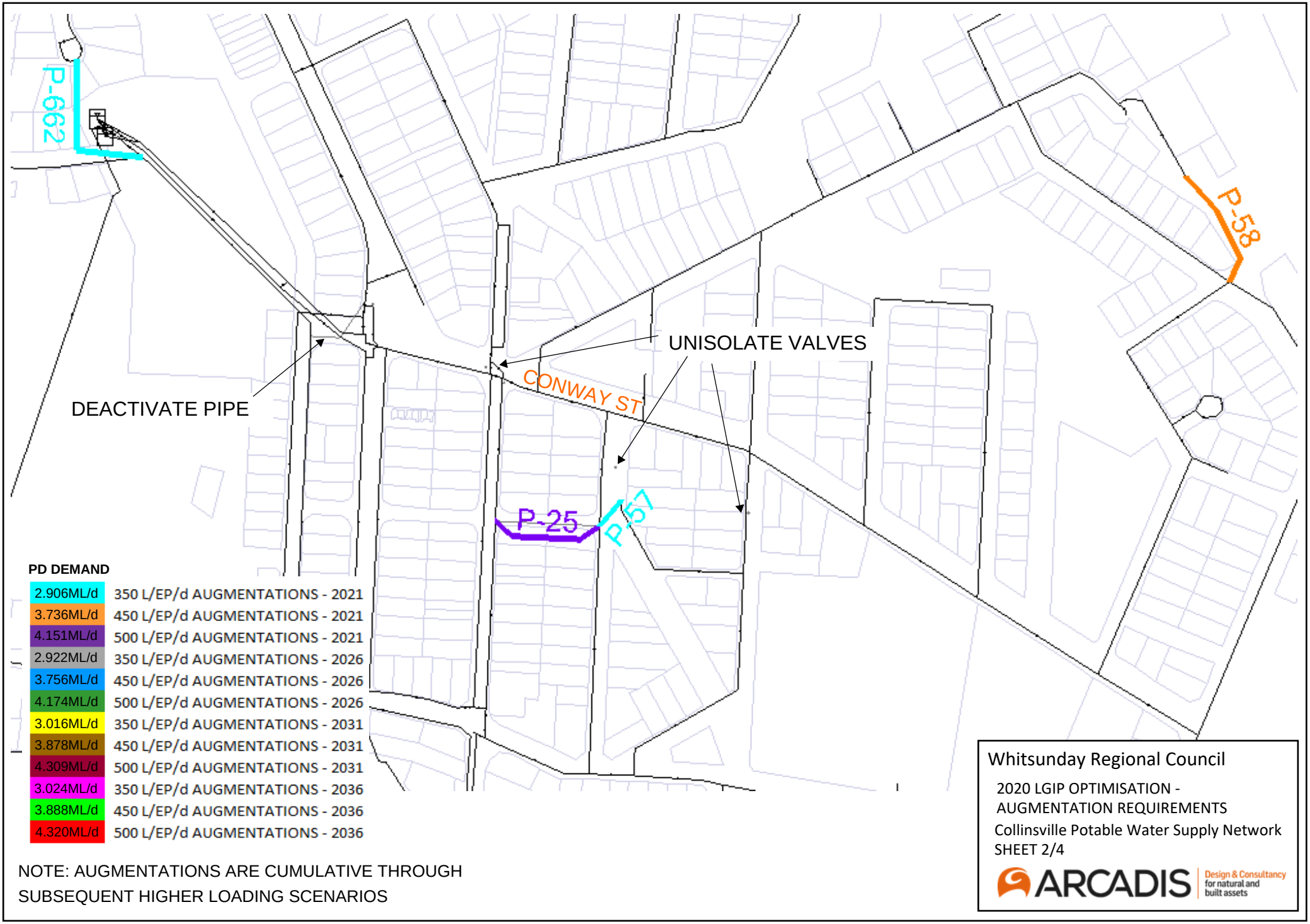
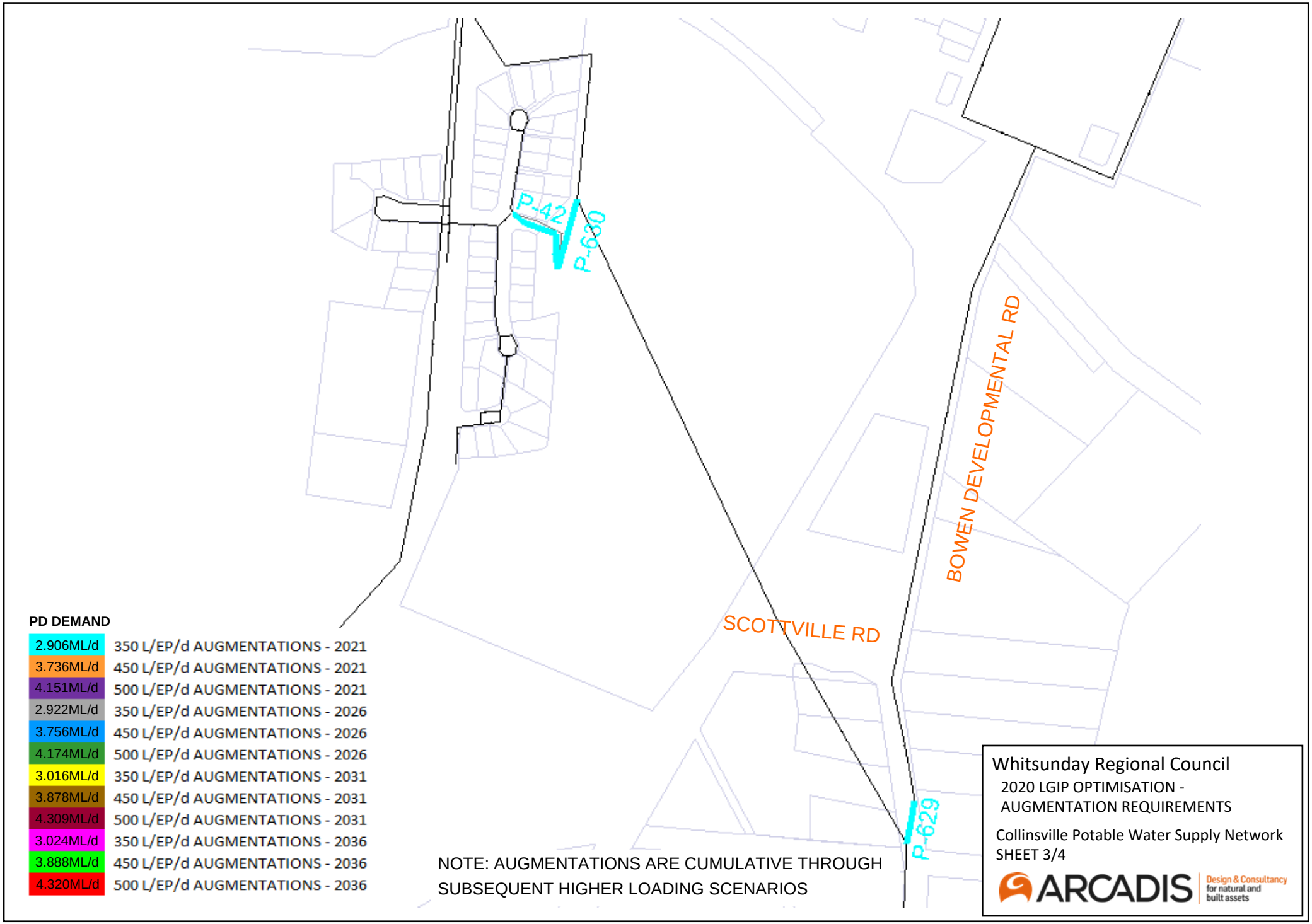


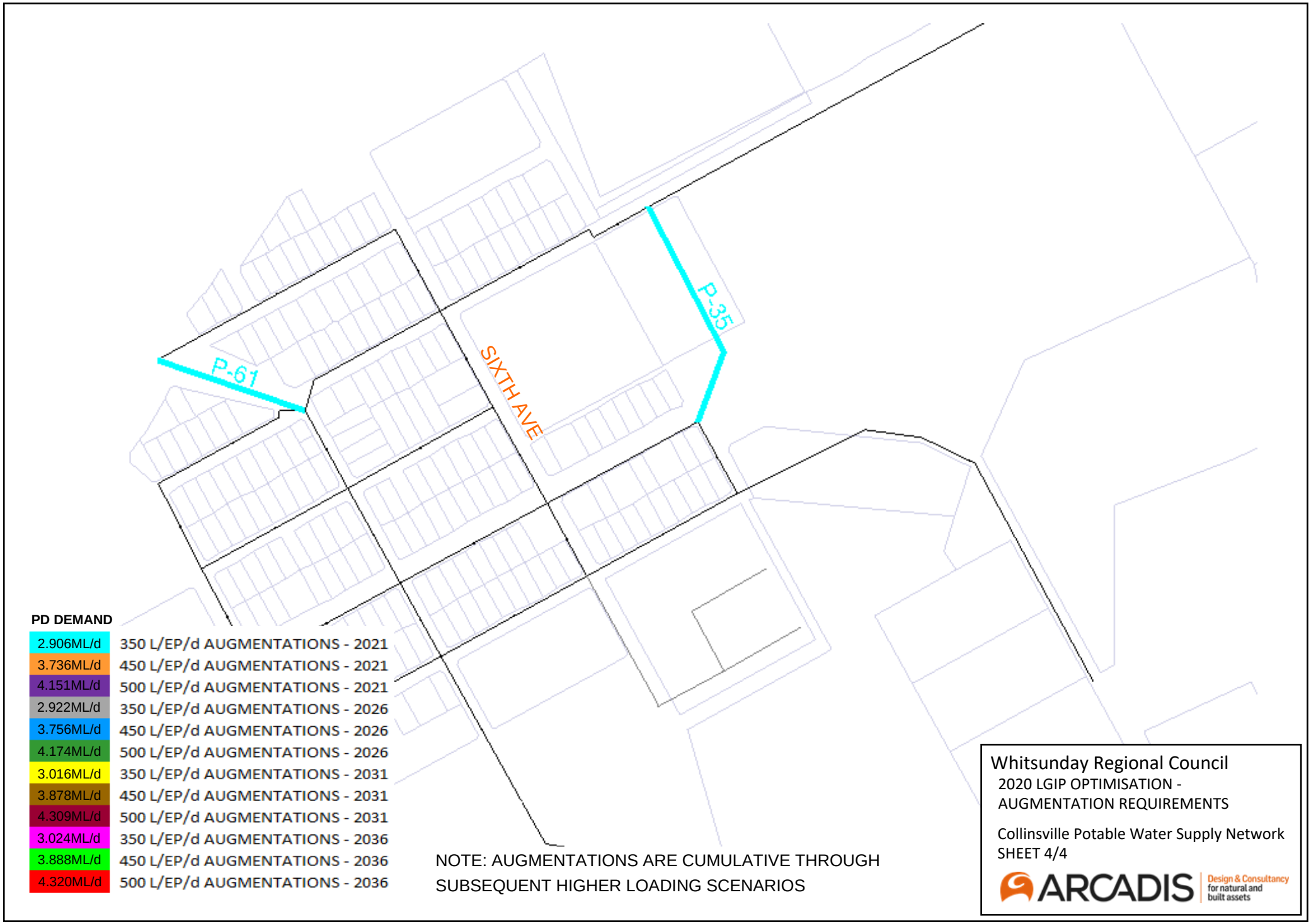
31/01/2020

SK001-10027536-02



31/01/2020

SK001-10027536-02



PD DEMAND	
2.906ML/d	350 L/EP/d AUGMENTATIONS - 2021
3.736ML/d	450 L/EP/d AUGMENTATIONS - 2021
4.151ML/d	500 L/EP/d AUGMENTATIONS - 2021
2.922ML/d	350 L/EP/d AUGMENTATIONS - 2026
3.756ML/d	450 L/EP/d AUGMENTATIONS - 2026
4.174ML/d	500 L/EP/d AUGMENTATIONS - 2026
3.016ML/d	350 L/EP/d AUGMENTATIONS - 2031
3.878ML/d	450 L/EP/d AUGMENTATIONS - 2031
4.309ML/d	500 L/EP/d AUGMENTATIONS - 2031
3.024ML/d	350 L/EP/d AUGMENTATIONS - 2036
3.888ML/d	450 L/EP/d AUGMENTATIONS - 2036
4.320ML/d	500 L/EP/d AUGMENTATIONS - 2036

NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS

Collinsville Potable Water Supply Network
SHEET 4/4

ARCADIS Design & Consultancy for natural and built assets

PROJECT:	WRC Potable Water Network Modelling	**Project Engineer:**	M.C/S.H
DOCUMENT NUMBER:	D001-10027536-AAC-03	**Software:**	WaterCad v8i
DATE:	10.02.2020		

ARCADIS Design & Consultancy for natural and built assets

WHITSUNDAYS COLLINSVILLE POTABLE WATER NETWORK
2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENT SUMMARY - DATA

AUGMENTATION ID	LENGTH (m)	EXISTING PIPE SEGMENT		DUPLICATION DN	NEW PIPE DN	COST - $/m	ADJUSTMENT FACTOR FOR SOIL	10% ADDITIONAL REGIONAL COSTS	30% CONTINGENCY	COST OF NEW/DUPLICATION	AC/PIPE REPLACEMENT						NON-LGIP AUGMENTATIONS	LGIP AUGMENTATIONS
		START NODE	END NODE								YEAR INSTALLED	AC DN	REPLACEMENT DN	COST - $/m	CAP & GROUT @ $20/M	TOTAL COST OF DECOMMISSIONING AND REPLACEMENT		
P-23	108	CLC20	CLC24				1.26	10%	30%			100	150	$ 262.00	$ 2,160.00	$ 55,639.44	$ 55,639.44	
P-25	118	CLC97	CLC98				1.26	10%	30%			100	150	$ 262.00	$ 2,360.00	$ 60,791.24	$ 60,791.24	
P-30	165	CLC164	CLC166				1.26	10%	30%			100	150	$ 262.00	$ 3,300.00	$ 85,004.70	$ 85,004.70	
P-35	309	CLC195	J-8		150	$ 262.00	1.26	10%	30%	$ 142,809.91			150				$ 142,809.91	
P-42	108	CLC120	CLC121				1.26	10%	30%			100	150	262	$ 2,160.00	$ 55,639.44	$ 55,639.44	
P-43	243	CLC165	CLC12		160	$ 262.00	1.26	10%	30%	$ 112,306.82			160				$ 112,306.82	
P-44	141	CLC6	CLC18				1.26	10%	30%			100	160.7	$ 272.00	$ 2,820.00	$ 75,305.28	$ 75,305.28	
P-47	101	CLC7	J-4		152.4	$ 262.00	1.26	10%	30%	$ 46,678.97			152.4				$ 46,678.97	
P-50	279	R-1	J-5		160	$ 262.00	1.26	10%	30%	$ 128,944.87			160				$ 128,944.87	
P-53	71	CLC55	J-6		110.7	$ 216.00	1.26	10%	30%	$ 27,052.70			110.7				$ 27,052.70	
P-56	121	CLC38	J-7		150	$ 262.00	1.26	10%	30%	$ 55,922.33			150				$ 55,922.33	
P-57	35	CLC98	CLC213		150	$ 262.00	1.26	10%	30%	$ 16,175.88			150				$ 16,175.88	
P-58	129	CLC72	CLC266		106	$ 205.00	1.26	10%	30%	$ 46,648.98			106				$ 46,648.98	
P-61	203	CLC183	CLC184		110	$ 205.00	1.26	10%	30%	$ 73,408.86			110				$ 73,408.86	
P-63	237	CLC258	CLC259		160	$ 272.00	1.26	10%	30%	$ 113,714.50							$ 113,714.50	
P-629	55	CLC205	CLC267		150	$ 262.00	1.26	10%	30%	$ 25,419.24			150				$ 25,419.24	
P-630	91	CLC172	CLC121		150	$ 262.00	1.26	10%	30%	$ 42,057.29			150				$ 42,057.29	
P-662	163	CLC170	CLC147		100	$ 205.00	1.26	10%	30%	$ 58,944.06			100				$ 58,944.06	
Deactivate P-45																		
Deactivate 20858																		
Deactivate 20909																		
Deactivate 20848																		
Deactivate Multiple Isolation Valves																		
	2677.00						**TOTAL**			**$ 890,084.41**						**$ 332,380.10**	**$ 1,222,464.51**	**$ -**

PROJECT:	WRC Potable Water Network Modelling	**Project Engineer:**	M.C/S.H
DOCUMENT NUMBER:	D001-10027536-AAC-03	**Software:**	WaterCad v8i
DATE:	10.02.2020		

ARCADIS Design & Consultancy for natural and built assets

WHITSUNDAYS COLLINSVILLE POTABLE WATER NETWORK
2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENT SUMMARY - TIMING

AUGMENTATION ID	350 L/EP/d DEMAND - 2021	450 L/EP/d DEMAND - 2021	BASELINE 500 L/EP/d DEMAND - 2021	350 L/EP/d DEMAND - 2026	450 L/EP/d DEMAND - 2026	BASELINE 500 L/EP/d DEMAND - 2026	350 L/EP/d DEMAND - 2031	450 L/EP/d DEMAND - 2031	BASELINE 500 L/EP/d DEMAND - 2031	350 L/EP/d DEMAND - 2036	450 L/EP/d DEMAND - 2036	BASELINE 500 L/EP/d DEMAND - 2036
P-23												
P-25												
P-30												
P-35												
P-42												
P-43												
P-44												
P-47												
P-50												
P-53												
P-56												
P-57												
P-58												
P-61												
P-63												
P-629												
P-630												
P-662												
Deactivate P-45												
Deactivate 20858												
Deactivate 20909												
Deactivate 20848												
Deactivate Multiple Isolation Vakves												

APPENDIX B

POTABLE WATER NETWORK RESERVOIR ASSESSMENT SUMMARY

PROJECT: Whitsundays Water Network Modelling
DOCUMENT NUMBER: D010-10027536-02
DATE: 10.02.2020

PROJECT ENGINEER: M.C/S.H
SOFTWARE: Bentley WaterCAD v8i

ARCADIS Design & Consultancy for natural and built assets

WHITSUNDAYS POTABLE WATER NETWORK
2020 LGIP OPTIMISATION - RESERVOIR CAPACITY ASSESSMENT (AD = 500L/EP/d)

Developed based on WRC Development Manual v1.3 - D5

Name	ID	Diameter (m) - **N3**	Physical		Operational		EPs Supplied				Total Volume (ML)	15%-95% Operational Storage Volume (ML)	Actual Operational Volume (ML)	Required Storage Volume (ML) - **N6**				TOTAL - Required Difference (Spare ML)				15%-95% Operational - Required Difference (Spare ML)				Name
			Min Lvl	Max Lvl	Min Lvl - **N5**	Max Lvl	2021	2026 - **N1**	2031 - **N1**	2036 - **N1**				2021	2026 - **N1**	2031 - **N1**	2036 - **N1**	2021	2026	2031	2036	2021	2026	2031	2036	
Proserpine LL	WPGR	35	10.2	15.2	14.2	14.95	8895.20	9131.36	9367.51	9564.31	4.811	3.848	0.722	11.119	11.414	11.709	11.955	-6.308	-6.604	-6.899	-7.145	-7.271	-7.566	-7.861	-8.107	Proserpine LL
Proserpine HL - (Elevated)	WPWT	9.11	35.7	42.5	38	42.11	8895.20	9131.36	9367.51	9564.31	0.443	0.355	0.268	2.100	2.824	2.898	2.964									Proserpine HL
Proserpine Combined - **N4**							8895.20	9131.36	9367.51	9564.31	5.254	4.203	0.989													Proserpine Combined - **N4**
Mt Julian 1	WCGR03	11.8	76	79.3	76.5	79.1					0.361	0.289	0.284													Mt Julian 1
Mt Julian 2	WCGR15	11.8	76	79.3	76.5	79.1					0.361	0.289	0.284													Mt Julian 2
Mt Julian Combined							382.74	443.61	500.68	562.57	0.722	0.577	0.569	0.581	0.649	0.713	0.783	0.141	0.073	0.009	-0.061	-0.003	-0.072	-0.136	-0.205	Mt Julian Combined
Cannon Valley - **N2**	T-7	39.41	89	102	93	101	4464.98	5175.12	5840.87	6562.84	15.858	12.686	9.759	5.581	6.469	7.301	8.204	10.277	9.389	8.557	7.654	7.105	6.217	5.385	4.483	Cannon Valley - **N2**
Coyne Rd LL	WCGR04	26.6	69.5	73.6	71.14	73.2	2304.65	2671.19	3014.83	3387.48	2.278	1.823	1.145	3.093	3.505	3.892	4.311	-0.814	-1.227	-1.613	-2.032	-1.270	-1.682	-2.069	-2.488	Coyne Rd LL
Coyne Rd HL	WCGR06	8.2	93.2	95.7	93.6	95.575	290.88	337.14	380.51	427.55	0.132	0.106	0.104	0.477	0.529	0.578	0.631	-0.345	-0.397	-0.446	-0.499	-0.372	-0.424	-0.472	-0.525	Coyne Rd HL
Cannonvale	WCGR05	40	70	80.2	75.1	79.18	4913.17	5694.59	6427.17	7221.61	12.818	10.254	5.127	6.141	7.118	8.034	9.027	6.676	5.699	4.784	3.791	4.113	3.136	2.220	1.227	Cannonvale
Airlie Summit	T-8	13	150	153	150.45	152.7	180.62	209.35	236.28	265.48	0.398	0.319	0.299	0.353	0.386	0.416	0.449	0.045	0.013	-0.018	-0.050	-0.035	-0.067	-0.097	-0.130	Airlie Summit
Moonlight Dr 1	WCGR01	5.3	92	97.6	93.9	97.32					0.124	0.099	0.075													Moonlight Dr 1
Moonlight Dr 2	WCGR02	5.3	92	97.6	93.9	97.32					0.124	0.099	0.075													Moonlight Dr 2
Moonlight Dr Combined							69.58	80.65	91.02	102.27	0.247	0.198	0.151	0.228	0.241	0.252	0.265	0.019	0.006	-0.005	-0.018	-0.031	-0.043	-0.055	-0.067	Moonlight Dr Combined
Sanctuary Dr (NEW)	T-10	5	61	66	62	65.5					0.098	0.079	0.069	0.108	0.108	0.108	0.108	-0.010	-0.010	-0.010	-0.010	-0.029	-0.029	-0.029	-0.029	Sanctuary Dr (NEW)
Shute Harbour LL	WCGR13	11.6	28.8	32.2	31.5	32.1	3.95	4.58	5.17	5.81	0.359	0.287	0.063	0.154	0.155	0.156	0.157	0.205	0.204	0.204	0.203	0.133	0.132	0.132	0.131	Shute Harbour LL
Shute Harbour HL	WCGR12	13.9	97.9	101.7	100.5	101.5	1176.85	1364.02	1539.50	1729.79	0.577	0.461	0.152	1.824	2.035	2.232	2.446	-1.247	-1.458	-1.655	-1.869	-1.363	-1.573	-1.771	-1.985	Shute Harbour HL
Daydream - **N7**	T-4	10	15	20			798.31	925.28	1044.31	1173.39	0.393	0.314		0.473	0.525	0.923	0.975	-0.081	-0.132	-0.530	-0.583	-0.159	-0.211	-0.609	-0.661	Daydream
Satinwood Ct 1	WCGR18	13.4	166.45	170	169	169.8					0.501	0.401	0.113													Satinwood Ct 1
Satinwood Ct 2	WCGR19	13.4	166.45	170	169	169.8					0.501	0.401	0.113													Satinwood Ct 2
Satinwood Combined							201.16	233.15	263.15	295.67	1.001	0.801	0.226	0.376	0.412	0.446	0.483	0.625	0.589	0.555	0.519	0.425	0.389	0.355	0.318	Satinwood Combined
Macona Cres	WCGR07	9	110	114.2	113.2	114	178.02	206.33	232.88	261.66	0.267	0.214	0.051	0.350	0.382	0.412	0.444	-0.083	-0.115	-0.145	-0.177	-0.137	-0.168	-0.198	-0.231	Macona Cres
Pepperberry Ln 1	WCGR14	7	128.7	133.3	132.61	133.07					0.177	0.142	0.018													Pepperberry Ln 1
Pepperberry Ln 2	WCGR17	9.83	130	133.3	132.61	133.07					0.250	0.200	0.035													Pepperberry Ln 2
Pepperberry Combined							219.16	254.02	286.69	322.13	0.427	0.342	0.053	0.397	0.436	0.473	0.512	0.031	-0.008	-0.045	-0.085	-0.055	-0.094	-0.131	-0.170	Pepperberry Combined
Hamilton Park	WBC01	5	89	91	137	137.8	50.70	58.76	66.32	74.52	0.039	0.031	0.016	0.207	0.216	0.225	0.234	-0.168	-0.177	-0.185	-0.195	-0.176	-0.185	-0.193	-0.202	Hamilton Park
																	TOTAL	8.962	5.846	2.556	-0.558	0.877	-2.239	-5.529	-8.643	

N1 - Factored based on 2021 supply catchments

N2 - EPs supplied = Dedicated supply from Cannon Valley - does not include catchments of reservoirs supplied via Cannon Valley gravity feed

N3 - Diameter assumed as internal tank diameter

N4 - Proserpine LL tank supplies HL via pumpset - combined capacity will require supply redundancy

N5 - Operational min level model extract - BWL may be defined higher than 15% tank volume in some instances to meet minimum pressure requirements at supply demand points

N6 - Based on 500L/EP/d

N7 - Daydream AD adopted as 180L/EP/d based on discussions with WRC and in line with tourism based water usage

PROJECT: Whitsundays Water Network Modelling
DOCUMENT NUMBER: D010-10027536-02
DATE: 10.02.2020

PROJECT ENGINEER: M.C/S.H
SOFTWARE: Bentley WaterCAD v8i

ARCADIS Design & Consultancy for natural and built assets

WHITSUNDAYS POTABLE WATER NETWORK
2020 LGIP OPTIMISATION - RESERVOIR CAPACITY ASSESSMENT (AD = 450L/EP/d)

Developed based on WRC Development Manual v1.3 - D5

Name	ID	Diameter (m) - **N3**	Physical		Operational		EPs Supplied				Total Volume (ML)	15%-95% Operational Storage Volume (ML)	Actual Operational Volume (ML)	Required Storage Volume (ML) - **N6**				TOTAL - Required Difference (Spare ML)				15%-95% Operational - Required Difference (Spare ML)				Name
			Min Lvl	Max Lvl	Min Lvl - **N5**	Max Lvl	2021	2026 - **N1**	2031 - **N1**	2036 - **N1**				2021	2026 - **N1**	2031 - **N1**	2036 - **N1**	2021	2026	2031	2036	2021	2026	2031	2036	
Proserpine LL	WPGR	35	10.2	15.2	14.2	14.95	8895.20	9131.36	9367.51	9564.31	4.811	3.848	0.722	10.007	10.273	10.538	10.760	-5.197	-5.462	-5.728	-5.949	-6.159	-6.424	-6.690	-6.911	Proserpine LL
Proserpine HL - (Elevated)	WPWT	9.11	35.7	42.5	38	42.11	8895.20	9131.36	9367.51	9564.31	0.443	0.355	0.268	1.933	2.542	2.608	2.668									Proserpine HL
Proserpine Combined - **N4**							8895.20	9131.36	9367.51	9564.31	5.254	4.203	0.989													Proserpine Combined - **N4**
Mt Julian 1	WCGR03	11.8	76	79.3	76.5	79.1					0.361	0.289	0.284													Mt Julian 1
Mt Julian 2	WCGR15	11.8	76	79.3	76.5	79.1					0.361	0.289	0.284													Mt Julian 2
Mt Julian Combined							382.74	443.61	500.68	562.57	0.722	0.577	0.569	0.538	0.599	0.657	0.720	0.184	0.123	0.065	0.002	0.040	-0.022	-0.080	-0.142	Mt Julian Combined
Cannon Valley - **N2**	T-7	39.41	89	102	93	101	4464.98	5175.12	5840.87	6562.84	15.858	12.686	9.759	5.023	5.822	6.571	7.383	10.835	10.036	9.287	8.475	7.663	6.864	6.115	5.303	Cannon Valley - **N2**
Coyne Rd LL	WCGR04	26.6	69.5	73.6	71.14	73.2	2304.65	2671.19	3014.83	3387.48	2.278	1.823	1.145	2.833	3.205	3.553	3.930	-0.555	-0.926	-1.274	-1.651	-1.011	-1.382	-1.730	-2.107	Coyne Rd LL
Coyne Rd HL	WCGR06	8.2	93.2	95.7	93.6	95.575	290.88	337.14	380.51	427.55	0.132	0.106	0.104	0.445	0.491	0.535	0.583	-0.312	-0.359	-0.403	-0.451	-0.339	-0.386	-0.430	-0.477	Coyne Rd HL
Cannonvale	WCGR05	40	70	80.2	75.1	79.18	4913.17	5694.59	6427.17	7221.61	12.818	10.254	5.127	5.527	6.406	7.231	8.124	7.290	6.411	5.587	4.693	4.727	3.848	3.024	2.130	Cannonvale
Airlie Summit	T-8	13	150	153	150.45	152.7	180.62	209.35	236.28	265.48	0.398	0.319	0.299	0.333	0.362	0.389	0.419	0.065	0.036	0.009	-0.021	-0.014	-0.043	-0.071	-0.100	Airlie Summit
Moonlight Dr 1	WCGR01	5.3	92	97.6	93.9	97.32					0.124	0.099	0.075													Moonlight Dr 1
Moonlight Dr 2	WCGR02	5.3	92	97.6	93.9	97.32					0.124	0.099	0.075													Moonlight Dr 2
Moonlight Dr Combined							69.58	80.65	91.02	102.27	0.247	0.198	0.151	0.220	0.232	0.242	0.254	0.027	0.015	0.005	-0.006	-0.023	-0.034	-0.044	-0.056	Moonlight Dr Combined
Sanctuary Dr (NEW)	T-10	5	61	66	62	65.5					0.098	0.079	0.069	0.108	0.108	0.108	0.108	-0.010	-0.010	-0.010	-0.010	-0.029	-0.029	-0.029	-0.029	Sanctuary Dr (NEW)
Shute Harbour LL	WCGR13	11.6	28.8	32.2	31.5	32.1	3.95	4.58	5.17	5.81	0.359	0.287	0.063	0.154	0.155	0.155	0.156	0.205	0.205	0.204	0.203	0.133	0.133	0.132	0.132	Shute Harbour LL
Shute Harbour HL	WCGR12	13.9	97.9	101.7	100.5	101.5	1176.85	1364.02	1539.50	1729.79	0.577	0.461	0.152	1.692	1.881	2.059	2.251	-1.115	-1.304	-1.482	-1.675	-1.230	-1.420	-1.597	-1.790	Shute Harbour HL
Daydream - **N7**	T-4	10	15	20			798.31	925.28	1044.31	1173.39	0.393	0.314		0.473	0.525	0.923	0.975	-0.081	-0.132	-0.530	-0.583	-0.159	-0.211	-0.609	-0.661	Daydream
Satinwood Ct 1	WCGR18	13.4	166.45	170	169	169.8					0.501	0.401	0.113													Satinwood Ct 1
Satinwood Ct 2	WCGR19	13.4	166.45	170	169	169.8					0.501	0.401	0.113													Satinwood Ct 2
Satinwood Combined							201.16	233.15	263.15	295.67	1.001	0.801	0.226	0.354	0.386	0.416	0.449	0.648	0.615	0.585	0.552	0.447	0.415	0.385	0.352	Satinwood Combined
Macona Cres	WCGR07	9	110	114.2	113.2	114	178.02	206.33	232.88	261.66	0.267	0.214	0.051	0.330	0.359	0.386	0.415	-0.063	-0.092	-0.119	-0.148	-0.116	-0.145	-0.172	-0.201	Macona Cres
Pepperberry Ln 1	WCGR14	7	128.7	133.3	132.61	133.07					0.177	0.142	0.018													Pepperberry Ln 1
Pepperberry Ln 2	WCGR17	9.83	130	133.3	132.61	133.07					0.250	0.200	0.035													Pepperberry Ln 2
Pepperberry Combined							219.16	254.02	286.69	322.13	0.427	0.342	0.053	0.372	0.407	0.440	0.476	0.056	0.020	-0.013	-0.049	-0.030	-0.065	-0.098	-0.134	Pepperberry Combined
Hamilton Park	WBC01	5	89	91	137	137.8	50.70	58.76	66.32	74.52	0.039	0.031	0.016	0.201	0.209	0.217	0.225	-0.162	-0.170	-0.178	-0.186	-0.170	-0.178	-0.186	-0.194	Hamilton Park
																	TOTAL	11.815	9.006	6.005	3.197	3.730	0.921	-2.080	-4.888	

N1 - Factored based on 2021 supply catchments
N2 - EPs supplied = Dedicated supply from Cannon Valley - does not include catchments of reservoirs supplied via Cannon Valley gravity feed
N3 - Diameter assumed as internal tank diameter
N4 - Proserpine LL tank supplies HL via pumpset - combined capacity will require supply redundancy
N5 - Operational min level model extract - BWL may be defined higher than 15% tank volume in some instances to meet minimum pressure requirements at supply demand points
N6 - Based on 450L/EP/d
N7 - Daydream AD adopted as 180L/EP/d based on discussions with WRC and in line with tourism based water usage

PROJECT: Whitsundays Water Network Modelling
DOCUMENT NUMBER: D010-10027536-02
DATE: 10.02.2020

PROJECT ENGINEER: M.C/S.H
SOFTWARE: Bentley WaterCAD v8i

ARCADIS Design & Consultancy for natural and built assets

WHITSUNDAYS POTABLE WATER NETWORK
2020 LGIP OPTIMISATION - RESERVOIR CAPACITY ASSESSMENT (AD = 350L/EP/d)

Developed based on WRC Development Manual v1.3 - D5

Name	ID	Diameter (m) - **N3**	Physical		Operational		EPs Supplied				Total Volume (ML)	15%-95% Operational Storage Volume (ML)	Actual Operational Volume (ML)	Required Storage Volume (ML) - **N6**				TOTAL - Required Difference (Spare ML)				15%-95% Operational - Required Difference (Spare ML)				Name
			Min Lvl	Max Lvl	Min Lvl - **N5**	Max Lvl	2021	2026 - **N1**	2031 - **N1**	2036 - **N1**				2021	2026 - **N1**	2031 - **N1**	2036 - **N1**	2021	2026	2031	2036	2021	2026	2031	2036	
Proserpine LL	WPGR	35	10.2	15.2	14.2	14.95	8895.20	9131.36	9367.51	9564.31	4.811	3.848	0.722	7.783	7.990	8.197	8.369	-2.973	-3.179	-3.386	-3.558	-3.935	-4.141	-4.348	-4.520	Proserpine LL
Proserpine HL - (Elevated)	WPWT	9.11	35.7	42.5	38	42.11	8895.20	9131.36	9367.51	9564.31	0.443	0.355	0.268	1.599	1.977	2.028	2.075									Proserpine HL
Proserpine Combined - **N4**							8895.20	9131.36	9367.51	9564.31	5.254	4.203	0.989													Proserpine Combined - **N4**
Mt Julian 1	WCGR03	11.8	76	79.3	76.5	79.1					0.361	0.289	0.284													Mt Julian 1
Mt Julian 2	WCGR15	11.8	76	79.3	76.5	79.1					0.361	0.289	0.284													Mt Julian 2
Mt Julian Combined							382.74	443.61	500.68	562.57	0.722	0.577	0.569	0.451	0.499	0.544	0.593	0.270	0.222	0.177	0.129	0.126	0.078	0.033	-0.016	Mt Julian Combined
Cannon Valley - **N2**	T-7	39.41	89	102	93	101	4464.98	5175.12	5840.87	6562.84	15.858	12.686	9.759	4.016	4.575	5.111	5.742	11.842	11.283	10.747	10.115	8.670	8.111	7.576	6.944	Cannon Valley - **N2**
Coyne Rd LL	WCGR04	26.6	69.5	73.6	71.14	73.2	2304.65	2671.19	3014.83	3387.48	2.278	1.823	1.145	2.315	2.604	2.874	3.168	-0.036	-0.325	-0.596	-0.889	-0.492	-0.781	-1.051	-1.345	Coyne Rd LL
Coyne Rd HL	WCGR06	8.2	93.2	95.7	93.6	95.575	290.88	337.14	380.51	427.55	0.132	0.106	0.104	0.379	0.416	0.450	0.487	-0.247	-0.283	-0.318	-0.355	-0.273	-0.310	-0.344	-0.381	Coyne Rd HL
Cannonvale	WCGR05	40	70	80.2	75.1	79.18	4913.17	5694.59	6427.17	7221.61	12.818	10.254	5.127	4.369	4.984	5.624	6.319	8.449	7.833	7.194	6.499	5.885	5.270	4.630	3.935	Cannonvale
Airlie Summit	T-8	13	150	153	150.45	152.7	180.62	209.35	236.28	265.48	0.398	0.319	0.299	0.292	0.315	0.336	0.359	0.106	0.083	0.062	0.039	0.026	0.004	-0.018	-0.041	Airlie Summit
Moonlight Dr 1	WCGR01	5.3	92	97.6	93.9	97.32					0.124	0.099	0.075													Moonlight Dr 1
Moonlight Dr 2	WCGR02	5.3	92	97.6	93.9	97.32					0.124	0.099	0.075													Moonlight Dr 2
Moonlight Dr Combined							69.58	80.65	91.02	102.27	0.247	0.198	0.151	0.205	0.214	0.222	0.231	0.042	0.034	0.025	0.017	-0.007	-0.016	-0.024	-0.033	Moonlight Dr Combined
Sanctuary Dr (NEW)	T-10	5	61	66	62	65.5					0.098	0.079	0.069	0.108	0.108	0.108	0.108	-0.010	-0.010	-0.010	-0.010	-0.029	-0.029	-0.029	-0.029	Sanctuary Dr (NEW)
Shute Harbour LL	WCGR13	11.6	28.8	32.2	31.5	32.1	3.95	4.58	5.17	5.81	0.359	0.287	0.063	0.153	0.154	0.154	0.155	0.206	0.206	0.205	0.205	0.134	0.134	0.133	0.133	Shute Harbour LL
Shute Harbour HL	WCGR12	13.9	97.9	101.7	100.5	101.5	1176.85	1364.02	1539.50	1729.79	0.577	0.461	0.152	1.427	1.574	1.712	1.862	-0.850	-0.998	-1.136	-1.286	-0.965	-1.113	-1.251	-1.401	Shute Harbour HL
Daydream - **N7**	T-4	10	15	20			798.31	925.28	1044.31	1173.39	0.393	0.314		0.473	0.525	0.923	0.975	-0.081	-0.132	-0.530	-0.583	-0.159	-0.211	-0.609	-0.661	Daydream
Satinwood Ct 1	WCGR18	13.4	166.45	170	169	169.8					0.501	0.401	0.113													Satinwood Ct 1
Satinwood Ct 2	WCGR19	13.4	166.45	170	169	169.8					0.501	0.401	0.113													Satinwood Ct 2
Satinwood Combined							201.16	233.15	263.15	295.67	1.001	0.801	0.226	0.308	0.334	0.357	0.383	0.693	0.668	0.644	0.618	0.493	0.467	0.444	0.418	Satinwood Combined
Macona Cres	WCGR07	9	110	114.2	113.2	114	178.02	206.33	232.88	261.66	0.267	0.214	0.051	0.290	0.312	0.333	0.356	-0.023	-0.045	-0.066	-0.089	-0.076	-0.099	-0.120	-0.142	Macona Cres
Pepperberry Ln 1	WCGR14	7	128.7	133.3	132.61	133.07					0.177	0.142	0.018													Pepperberry Ln 1
Pepperberry Ln 2	WCGR17	9.83	130	133.3	132.61	133.07					0.250	0.200	0.035													Pepperberry Ln 2
Pepperberry Combined							219.16	254.02	286.69	322.13	0.427	0.342	0.053	0.323	0.350	0.376	0.404	0.105	0.077	0.052	0.024	0.019	-0.008	-0.034	-0.062	Pepperberry Combined
Hamilton Park	WBC01	5	89	91	137	137.8	50.70	58.76	66.32	74.52	0.039	0.031	0.016	0.190	0.196	0.202	0.209	-0.151	-0.157	-0.163	-0.169	-0.159	-0.165	-0.171	-0.177	Hamilton Park
																	TOTAL	17.342	15.276	12.903	10.707	9.257	7.191	4.818	2.622	

N1 - Factored based on 2021 supply catchments

N2 - EPs supplied = Dedicated supply from Cannon Valley - does not include catchments of reservoirs supplied via Cannon Valley gravity feed

N3 - Diameter assumed as internal tank diameter

N4 - Proserpine LL tank supplies HL via pumpset - combined capacity will require supply redundancy

N5 - Operational min level model extract - BWL may be defined higher than 15% tank volume in some instances to meet minimum pressure requirements at supply demand points

N6 - Based on 350L/EP/d

N7 - Daydream AD adopted as 180L/EP/d based on discussions with WRC and in line with tourism based water usage

PROJECT: Bowen Water Network Modelling
DOCUMENT NUMBER: D011-10027536-01
DATE: 10.02.2020

PROJECT ENGINEER: M.C/S.H
SOFTWARE: Bentley WaterCAD v8i

ARCADIS Design & Consultancy for natural and built assets

BOWEN POTABLE WATER NETWORK
2020 LGIP OPTIMISATION - RESERVOIR CAPACITY ASSESSMENT (AD = 500L/EP/d)

Name	ID	Diameter (m) - **N2**	Physical		Operational		EPs Supplied				Total Volume (ML)	15%-95% Operational Storage Volume (ML)	Actual Operational Volume (ML)	Required Storage Volume (ML) - **N4**				TOTAL - Required Difference (Spare ML)				15%-95% Operational - Required Difference (Spare ML)				Name
			Min Lvl	Max Lvl	Min Lvl - **N3**	Max Lvl	2021	2026 - **N1**	2031 - **N1**	2036 - **N1**				2021	2026 - **N1**	2031 - **N1**	2036 - **N1**	2021	2026	2031	2036	2021	2026	2031	2036	
Heronvale	1494	15	39	44	39.75	43.75	197.10	199.96	207.77	210.72	0.884	0.707	0.707	0.654	0.657	0.666	0.669	0.230	0.227	0.218	0.215	0.053	0.050	0.041	0.038	Heronvale
Bowen Main Res	6963	43.5	48	59.5	49.7	58.925	9019.32	9513.51	10088.76	10581.60	17.091	13.673	13.710	11.274	11.892	12.611	13.227	5.817	5.199	4.480	3.864	2.399	1.781	1.062	0.446	Bowen Main Res
																	TOTAL	6.047	5.426	4.698	4.078	2.452	1.831	1.103	0.484	

N1 - Factored based on 2021 supply catchments
N2 - Diameter assumed as internal tank diameter
N3 - Operational min level model extract - BWL may be defined higher than 15% tank volume in some instances to meet minimum pressure requirements at supply demand points
N4 - Based on 500L/EP/d

PROJECT: Bowen Water Network Modelling
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ARCADIS Design & Consultancy for natural and built assets

BOWEN POTABLE WATER NETWORK
2020 LGIP OPTIMISATION - RESERVOIR CAPACITY ASSESSMENT (AD = 450L/EP/d)

Name	ID	Diameter (m) - **N2**	Physical		Operational		EPs Supplied				Total Volume (ML)	15%-95% Operational Storage Volume (ML)	Actual Operational Volume (ML)	Required Storage Volume (ML) - **N4**				TOTAL - Required Difference (Spare ML)				15%-95% Operational - Required Difference (Spare ML)				Name
			Min Lvl	Max Lvl	Min Lvl - **N3**	Max Lvl	2021	2026 - **N1**	2031 - **N1**	2036 - **N1**				2021	2026 - **N1**	2031 - **N1**	2036 - **N1**	2021	2026	2031	2036	2021	2026	2031	2036	
Heronvale	1494	14.5	39	44	39.75	43.75	197.10	199.96	207.77	210.72	0.826	0.661	0.661	0.632	0.634	0.642	0.645	0.194	0.191	0.183	0.180	0.029	0.026	0.018	0.015	Heronvale
Bowen Main Res	6963	43.5	48	59.5	49.7	58.925	9019.32	9513.51	10088.76	10581.60	17.091	13.673	13.710	10.147	10.703	11.350	11.904	6.944	6.388	5.741	5.187	3.526	2.970	2.323	1.768	Bowen Main Res
																	TOTAL	7.138	6.579	5.924	5.367	3.555	2.996	2.341	1.784	

N1 - Factored based on 2021 supply catchments
N2 - Diameter assumed as internal tank diameter
N3 - Operational min level model extract - BWL may be defined higher than 15% tank volume in some instances to meet minimum pressure requirements at supply demand points
N4 - Based on 450L/EP/d

PROJECT: Bowen Water Network Modelling
DOCUMENT NUMBER: D011-10027536-01
DATE: 10.02.2020

PROJECT ENGINEER: M.C/S.H
SOFTWARE: Bentley WaterCAD v8i

ARCADIS Design & Consultancy for natural and built assets

BOWEN POTABLE WATER NETWORK
2020 LGIP OPTIMISATION - RESERVOIR CAPACITY ASSESSMENT (AD = 350L/EP/d)

Name	ID	Diameter (m) - **N2**	Physical		Operational		EPs Supplied				Total Volume (ML)	15%-95% Operational Storage Volume (ML)	Actual Operational Volume (ML)	Required Storage Volume (ML) - **N4**				TOTAL - Required Difference (Spare ML)				15%-95% Operational - Required Difference (Spare ML)				Name
			Min Lvl	Max Lvl	Min Lvl - **N3**	Max Lvl	2021	2026 - **N1**	2031 - **N1**	2036 - **N1**				2021	2026 - **N1**	2031 - **N1**	2036 - **N1**	2021	2026	2031	2036	2021	2026	2031	2036	
Heronvale	1494	14	39	44	39.75	43.75	197.10	199.96	207.77	210.72	0.770	0.616	0.616	0.587	0.589	0.596	0.598	0.182	0.180	0.174	0.172	0.029	0.026	0.020	0.018	Heronvale
Bowen Main Res	6963	43.5	48	59.5	49.7	58.925	9019.32	9513.51	10088.76	10581.60	17.091	13.673	13.710	7.892	8.324	8.828	9.259	9.199	8.767	8.263	7.832	5.781	5.348	4.845	4.414	Bowen Main Res
																	TOTAL	9.382	8.947	8.437	8.004	5.809	5.375	4.865	4.432	

N1 - Factored based on 2021 supply catchments
N2 - Diameter assumed as internal tank diameter
N3 - Operational min level model extract - BWL may be defined higher than 15% tank volume in some instances to meet minimum pressure requirements at supply demand points
N4 - Based on 350L/EP/d

PROJECT: Collinsville Water Network Modelling
DOCUMENT NUMBER: D012-10027536-01
DATE: 10.02.2020

PROJECT ENGINEER: M.C/S.H
SOFTWARE: Bentley WaterCAD v8i

ARCADIS Design & Consultancy for natural and built assets

COLLINSVILLE POTABLE WATER NETWORK
2020 LGIP OPTIMISATION - RESERVOIR CAPACITY ASSESSMENT (AD = 500L/EP/d)

Name	ID	Diameter (m) - **N3**	Physical		Operational		EPs Supplied				Total Volume (ML)	15%-95% Operational Storage Volume (ML)	Actual Operational Volume (ML)	Required Storage Volume (ML) - **N5**				TOTAL - Required Difference (Spare ML)				15%-95% Operational - Required Difference (Spare ML)				Name
			Min Lvl	Max Lvl	Min Lvl - **N4**	Max Lvl	2021	2026 - **N1**	2031 - **N1**	2036 - **N1**				2021	2026 - **N1**	2031 - **N1**	2036 - **N1**	2021	2026	2031	2036	2021	2026	2031	2036	
6ML Tank - Peter Delemothe Rd - **N2**	528	36	254	260	254.9	259.9	3689.98	2002.90	2067.26	2155.79	6.107	4.886	5.089	4.612	2.685	2.758	2.857	1.495	3.422	3.350	3.250	0.273	2.201	2.128	2.029	6ML Tank - Peter Delemothe Rd - **N2**
1.136ML Tank - Miller St	529	18.3	232.1	236.6	232.1	236.375					1.184	0.947	1.124													1.136ML Tank - Miller St
454kL Tank - Miller St	530	12.8	233.25	236.6	233.25	236.433					0.431	0.345	0.410													454kL Tank - Miller St
Miller St Combined							0.00	1707.05	1762.71	1784.16	1.615	1.292	1.534	0.150	2.420	2.483	2.507	1.465	-0.806	-0.868	-0.893	1.142	-1.129	-1.191	-1.215	Miller St Combined
																	TOTAL	2.959	2.616	2.481	2.357	1.415	1.072	0.937	0.813	

N1 - Factored based on 2021 supply catchments
N2 - EPs supplied = Dedicated supply from Peter Delemothe Rd reservoir - does not include catchments of reservoirs supplied via Peter Delemothe Rd gravity feed
N3 - Diameter assumed as internal tank diameter
N4 - Operational min level model extract - BWL may be defined higher than 15% tank volume in some instances to meet minimum pressure requirements at supply demand points
N5 - Based on 500L/EP/d

PROJECT: Collinsville Water Network Modelling
DOCUMENT NUMBER: D012-10027536-01
DATE: 10.02.2020

PROJECT ENGINEER: M.C/S.H
SOFTWARE: Bentley WaterCAD v8i

ARCADIS Design & Consultancy for natural and built assets

COLLINSVILLE POTABLE WATER NETWORK
2020 LGIP OPTIMISATION - RESERVOIR CAPACITY ASSESSMENT (AD = 450L/EP/d)

Name	ID	Diameter (m) - **N3**	Physical		Operational		EPs Supplied				Total Volume (ML)	15%-95% Operational Storage Volume (ML)	Actual Operational Volume (ML)	Required Storage Volume (ML) - **N5**				TOTAL - Required Difference (Spare ML)				15%-95% Operational - Required Difference (Spare ML)				Name
			Min Lvl	Max Lvl	Min Lvl - **N4**	Max Lvl	2021	2026 - **N1**	2031 - **N1**	2036 - **N1**				2021	2026 - **N1**	2031 - **N1**	2036 - **N1**	2021	2026	2031	2036	2021	2026	2031	2036	
6ML Tank - Peter Delemothe Rd - **N2**	528	36	254	260	254.9	259.9	3689.98	2002.90	2067.26	2155.79	6.107	4.886	5.089	4.168	2.460	2.525	2.615	1.939	3.647	3.582	3.493	0.718	2.426	2.361	2.271	6ML Tank - Peter Delemothe Rd - **N2**
1.136ML Tank - Miller St	529	18.3	232.1	236.6	232.1	236.375					1.184	0.947	1.124													1.136ML Tank - Miller St
454kL Tank - Miller St	530	12.8	233.25	236.6	233.25	236.433					0.431	0.345	0.410													454kL Tank - Miller St
Miller St Combined							0.00	1707.05	1762.71	1784.16	1.615	1.292	1.534	0.150	2.228	2.285	2.306	1.465	-0.614	-0.670	-0.692	1.142	-0.937	-0.993	-1.015	Miller St Combined
																	TOTAL	3.404	3.034	2.912	2.801	1.859	1.489	1.368	1.256	

N1 - Factored based on 2021 supply catchments
N2 - EPs supplied = Dedicated supply from Peter Delemothe Rd reservoir - does not include catchments of reservoirs supplied via Peter Delemothe Rd gravity feed
N3 - Diameter assumed as internal tank diameter
N4 - Operational min level model extract - may be defined in some instances to meet minimum pressure requirements at supply demand points
N5 - Based on 450L/EP/d

PROJECT: Collinsville Water Network Modelling
DOCUMENT NUMBER: D012-10027536-01
DATE: 10.02.2020

PROJECT ENGINEER: M.C/S.H
SOFTWARE: Bentley WaterCAD v8i

ARCADIS Design & Consultancy for natural and built assets

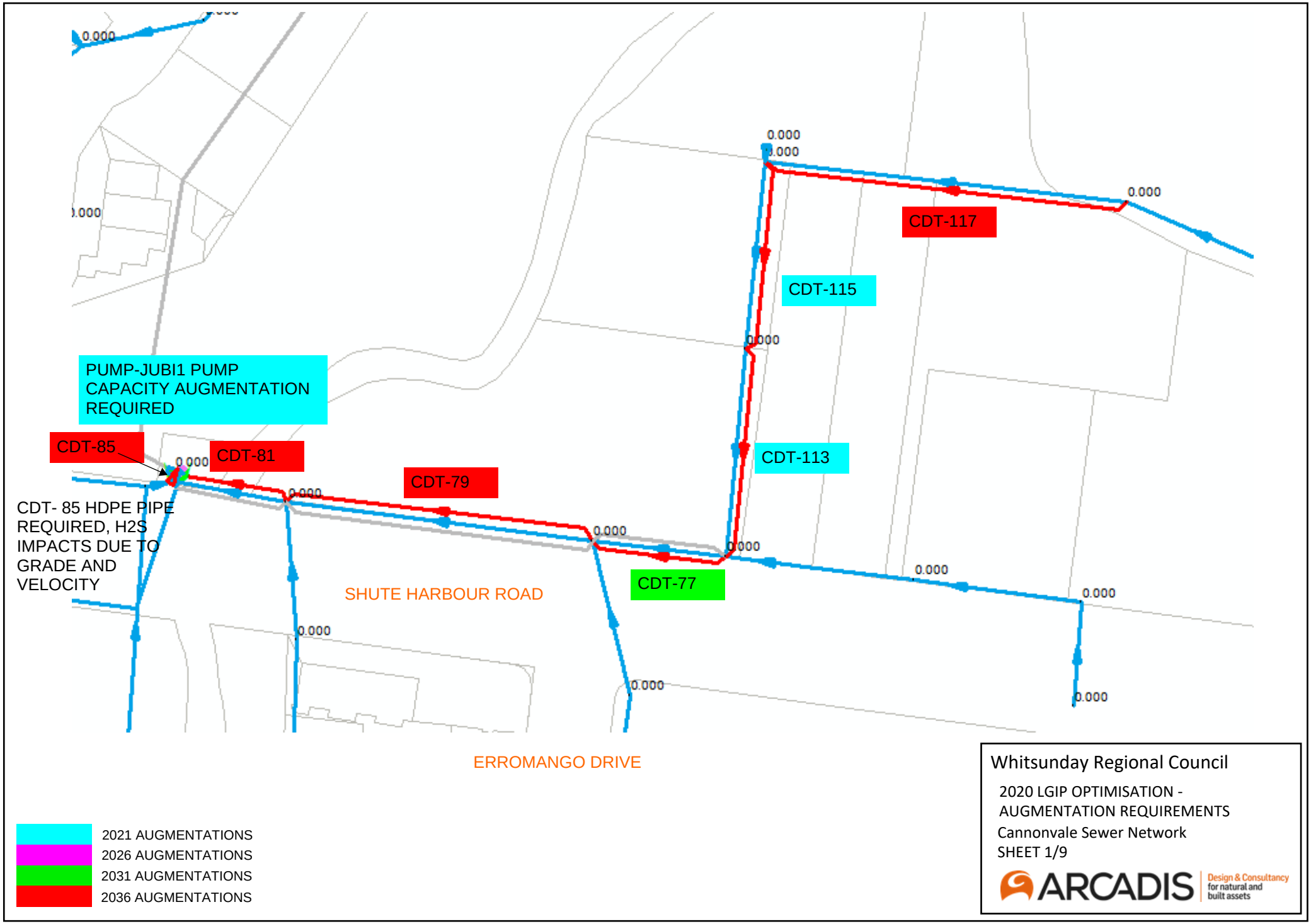
COLLINSVILLE POTABLE WATER NETWORK
2020 LGIP OPTIMISATION - RESERVOIR CAPACITY ASSESSMENT (AD = 350L/EP/d)

Name	ID	Diameter (m) - **N3**	Physical		Operational		EPs Supplied				Total Volume (ML)	15%-95% Operational Storage Volume (ML)	Actual Operational Volume (ML)	Required Storage Volume (ML) - **N5**				TOTAL - Required Difference (Spare ML)				15%-95% Operational - Required Difference (Spare ML)				Name
			Min Lvl	Max Lvl	Min Lvl - **N4**	Max Lvl	2021	2026 - **N1**	2031 - **N1**	2036 - **N1**				2021	2026 - **N1**	2031 - **N1**	2036 - **N1**	2021	2026	2031	2036	2021	2026	2031	2036	
6ML Tank - Peter Delemothe Rd - **N2**	528	36	254	260	254.9	259.9	3689.98	2002.90	2067.26	2155.79	6.107	4.886	5.089	3.338	2.009	2.060	2.130	2.769	4.098	4.047	3.978	1.548	2.877	2.826	2.756	6ML Tank - Peter Delemothe Rd - **N2**
1.136ML Tank - Miller St	529	18.3	232.1	236.6	232.1	236.375					1.184	0.947	1.124													1.136ML Tank - Miller St
454kL Tank - Miller St	530	12.8	233.25	236.6	233.25	236.433					0.431	0.345	0.410													454kL Tank - Miller St
Miller St Combined							0.00	1707.05	1762.71	1784.16	1.615	1.292	1.534	0.150	1.844	1.888	1.905	1.465	-0.230	-0.273	-0.290	1.142	-0.553	-0.596	-0.613	Miller St Combined
																	TOTAL	4.234	3.868	3.774	3.687	2.690	2.324	2.229	2.143	

N1 - Factored based on 2021 supply catchments
N2 - EPs supplied = Dedicated supply from Peter Delemothe Rd reservoir - does not include catchments of reservoirs supplied via Peter Delemothe Rd gravity feed
N3 - Diameter assumed as internal tank diameter
N4 - Operational min level model extract - may be defined in some instances to meet minimum pressure requirements at supply demand points
N5 - Based on 350L/EP/d

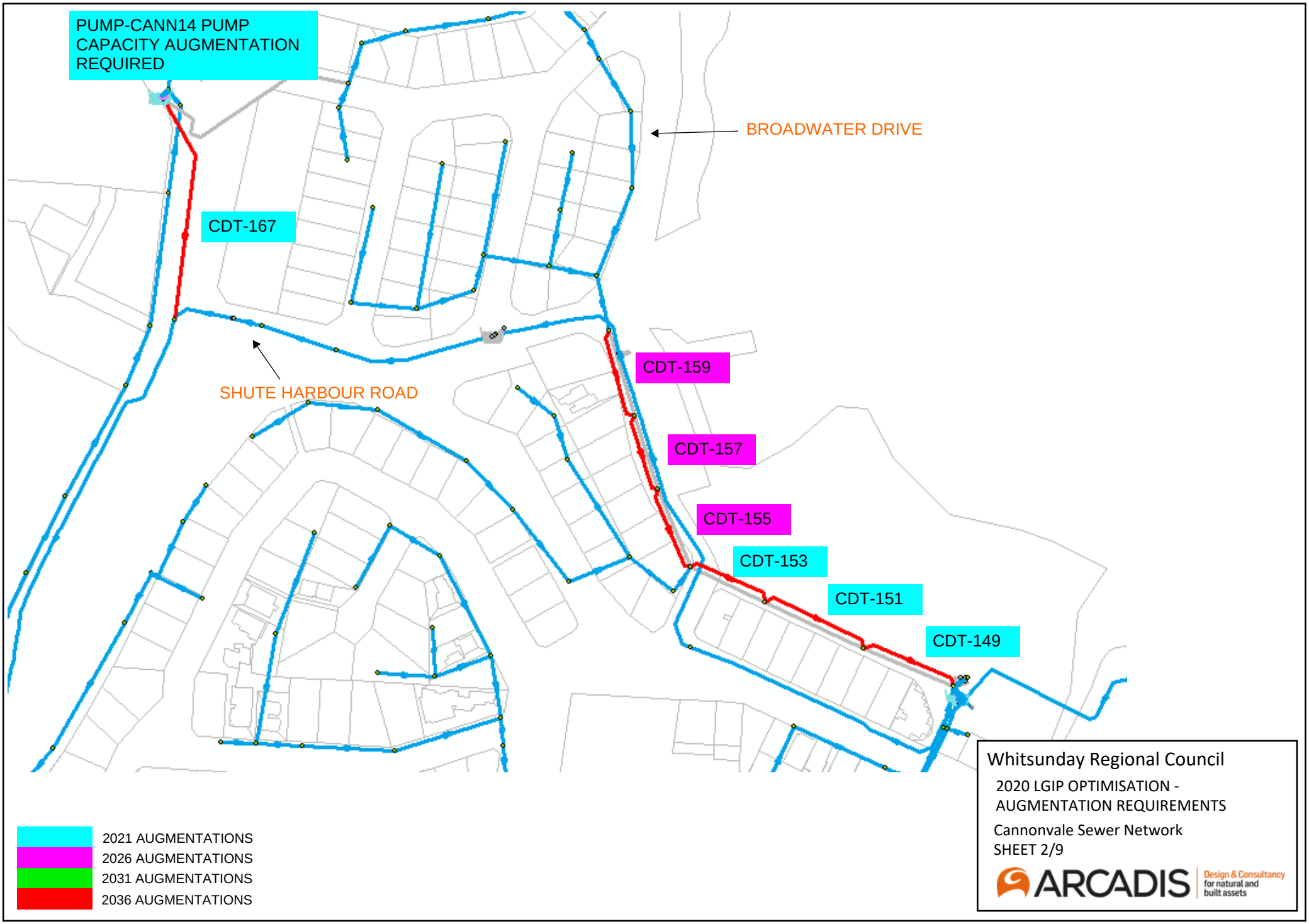
APPENDIX C

SEWER NETWORK AUGMENTATION MAPPING AND SUMMARY



31/01/2020

SK006-10027536-02


PUMP-CANN14 PUMP CAPACITY AUGMENTATION REQUIRED
BROADWATER DRIVE
CDT-167
SHUTE HARBOUR ROAD
CDT-159
CDT-157
CDT-155
CDT-153
CDT-151
CDT-149
2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS
Whitsunday Regional Council
2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS
Cannonvale Sewer Network
SHEET 2/9
ARCADIS
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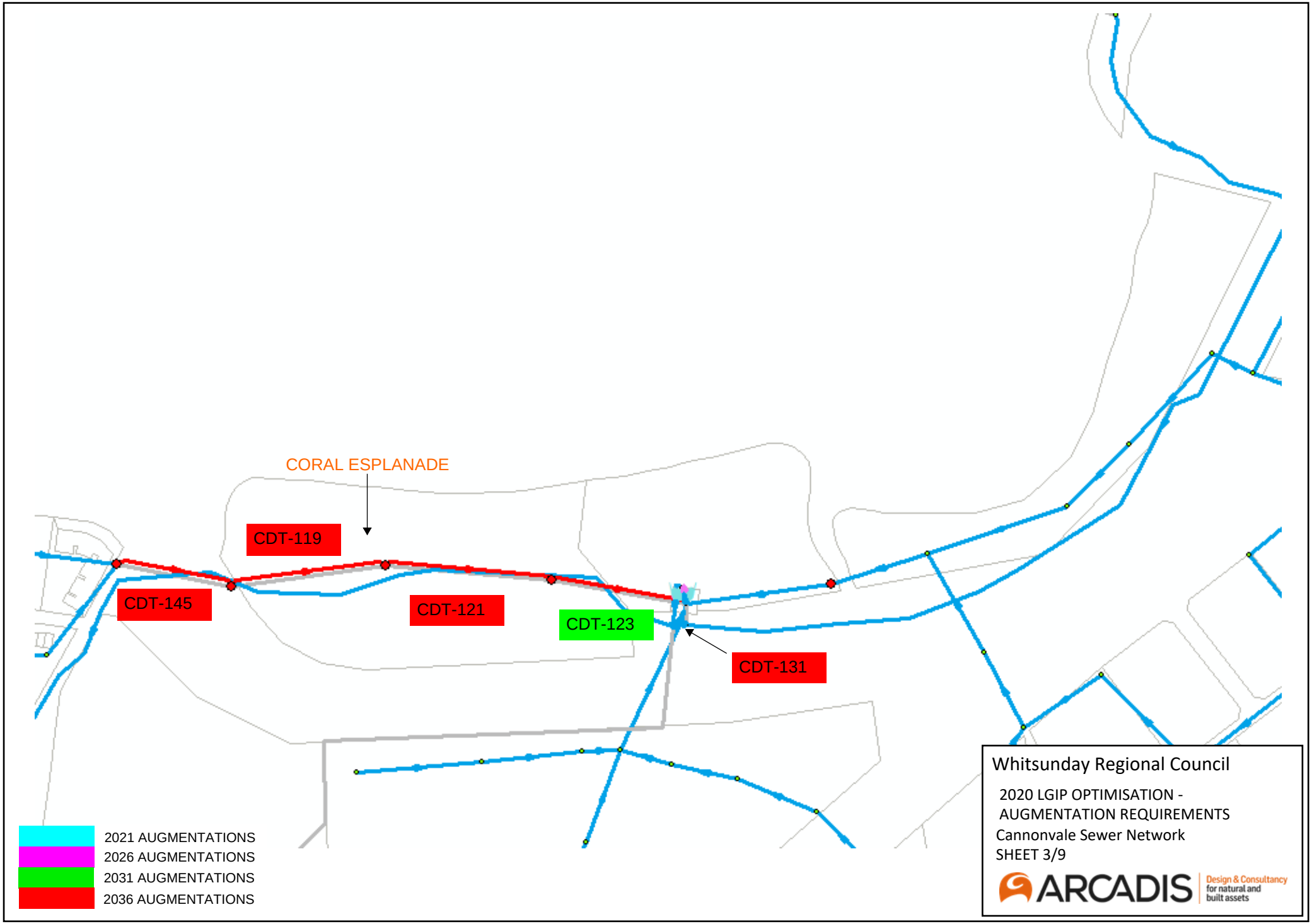
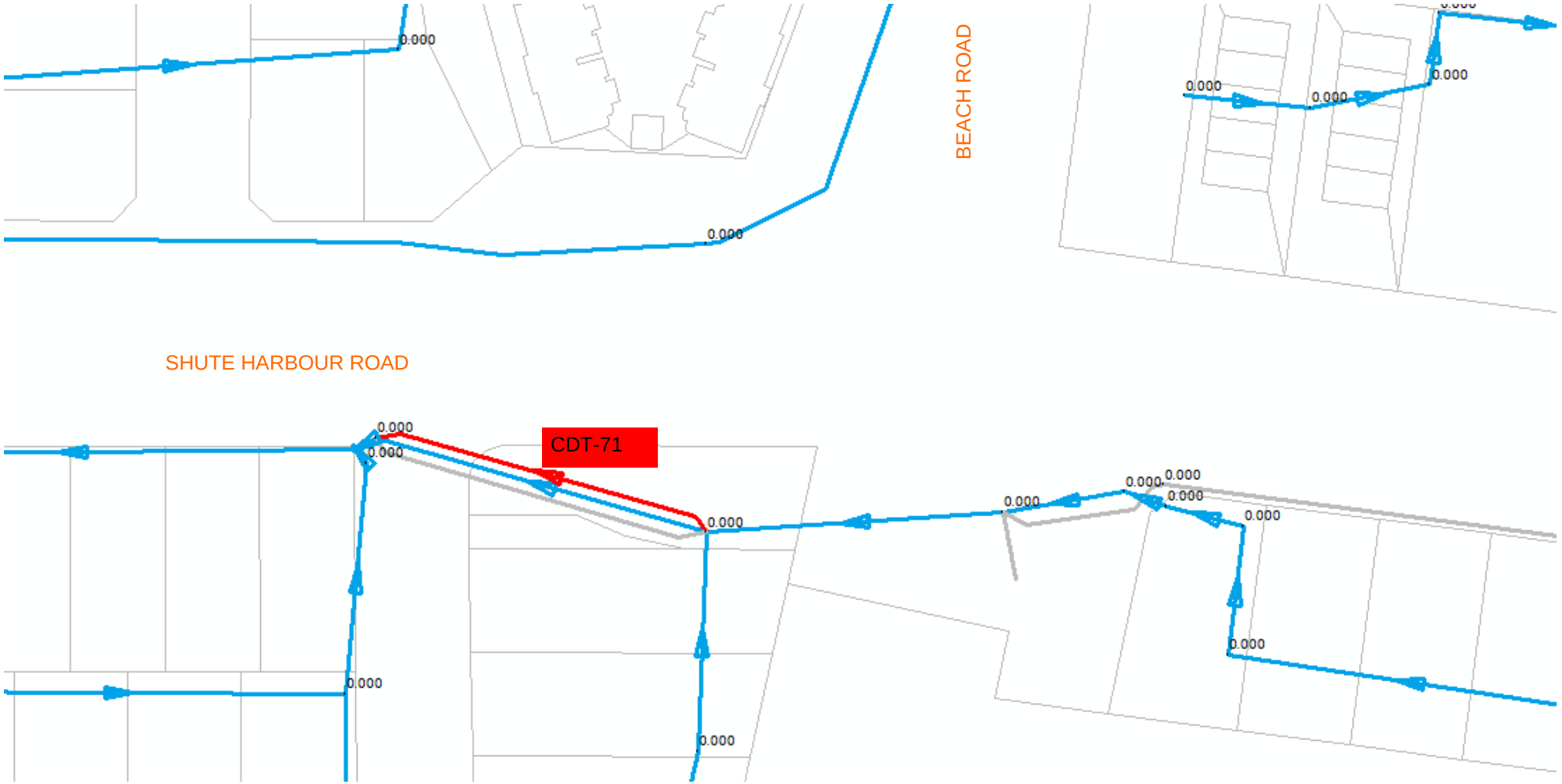

CORAL ESPLANADE
CDT-119
CDT-145
CDT-121
CDT-123
CDT-131
2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS
Whitsunday Regional Council
2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS
Cannonvale Sewer Network
SHEET 3/9
ARCADIS
Design & Consultancy for natural and built assets



2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS

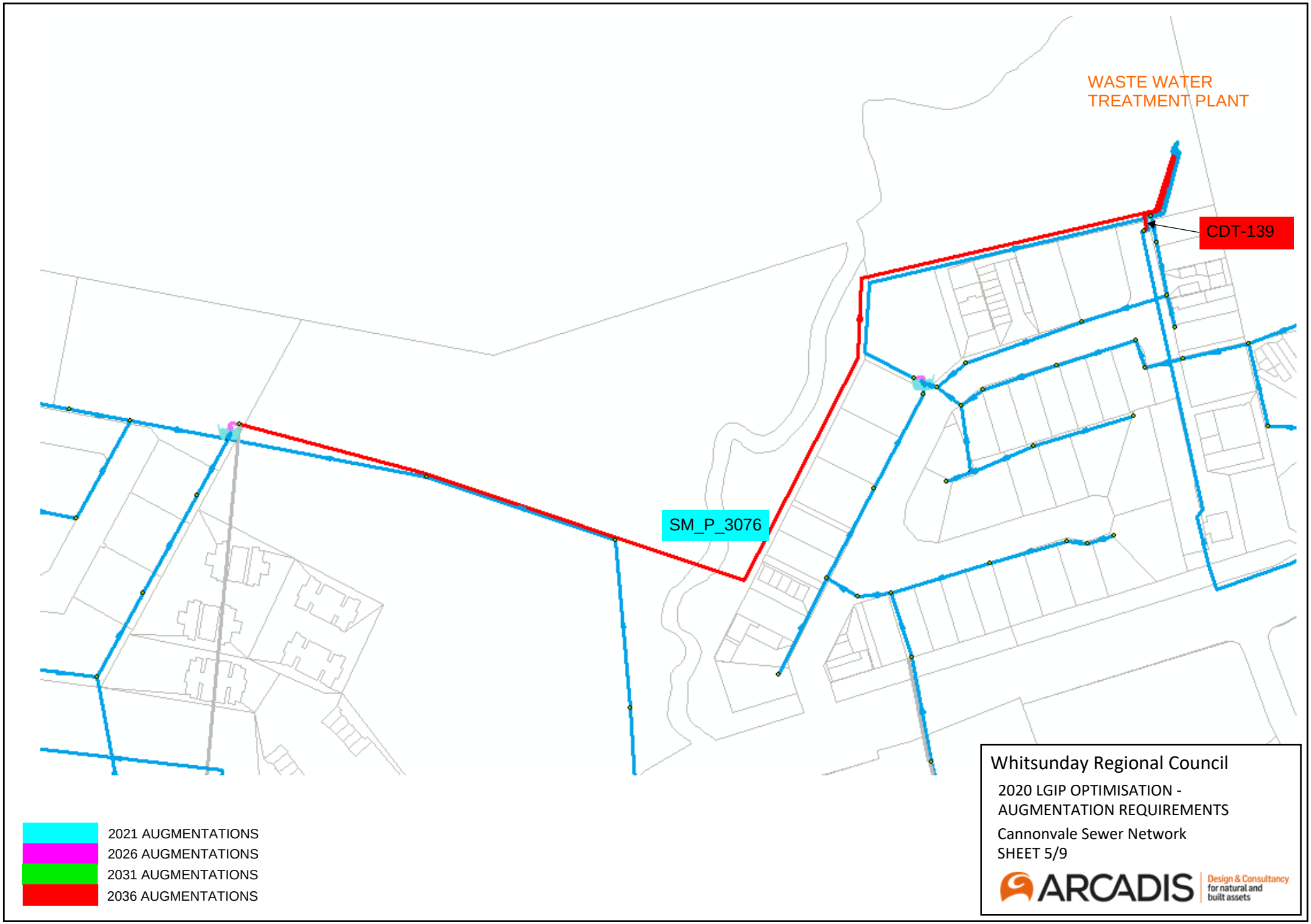
Whitsunday Regional Council

2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS

Cannonvale Sewer Network

SHEET 4/9

ARCADIS Design & Consultancy for natural and built assets


WASTE WATER
TREATMENT PLANT
CDT-139
SM_P_3076
2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS
Whitsunday Regional Council
2020 LGIP OPTIMISATION -
AUGMENTATION REQUIREMENTS
Cannonvale Sewer Network
SHEET 5/9
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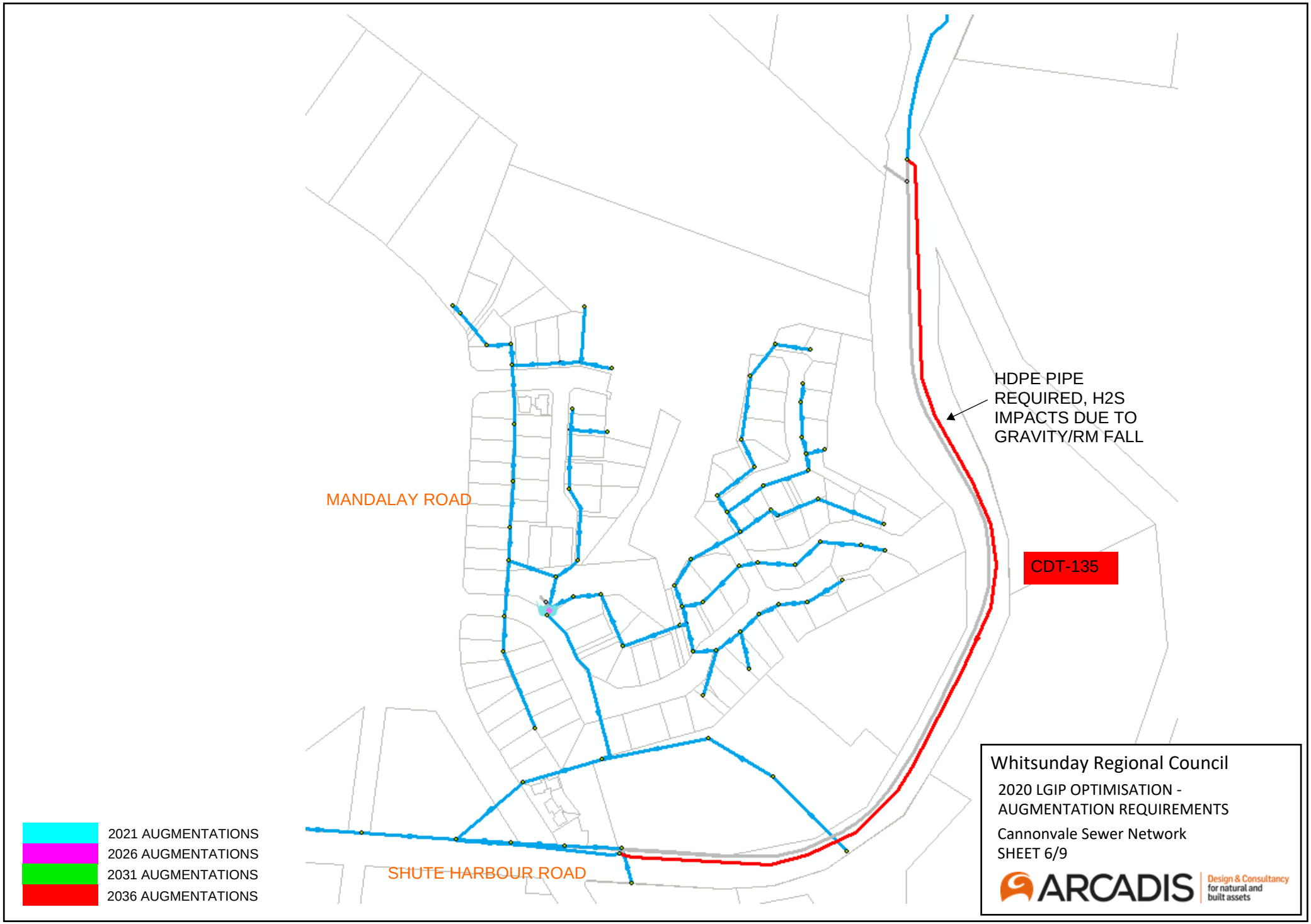
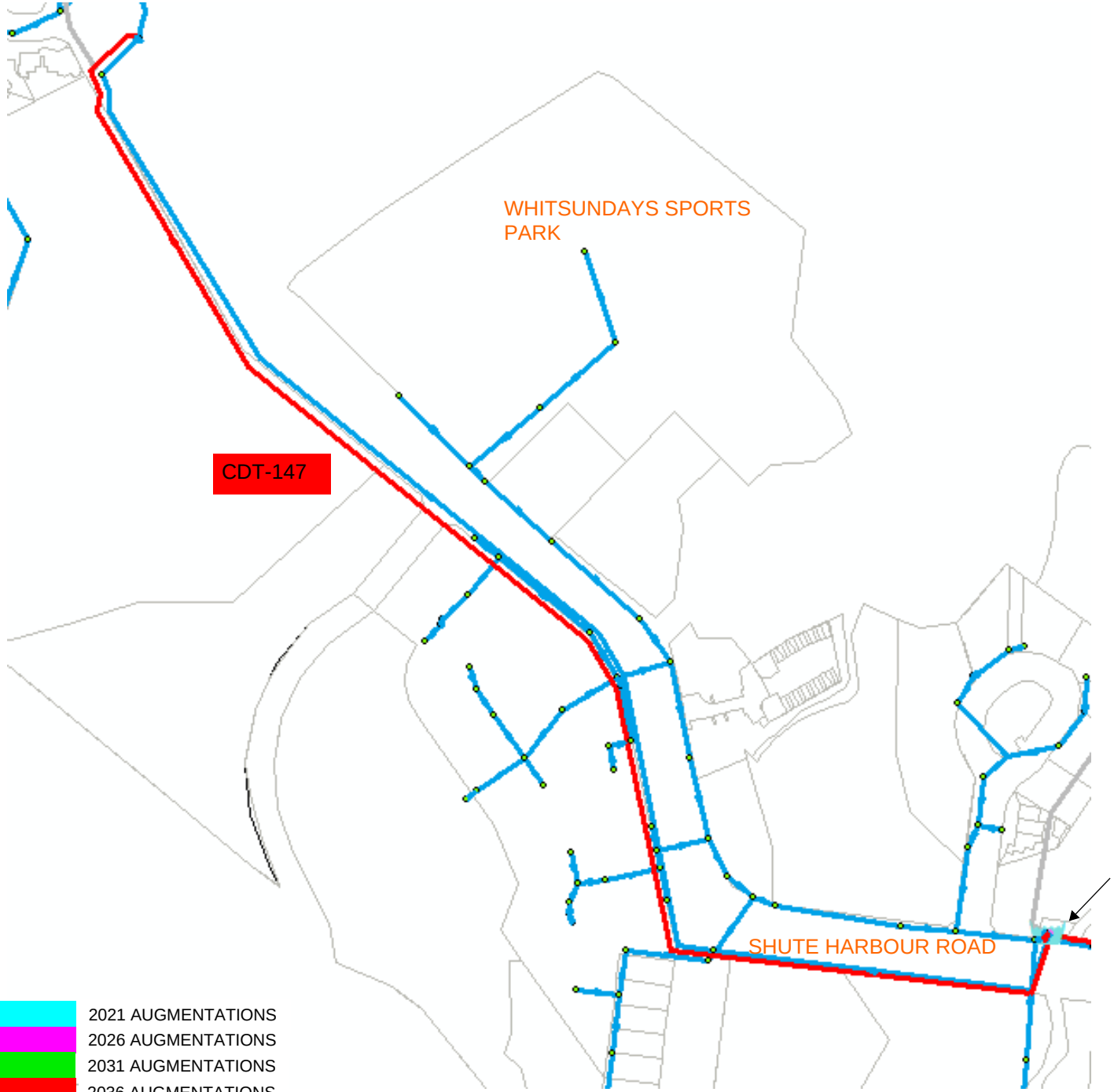

HDPE PIPE REQUIRED, H2S IMPACTS DUE TO GRAVITY/RM FALL
MANDALAY ROAD
CDT-135
SHUTE HARBOUR ROAD
2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS
Whitsunday Regional Council
2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS
Cannonvale Sewer Network
SHEET 6/9
ARCADIS
Design & Consultancy for natural and built assets



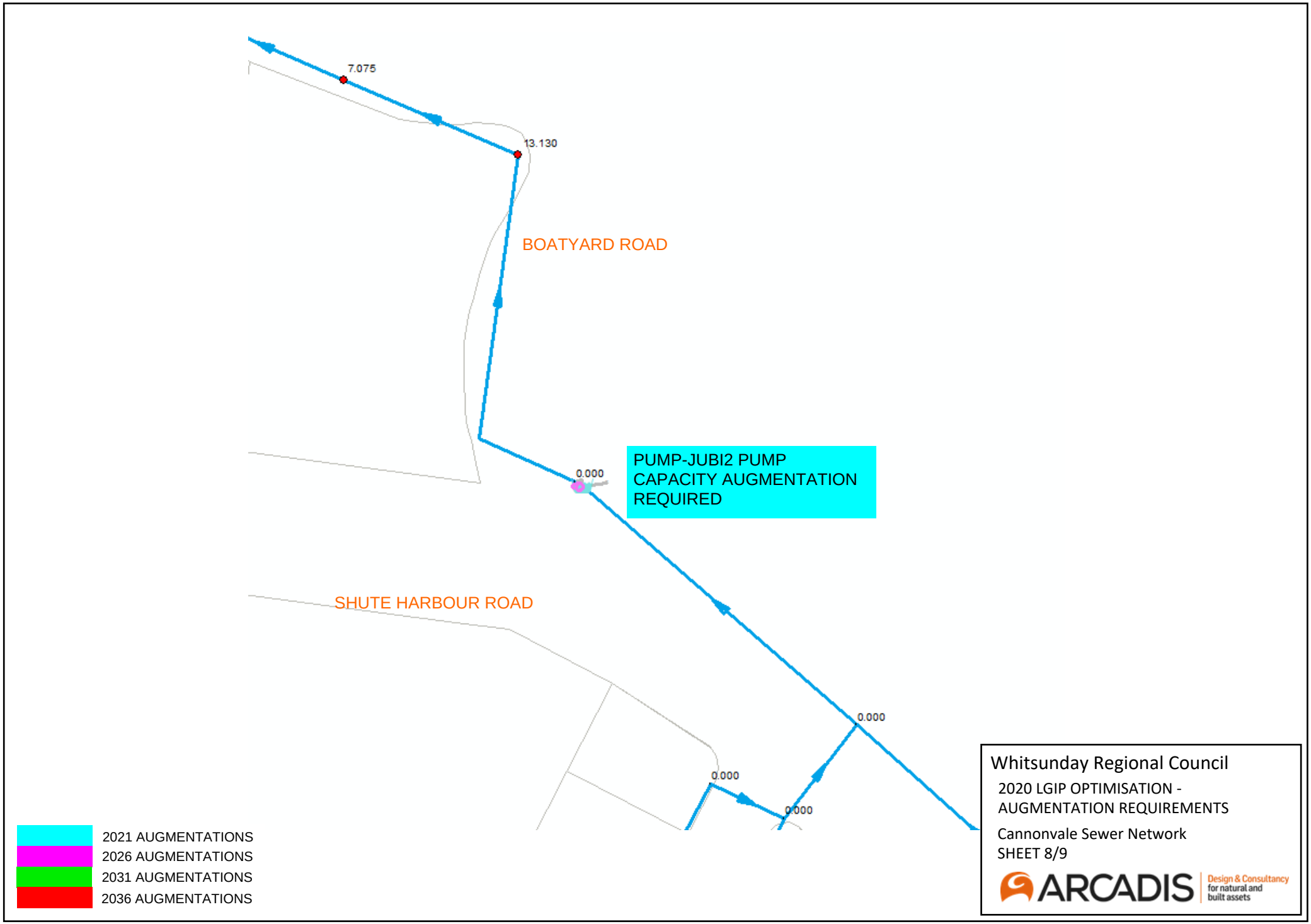
Whitsunday Regional Council

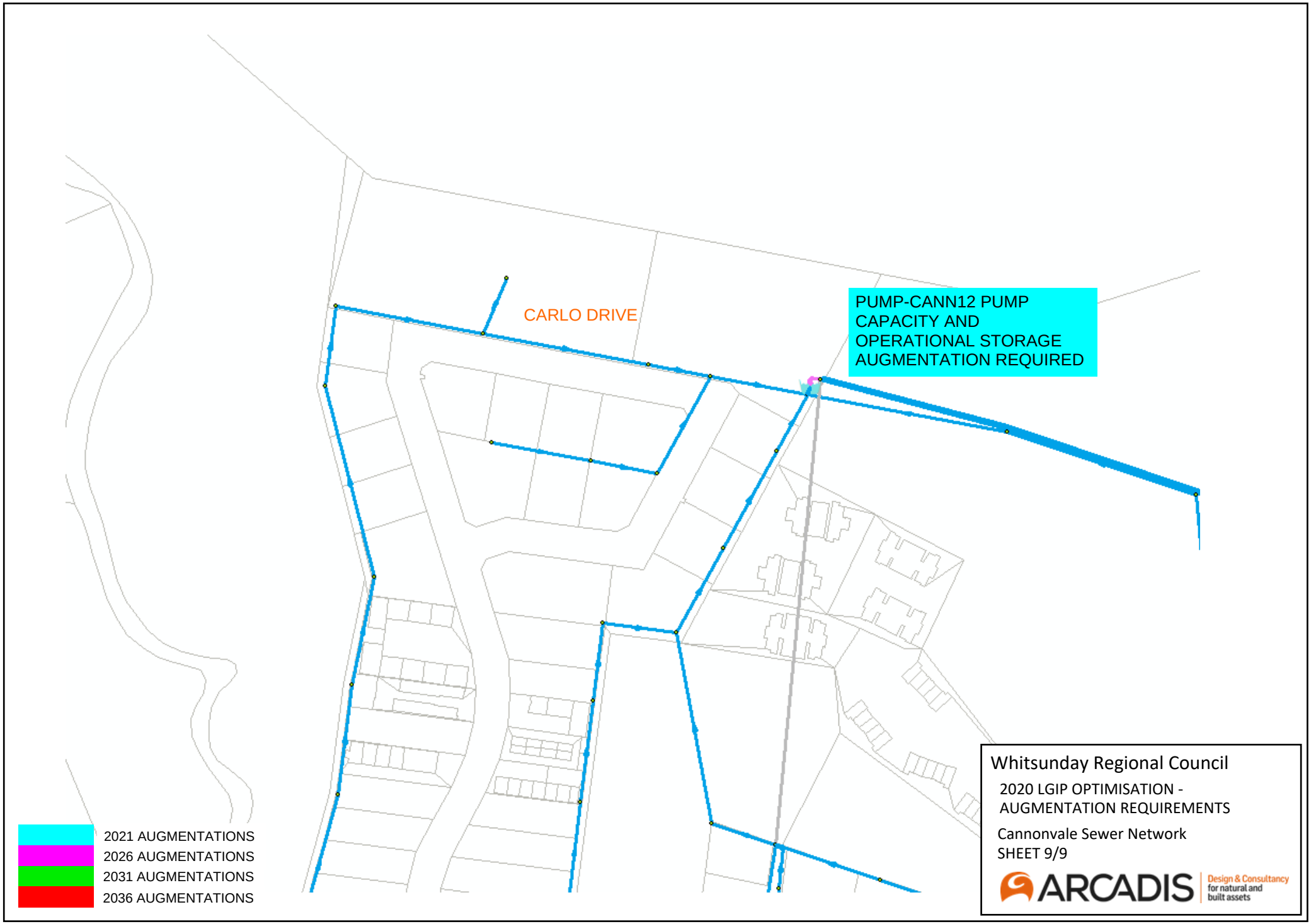
2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS

Cannonvale Sewer Network

SHEET 7/9

ARCADIS Design & Consultancy for natural and built assets


7.075
13.130
BOATYARD ROAD
0.000
PUMP-JUBI2 PUMP CAPACITY AUGMENTATION REQUIRED
SHUTE HARBOUR ROAD
0.000
0.000
0.000
2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS
Whitsunday Regional Council
2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS
Cannonvale Sewer Network
SHEET 8/9
ARCADIS
Design & Consultancy for natural and built assets


CARLO DRIVE
PUMP-CANN12 PUMP CAPACITY AND OPERATIONAL STORAGE AUGMENTATION REQUIRED
2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS
Whitsunday Regional Council
2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS
Cannonvale Sewer Network
SHEET 9/9
ARCADIS
Design & Consultancy for natural and built assets

PROJECT: Whitsundays Sewer Network Modelling
Project Engineer: M.C/S.H
DOCUMENT NUMBER: D006-10027536-03
Software: InfoSWMM SA
DATE: 06.02.2020

WHITSUNDAYS CANNONVALE SEWER NETWORK
2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENT SUMMARY

AUGMENTATION ID	LENGTH (m)	EXISTING PIPE SEGMENT		NEW/ DUPLICATION DN (mm)	DEPTH RANGE (m)	COST - $/m	ADJUSTMENT FACTOR FOR SOIL	SCALE FACTOR	10% ADDITIONAL REGIONAL COSTS	30% CONTINGENCY	COST OF NEW /DUPLICATION	PIPE REPLACEMENT						NON-LGIP AUGMENTATIONS	LGIP AUGMENTATIONS	2021	2026	2031	2036	Notes
		START NODE	END NODE									NOTES	ORIGINAL DN	REPLACEMENT DN	COST - $/m	CAP & GROUT @ $20/M	TOTAL COST	COST INCREASE COMPARED TO DULPICATION						
COT-71	60.25	MH-P-3181	MH-P-3180	200	> 6	$ 835.00	0.96	2.24	10%	30%	$ 151,379.75	PVC	225	300	$ 1,066.00		$ 193,258.46	$ 41,878.71		$ 193,258.46				
COT-77	38.38	MH-P-1883	MH-P-1882	225	0 - 1.5	$ 215.00	1.04	2.45	10%	30%	$ 29,435.46	AC	200	300	$ 266.00	$ 767.60	$ 37,185.43	$ 7,749.97		$ 37,185.43				
COT-79	95.46	MH-P-1882	MH-P-1881	225	0 - 1.5	$ 215.00	1.04	1.51	10%	30%	$ 45,228.33	AC	275	375	$ 393.00	$ 1,909.20	$ 84,582.38	$ 39,354.05		$ 84,582.38				
COT-81	34.55	MH-P-1881	MH-P-1728	150	0 - 1.5	$ 148.00	1.04	2.45	10%	30%	$ 18,240.52		400						$ 18,240.52					
COT-85	2	MH-P-1728	JUB1-PS1	200	0 - 1.5	$ 200.00	1.04	3.44	10%	30%	$ 2,002.76	Pump Inlet	275	500	$ 586.00	$ 40.00	$ 5,908.08	$ 3,905.32		$ 5,908.08				
COT-113	63.74	MH-P-1887	MH-P-1883	250	1.5 -3	$ 328.00	0.95	2.17	10%	30%	$ 60,254.24	AC	150	300	$ 387.00	$ 1,274.80	$ 72,367.46	$ 12,113.22		$ 72,367.46				
COT-115	54.34	MH-P-1888	MH-P-1887	250	1.5 -3	$ 328.00	0.95	2.36	10%	30%	$ 55,958.59	AC	150	300	$ 387.00	$ 1,086.80	$ 67,111.12	$ 11,152.53		$ 67,111.12				
COT-117	102.53	MH-P-1889	MH-P-1888	250	1.5 -3	$ 328.00	0.95	1.41	10%	30%	$ 63,066.04	AC	200	300	$ 387.00	$ 2,050.60	$ 76,460.83	$ 13,394.80		$ 76,460.83				
COT-119	81.82	MH-P-651	MH-P-650		0 - 1.5		1.04	1.79	10%	30%	$ -	AC	150	225	$ 215.00	$ 1,636.40	$ 47,599.01		$ 47,599.01					
COT-121	90.47	MH-P-650	MH-P-649		0 - 1.5		1.04	1.62	10%	30%	$ -	AC	150	300	$ 266.00	$ 1,809.40	$ 58,443.03			$ 58,443.03				
COT-123	69.93	MH-P-649	MH-P-3188		0 - 1.5		1.04	2.04	10%	30%	$ -	AC	150	300	$ 266.00	$ 1,398.60	$ 56,634.05			$ 56,634.05				
COT-131	2.344	MH-JOIN-0175	MH-JOIN-0176	200		$ 240.00	1.35	2.45	10%	30%	$ 2,604.93	RM DULPICATION	250						$ 2,604.93					
COT-135	914.384	MH-JOIN-0193	MH-JOIN-0202				1.35	0.94	10%	30%	$ -	RM/GRAVITY REPLACEMENT noting hs2 IMPACT	100 HDPE	200	$ 240.00		$ 389,878.71		$ 389,878.71					RM/gravity line noting HS2 Impacts
COT-139	6.563	JCT-70	JCT-72	375		$ 821.00	1.07	2.45	10%	30%	$ 19,775.32	RM DULPICATION	350							$ 19,775.32				
COT-145	64.858	MH-P-652	MH-P-651		0 - 1.5		1.04	2.14	10%	30%	$ -	AC	150	225	$ 215.00	$ 1,297.16	$ 44,825.59			$ 44,825.59				
COT-147	1155.018	JCT-26	MH_JOIN-0163				1.35	0.91	10%	30%	$ -	REPLACEMENT PVC	215 DI	425	$ 863.00		$ 1,714,362.84			$ 1,714,362.84				
COT-149	66.16	MH-P-864	MH-P-3569		3 - 4.5		0.97	2.12	10%	30%	$ -	AC	150	300	$ 499.00	$ 1,323.12	$ 96,236.76			$ 96,236.76				
COT-151	74.37	MH-P-865	MH-P-864		1.5 -3		0.95	1.95	10%	30%	$ -	AC	150	300	$ 387.00	$ 1,487.46	$ 76,054.72			$ 76,054.72				
COT-153	56.19	MH-P-866	MH-P-865		1.5 -3		0.95	2.32	10%	30%	$ -	AC	150	300	$ 387.00	$ 1,123.88	$ 68,296.18			$ 68,296.18				
COT-155	57.67	MH-P-867	MH-P-866		1.5 -3		0.95	2.29	10%	30%	$ -	AC	150	300	$ 387.00	$ 1,153.46	$ 69,189.29			$ 69,189.29				
COT-157	52.66	MH-P-868	MH-P-867		0 - 1.5		1.04	2.40	10%	30%	$ -	AC	150	300	$ 266.00	$ 1,053.26	$ 49,904.99			$ 49,904.99				
COT-159	59.96	MH-P-869	MH-P-868		0 - 1.5		1.04	2.24	10%	30%	$ -	AC	150	300	$ 266.00	$ 1,199.14	$ 53,327.87			$ 53,327.87				
COT-167	145.72	CANN_14_PS-14	MH-JOIN-0171	100		$ 153.00	1.04	2.24	10%	30%	$ 72,873.43								$ 72,873.43					
SM_P_3076	925.00	CANN_12_PS-12	JCT-68	300		$ 362.00	1.04	2.24	10%	30%	$ 1,094,475.21	RISING MAIN								$ 1,094,475.21				
							TOTAL				$ 1,615,294.60						$ 3,261,626.81	$ 129,548.58	$ 531,196.60	$ 3,938,399.62				

PUMP AUGMENTATIONS REQUIRED

PUMP STATION LABEL	AUGMENTATION TYPE	VALUE	COST - $/x	TOTAL COST	2021	2026	2031	2036
PUMP-JUB1	PUMP CAPACITY	2 x 79.5 kW*	$2181/kW	$346,608.88				
PUMP-CANN12	PUMP CAPACITY	2 x 27.4 kW*	$3484/kW	$190,615.81				
PUMP-JUB2	PUMP CAPACITY	2 x 2.1 kW*	$16813/kW	$95,002.87				
PUMP-CANN14	PUMP CAPACITY	2 x 1.8kW	$16813/kW	$58,905.55				
PUMP-CANN12	OPERATIONAL STORAGE	2.71 kL	$5303/kL	$14,371.13				

Additional pump upgrades are already ordered, planned and/or are to take place prior to 2021
**Assumes 70% efficiency at duty*

ADDITIONAL EMERGENCY STORAGE REQUIREMENTS HAVE NOT BEEN COSTED - TO BE VERIFIED AGAINST EXISTING UPSTREAM NETWORK CAPACITY (PIPEWORK + MANHOLES)

REFERENCE

ACID SULFATE SOILS (ASS)[1] ON RELATIVELY UNDISTURBED LAND

Depth	Depth Code	Depth to Actual Acid Sulfate Soil[2] (pH ≤4.0)	Depth to Strongly Acidic Soil layer[2] (pH >4.0 to ≤5.0)	Depth to Potential Acid Sulfate Soil[2]
0 - 0.5m	0	A0	a0	S0
0.5 - 1m	1	A1	a1	S1
1 - 2m	2	A2	a2	S2
2 - 3m	3	A3	a3	S3
3 - 4m	4	A4	a4	S4
4 - 5m	5	A5	a5	S5
>5m	5+	A5+	a5+	S5+

NOTE:

- The depth codes above imply that a predominance of profiles in the map unit fall within the nominated depth range.
- Actual acid sulfate soil layers (designated with an A code) often overlie potential acid sulfate soil layers (designated with an S code). Where this occurs eg. ASS2 the map unit is coloured according to the depth of the upper surface of the 'actual' layer (A2) and overlayed with yellow dots. An 'a' preceding the soil depth code indicates a strong acid soil layer with field pH ranging from > 4.0 to ≤ 5.0. This may or may not be a result of sulfide oxidation. While 'a' depth code is shown on the map, no colour is assigned to it.
- In areas where there is varying depth to an ASS layer that cannot be separately mapped at the operative scale, two colours are used to designate the dominant depths. This appears as equal width striped colours. e.g. S1/S2 .
- P as a superscript indicates sediments of Pleistocene age[3] , so that $S^{P}5+$ indicates sulfidic sediments (of Pleistocene age) deeper than 5m.
- W as a subscript indicates areas associated with Melaleuca sp. wetlands and occasionally Casuarina glauca communities. Oxidisable sulfur % in surface layers may be highly variable and often exceeds the 'Action Criteria' . This may include sulfur from organic compounds and modern accretion of sulfides in a wet, organic rich environment. ASS typically occurs at depth. Where this occurs e.g. S_{DW} or $S2_{DW}$ or $A1_{DW}$ the map is coloured as per the actual or potential depth category and is overlayed with ⁙ pattern.
- N as a subscript indicates areas with oxidisable sulfur values that exceed the action criteria[4] but contain varying amounts of carbonate materials that may compensate for the potential acidity. Commonly the carbonate materials are naturally occurring shell fragments, coral fragments or Foraminifera. Depth codes are as above e.g. a potential acid sulfate soil (rich in carbonate) occuring at 1 to 2m depth is designated $S2_N$. The map unit is coloured as S2 and overlayed with green dots.

S_{LC} Limited field assessment but occurs in a landscape position where there is a reasonable probability of ASS occurrence. This is usually land where the present use precludes any disturbance eg. National Parks, Reserves etc., or land where accessibility is severely restricte

ACID SULFATE ON DISTURBED LAND[5]

S_{DL} Disturbed land, eg. Canal estate, Marina, Aquaculture, Quarry, Urban, Industrial likely to contain ASS. (In some cases partial or full treatment may have been undertaken).

LAND WITH A LOW PROBABILITY OF ACID SULFATE SOIL OCCURRENCE

LP Land between the 5m AHD contour and the outer limit of Holocene, estuarine ASS (ie. land below 5m AHD) as mapped at this scale, with low probability of ASS occurrence[6]. Limited field investigation.

LAND NOT ASSESSED

NA Land not assessed for ASS as part of this survey. It may include non ASS land beyond the boundary established as the limit of Holocene, estuarine, sulfidic sediments[6] but insufficient or no field testing was carried out[7].

5m AHD[8] CONTOUR - NORMAL LIMIT OF FIELD INVESTIGATION

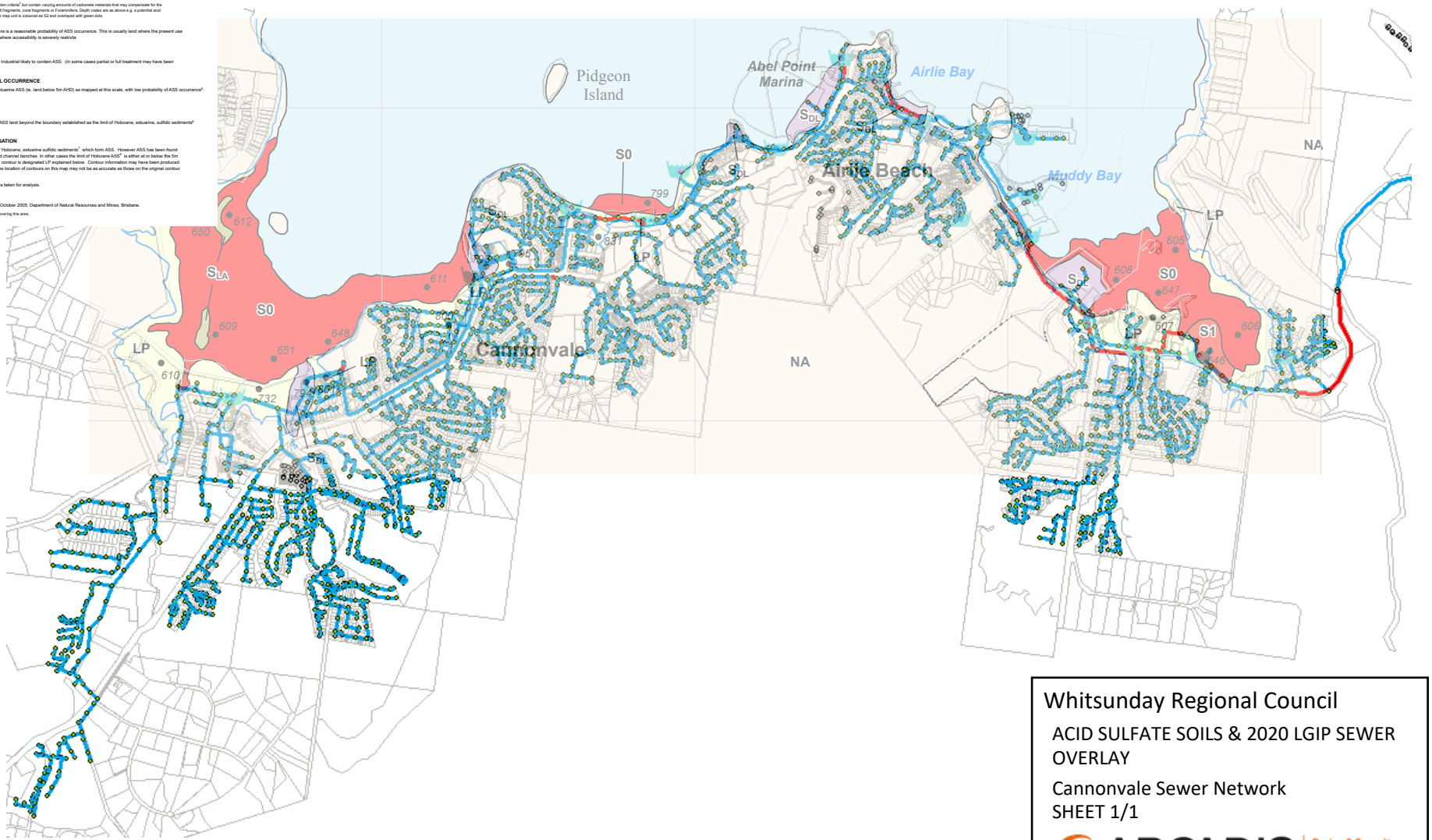
The 5m contour line delineates the normal limit of field investigation of Holocene, estuarine sulfidic sediments[7] which form ASS. However ASS has been found in this study on some lands above 5m, eg. valley flats, sand dunes and channel benches. In other cases the limit of Holocene ASS[7] is either at or below the 5m contour. In the latter case, the land between the ASS limit and the 5m contour is designated LP explained below. Contour information may have been produced at a scale different to that assigned to this map. As a consequence, the location of contours on this map may not be as accurate as those on the original contour map.

707 Borehole locations where profiles were described in detail and samples taken for analysis.

Digital Cadastral Database

Base map compiled from the Queensland Digital Cadastral Database October 2005, Department of Natural Resources and Mines, Brisbane.

NOTE: This map should be used in conjunction with the accompanying report covering this area.



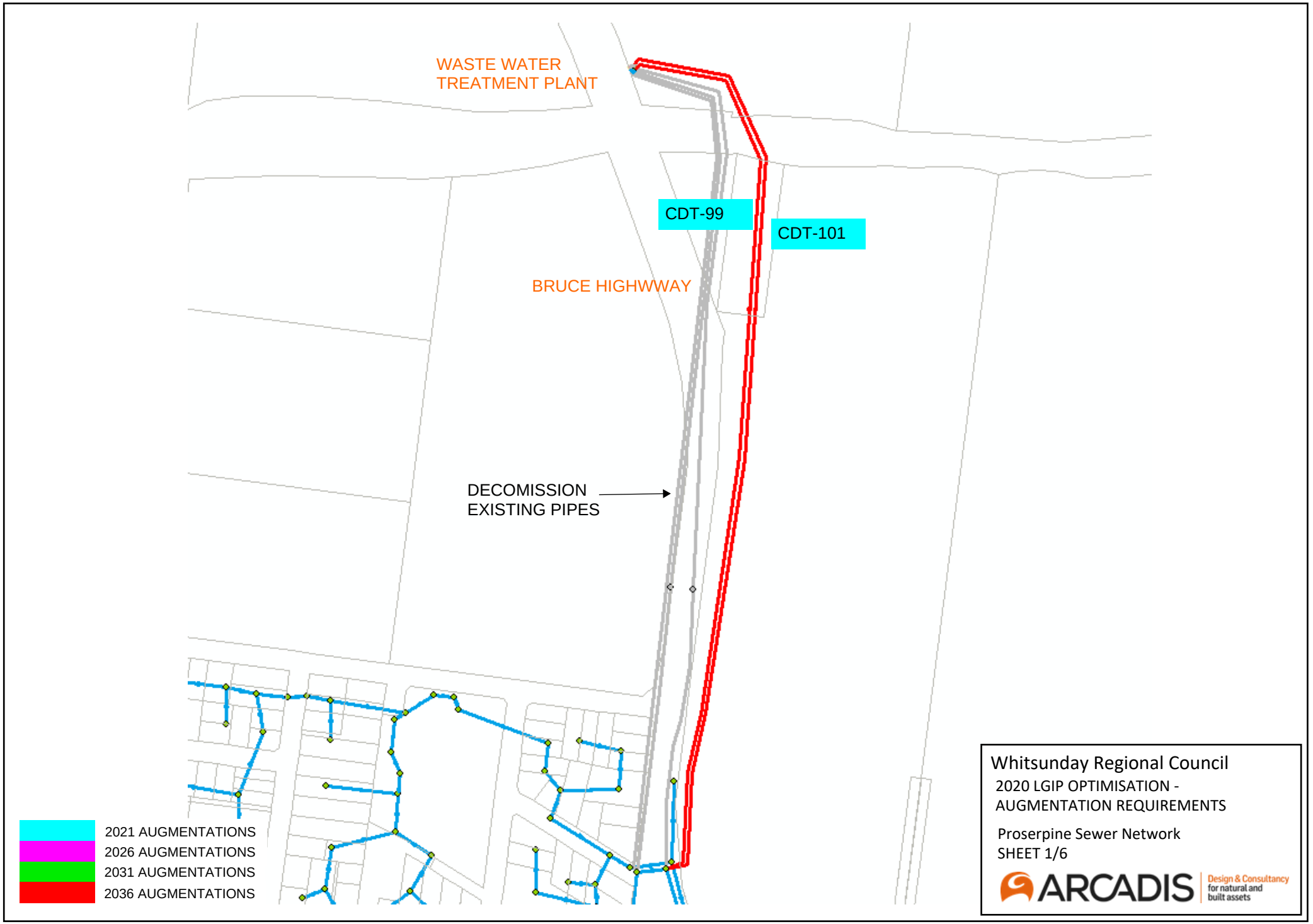
Whitsunday Regional Council

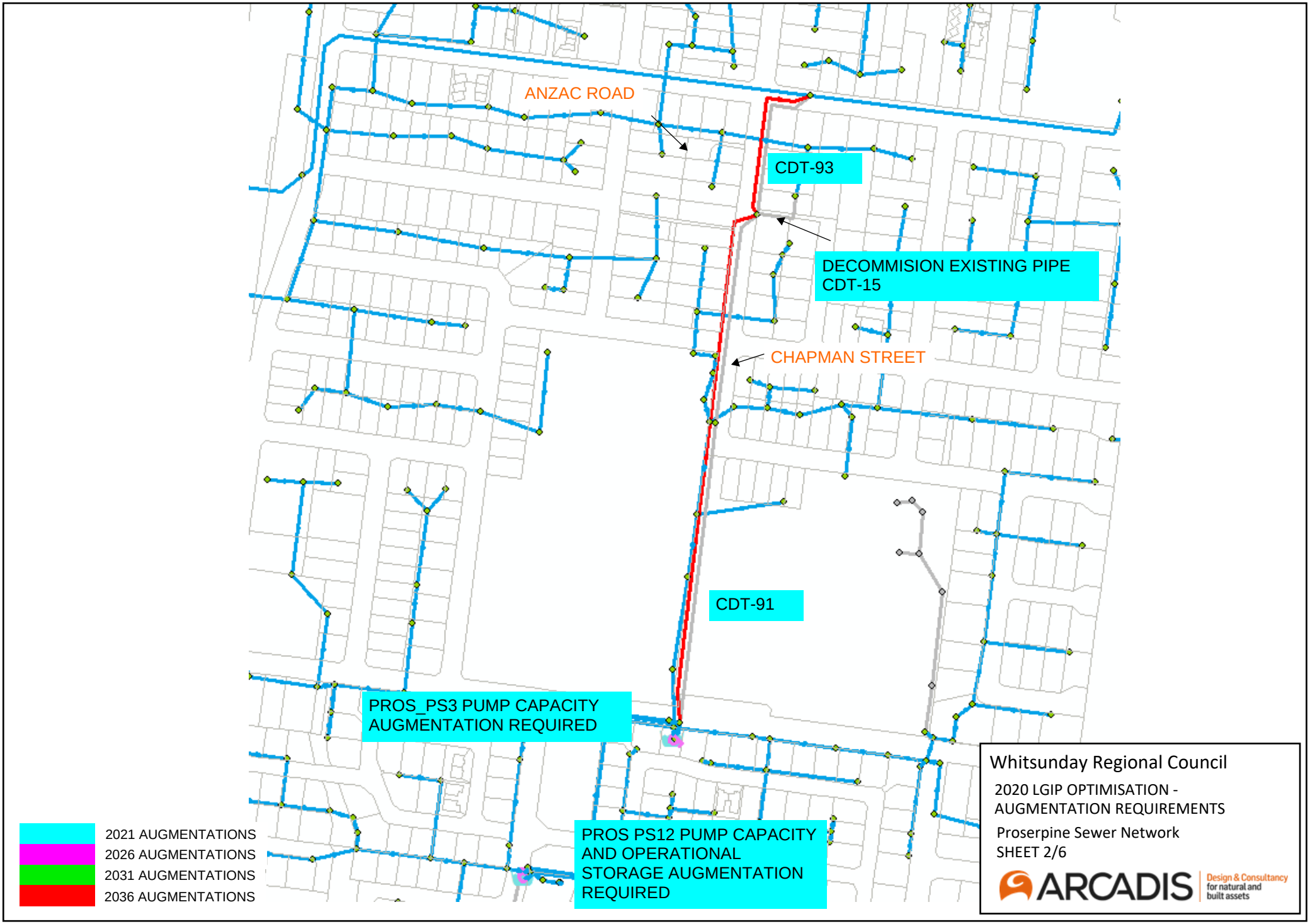
ACID SULFATE SOILS & 2020 LGIP SEWER OVERLAY

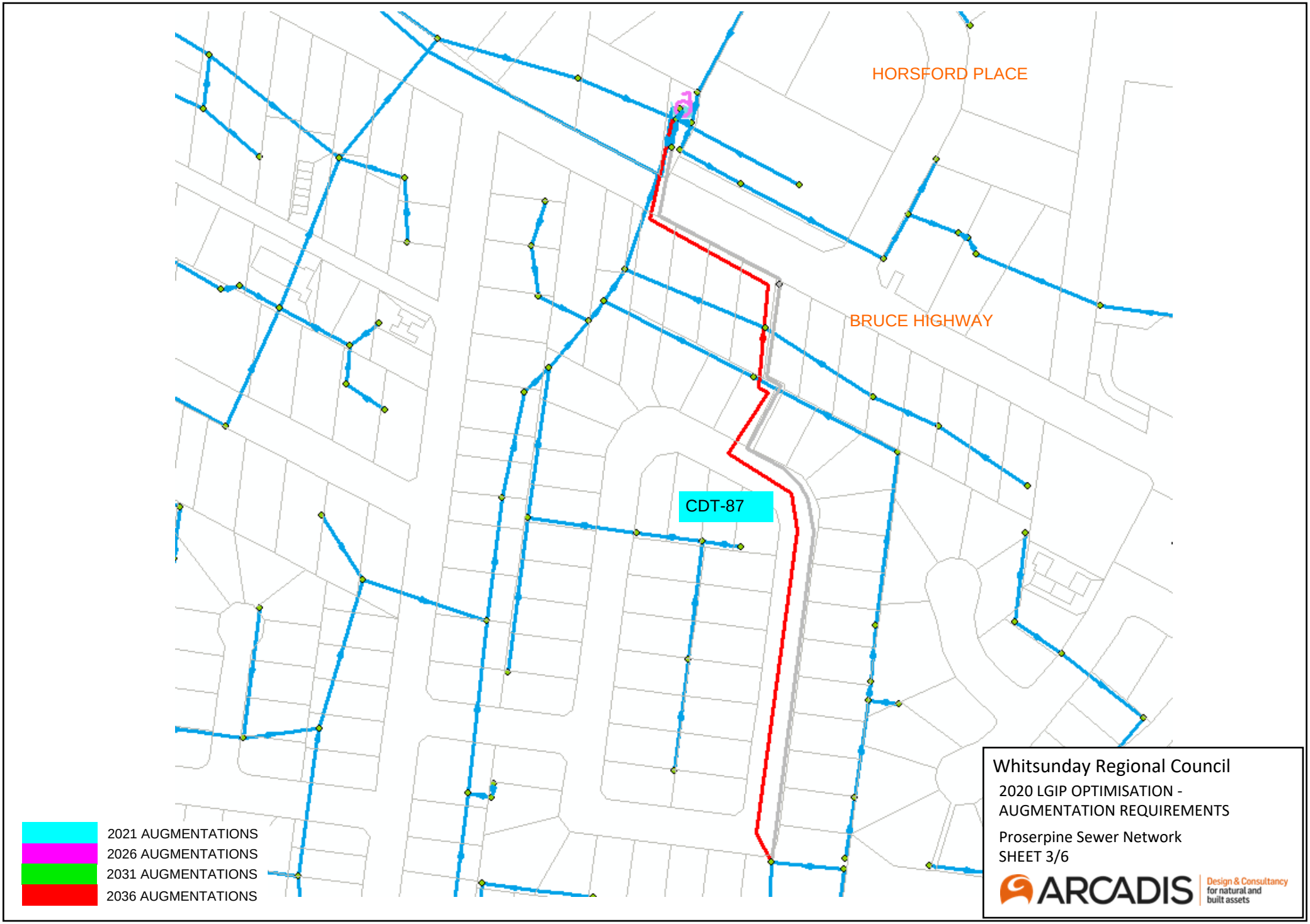
Cannonvale Sewer Network
SHEET 1/1

ARCADIS Design & Consultancy for natural and built assets

ACID SULFATE SOILS OVERLAY AND LEGEND SOURCED FROM QUEENSLAND GOVERMENT


WASTE WATER
TREATMENT PLANT
CDT-99
CDT-101
BRUCE HIGHWWAY
DECOMISSION
EXISTING PIPES
2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS
Whitsunday Regional Council
2020 LGIP OPTIMISATION -
AUGMENTATION REQUIREMENTS
Proserpine Sewer Network
SHEET 1/6
ARCADIS
Design & Consultancy
for natural and
built assets


ANZAC ROAD
CDT-93
DECOMMISION EXISTING PIPE
CDT-15
CHAPMAN STREET
CDT-91
PROS_PS3 PUMP CAPACITY
AUGMENTATION REQUIRED
PROS PS12 PUMP CAPACITY
AND OPERATIONAL
STORAGE AUGMENTATION
REQUIRED
2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS
Whitsunday Regional Council
2020 LGIP OPTIMISATION -
AUGMENTATION REQUIREMENTS
Proserpine Sewer Network
SHEET 2/6
ARCADIS
Design & Consultancy
for natural and
built assets


HORSFORD PLACE
BRUCE HIGHWAY
CDT-87
2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS
Whitsunday Regional Council
2020 LGIP OPTIMISATION -
AUGMENTATION REQUIREMENTS
Proserpine Sewer Network
SHEET 3/6
ARCADIS
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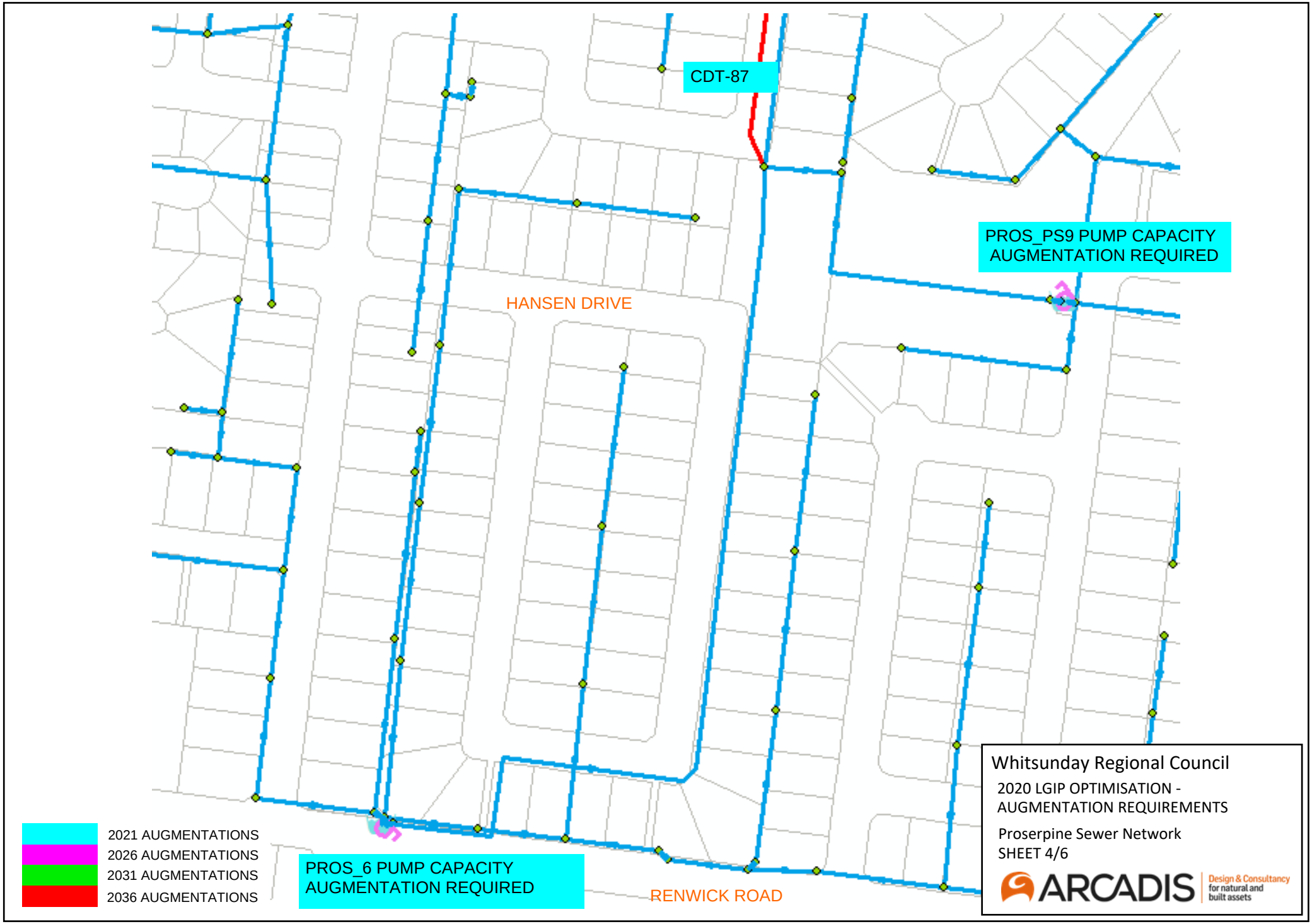
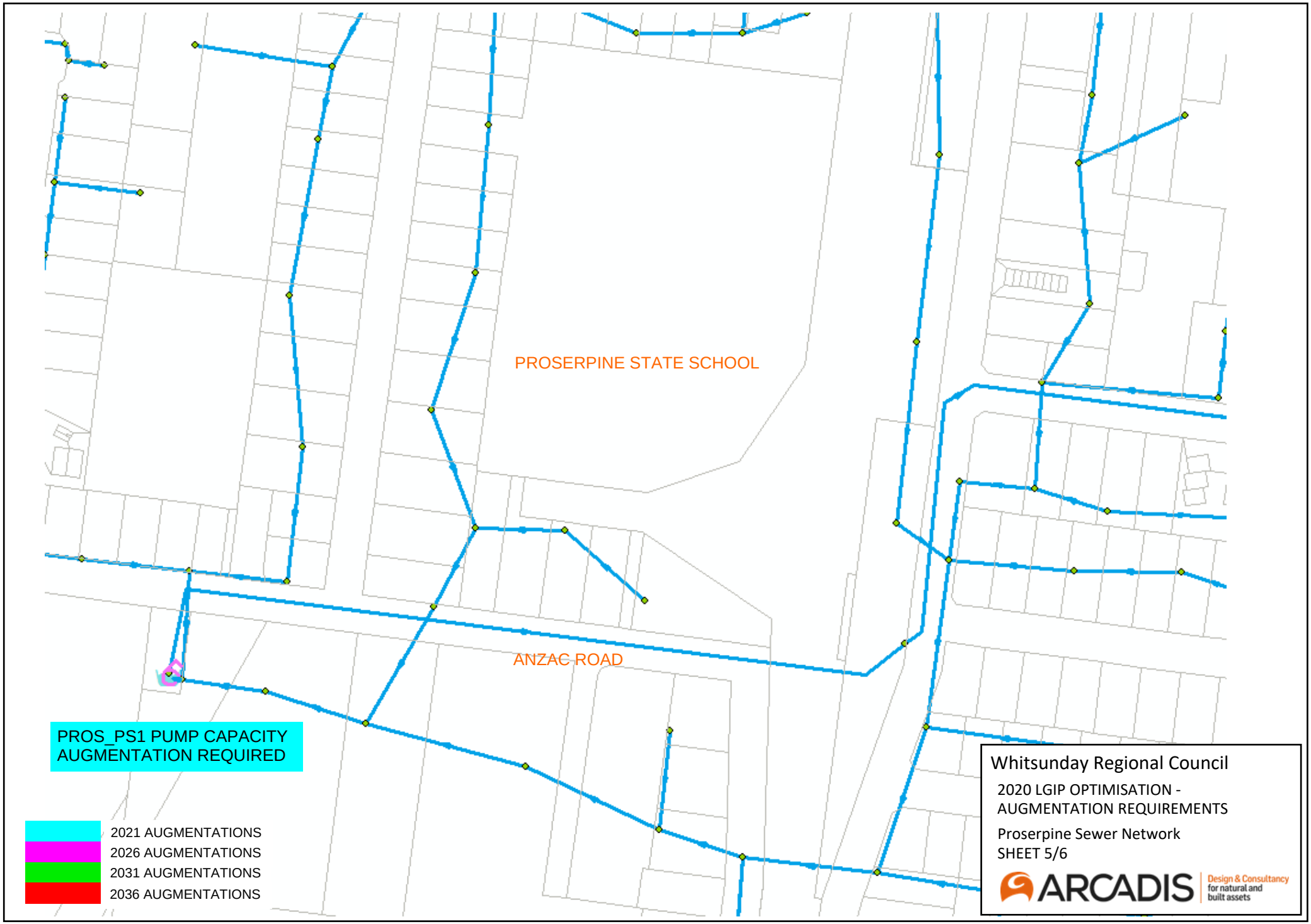
built assets


CDT-87
PROS_PS9 PUMP CAPACITY AUGMENTATION REQUIRED
HANSEN DRIVE
PROS_6 PUMP CAPACITY AUGMENTATION REQUIRED
RENWICK ROAD
2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS
Whitsunday Regional Council
2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS
Proserpine Sewer Network
SHEET 4/6
ARCADIS
Design & Consultancy for natural and built assets


PROSERPINE STATE SCHOOL
ANZAC ROAD
PROS_PS1 PUMP CAPACITY AUGMENTATION REQUIRED
2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS
Whitsunday Regional Council
2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS
Proserpine Sewer Network
SHEET 5/6
ARCADIS
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FAUST STREET
PUMP-11 OPERATIONAL STORAGE AUGMENTATION REQUIRED
2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS
Whitsunday Regional Council
2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS
Proserpine Sewer Network
SHEET 6/6
ARCADIS
Design & Consultancy for natural and built assets

PROJECT:	Whitsundays Sewer Network Modelling	**Project Engineer:**	M.C/S.H
DOCUMENT NUMBER:	D007-10027536-AAC-03	**Software:**	InfoSWMM SA
DATE:	06.02.2020		

ARCADIS Design & Consultancy for natural and built assets

WHITSUNDAYS PROSERPINE SEWER NETWORK
2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENT SUMMARY

AUGMENTATION ID	LENGTH (m)	EXISTING PIPE SEGMENT		NEW/ DUPLICATION DN (mm)	DEPTH RANGE (m)	COST - $/m	ADJUSTMENT FACTOR FOR SOIL	SCALE FACTOR	10% ADDITIONAL REGIONAL COSTS	30% CONTINGENCY	COST OF NEW /DUPLICATION	PIPE REPLACEMENT							NON-LGIP AUGMENTATIONS	LGIP AUGMENTATIONS	2021	2026	2031	2036	NOTES
		START NODE	END NODE									NOTES	ORIGINAL DN (mm)	REPLACEMENT DN	COST - $/m	CAP & GROUT @ $20/M	TOTAL COST	COST INCREASE COMPARED TO DUPLICATION							
CDT-87	468.216	PI-26	MH-P-2560				1.35	1.02	10%	30%	$ -	GRAVITY REPLACEMENT	100	150	$ 240.00		$ 216,630.43		$ 216,630.43						Velocity only upgrade - 3.3m/s up through all horizons
CDT-91	507.029	PI-27	JCT-12				1.35	1	10%	30%	$ -	RM POLY REPLACEMENT	100	250	$ 299.00		$ 286,527.16			$ 286,527.16					
CDT-93	157.076	JCT-12	JCT-14				1.35	1.28	10%	30%	$ -	RM POLY REPLACEMENT	100	250	$ 299.00		$ 113,619.48			$ 113,619.48					
DEACTIVATE CDT-15																									
CDT-99	895.157	PI-20	JCT-10	300		$ 362.00	1.35	0.94	10%	30%	$ 575,701.61	NEW RM								$ 575,701.61					
CDT-101	920.76	PI-20	JCT-10	300		$ 362.00	1.35	0.93	10%	30%	$ 585,867.99	NEW RM								$ 585,867.99					
CDT-103	432.414	PROS_PS2_SURROGATE	PI-20	200		$ 262.00	1.35	1.12	10%	30%	$ 239,817.50								$ 239,817.50						This augment may be suplemented bu another augment to PS2
							TOTAL				$ 1,161,569.59						$ 636,777.07	$ -	$ 456,447.93	$ 1,561,716.23					

PUMP AUGMENTATIONS REQUIRED

PUMP STATION LABEL	AUGMENTATION TYPE	VALUE	COST - $/x	TOTAL COST	2021	2026	2031	2036	
PROS_PS1	PUMP CAPACITY	2 x 24 kW*	$3654/kW	$138,473.30					
PROS_PS12	PUMP CAPACITY	2 x 9.0 kW*	$6217/kW	$90,310.30					
PROS_PS3	PUMP CAPACITY	2 x 14 kW*	$4762/kW	$105,898.05					
PROS_6	PUMP CAPACITY	2 x 6.5 kW*	$7564/kW	$65,192.75					
PROS-PS2	PUMP CAPACITY	2 x 16.6 kW*	$4318/kW	$103,506.66					This augment is only required if CDT-103 is not augmented.
PROS_PS12	OPERATIONAL STORAGE	0.31 kL	$5303/kL	$1,641.93					
PUMP-11	OPERATIONAL STORAGE	0.02 kL	$5303/kL	$106.06					

*Assumes 70% efficiency at duty

ADDITIONAL EMERGENCY STORAGE REQUIREMENTS HAVE NOT BEEN COSTED - TO BE VERIFIED AGAINST EXISTING UPSTREAM NETWORK CAPACITY (PIPEWORK + MANHOLES)

REFERENCE

ACID SULFATE SOILS (ASS)[1] ON RELATIVELY UNDISTURBED LAND

Depth	Depth Code	Depth to Actual Acid Sulfate Soil[2] (pH ≤4.0)	Depth to Strongly Acidic Soil layer[2] (pH >4.0 to ≤5.0)	Depth to Potential Acid Sulfate Soil[2]
0 - 0.5m	0	A0	a0	S0
0.5 - 1m	1	A1	a1	S1
1 - 2m	2	A2	a2	S2
2 - 3m	3	A3	a3	S3
3 - 4m	4	A4	a4	S4
4 - 5m	5	A5	a5	S5
>5m	5+	A5+	a5+	S5+

NOTE:

- The depth codes above imply that a predominance of profiles in the map unit fall within the nominated depth range.
- Actual acid sulfate soil layers (designated with an A code) often overlie potential acid sulfate soil layers (designated with an S code). Where this occurs eg. AS2 the map unit is coloured according to the depth of the upper surface of the 'actual' layer (A2) and overlayed with yellow dots. An 'a' preceding the soil depth code indicates a strong acid soil layer with field pH ranging from > 4.0 to ≤ 5.0. This may or may not be a result of sulfide oxidation. While 'a' depth code is shown on the map, no colour is assigned to it.
- In areas where there is varying depth to an ASS layer that cannot be separately mapped at the operative scale, two colours are used to designate the dominant depths. This appears as equal width striped colours. e.g. S1/S2
- P as a superscript indicates sediments of Pleistocene age[3] , so that S^{P}5+ indicates sulfidic sediments (of Pleistocene age) deeper than 5m.
- W as a subscript indicates areas associated with Melaleuca sp. wetlands and occasionally Casuarina glauca communities. Oxidisable sulfur % in surface layers may be highly variable and often exceeds the 'Action Criteria'[4] . This may include sulfur from organic compounds and modern accretion of sulfides in a wet, organic rich environment. ASS typically occurs at depth. Where this occurs e.g. S_{0W} or $S2_{W}$ or $A1_{W}$ the map is coloured as per the actual or potential depth category and is overlayed with ⁘ pattern.
- N as a subscript indicates areas with oxidisable sulfur values that exceed the action criteria[4] but contain varying amounts of carbonate materials that may compensate for the potential acidity. Commonly the carbonate materials are naturally occurring shell fragments, coral fragments or Foraminifera. Depth codes are as above e.g. a potential acid sulfate soil (rich in carbonate) occuring at 1 to 2m depth is designated $S0_{N}$. The map unit is coloured as S2 and overlayed with green dots.

S_{LF} Limited field assessment but occurs in a landscape position where there is a reasonable probability of ASS occurrence. This is usually land where the present use precludes any disturbance eg. National Parks, Reserves etc., or land where accessibility is severely restricte

ACID SULFATE ON DISTURBED LAND[5]

S_{DL} Disturbed land, eg. Canal estate, Marina, Aquaculture, Quarry, Urban, Industrial likely to contain ASS. (In some cases partial or full treatment may have been undertaken).

LAND WITH A LOW PROBABILITY OF ACID SULFATE SOIL OCCURRENCE

LP Land between the 5m AHD contour and the outer limit of Holocene, estuarine ASS (ie. land below 5m AHD) as mapped at this scale, with low probability of ASS occurrence[6]. Limited field investigation.

LAND NOT ASSESSED

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5m AHD[6] CONTOUR - NORMAL LIMIT OF FIELD INVESTIGATION

The 5m contour line delineates the normal limit of field investigation of Holocene, estuarine sulfidic sediments[7] which form ASS. However ASS has been found in this study on some lands above 5m, eg. valley flats, sand dunes and channel benches. In other cases the limit of Holocene ASS[7] is either at or below the 5m contour. In the latter case, the land between the ASS limit and the 5m contour is designated LP explained below. Contour information may have been produced at a scale different to that assigned to this map. As a consequence, the location of contours on this map may not be as accurate as those on the original contour map.

707 Borehole locations where profiles were described in detail and samples taken for analysis.

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Base map compiled from the Queensland Digital Cadastral Database October 2005, Department of Natural Resources and Mines, Brisbane.

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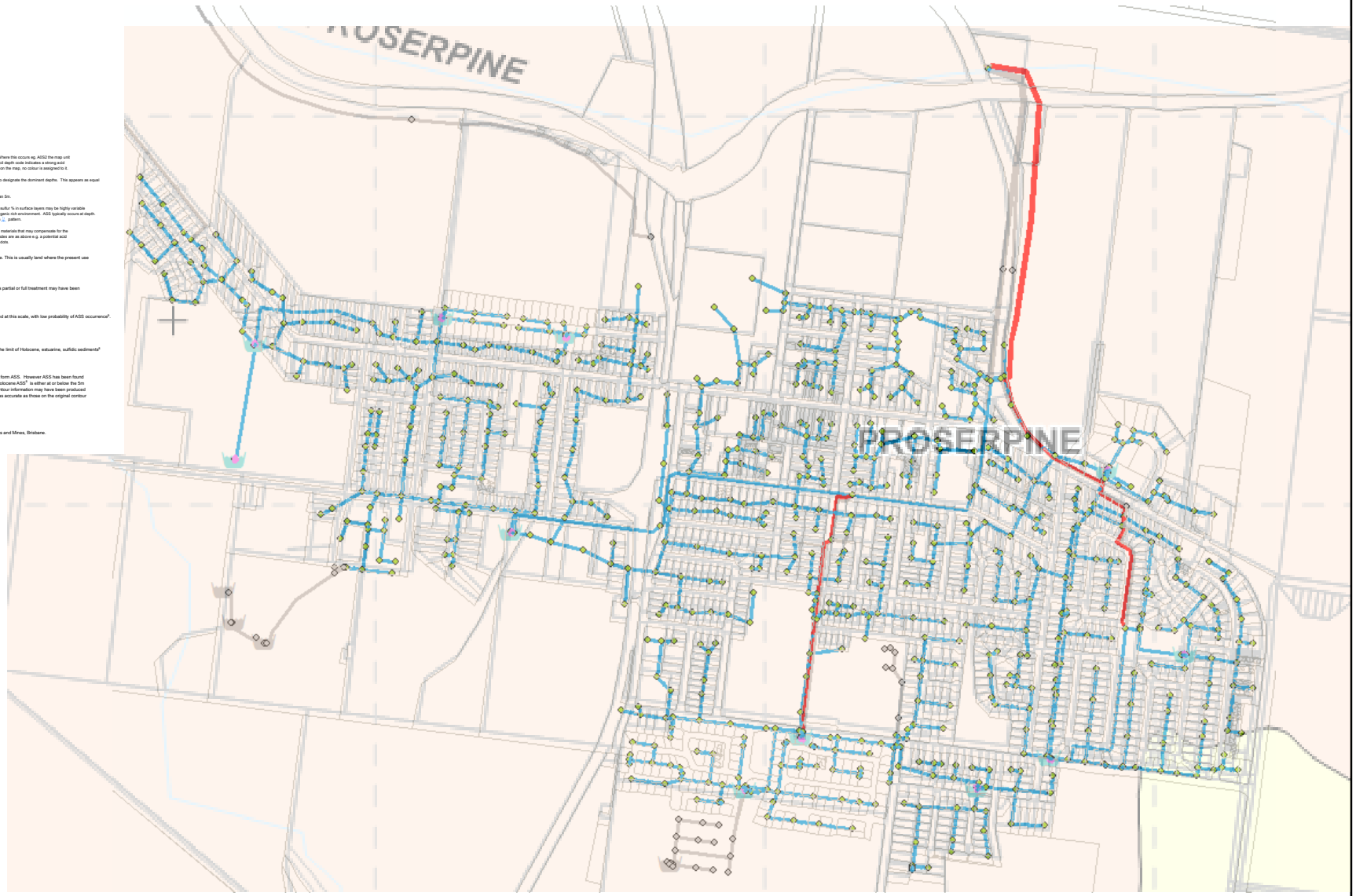


ACID SULFATE SOILS OVERLAY AND LEGEND SOURCED FROM QUEENSLAND GOVERMENT

Whitsunday Regional Council

ACID SULFATE SOILS & 2020 LGIP SEWER OVERLAY

Proserpine Sewer Network
SHEET 1/1

ARCADIS Design & Consultancy for natural and built assets

2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS

NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

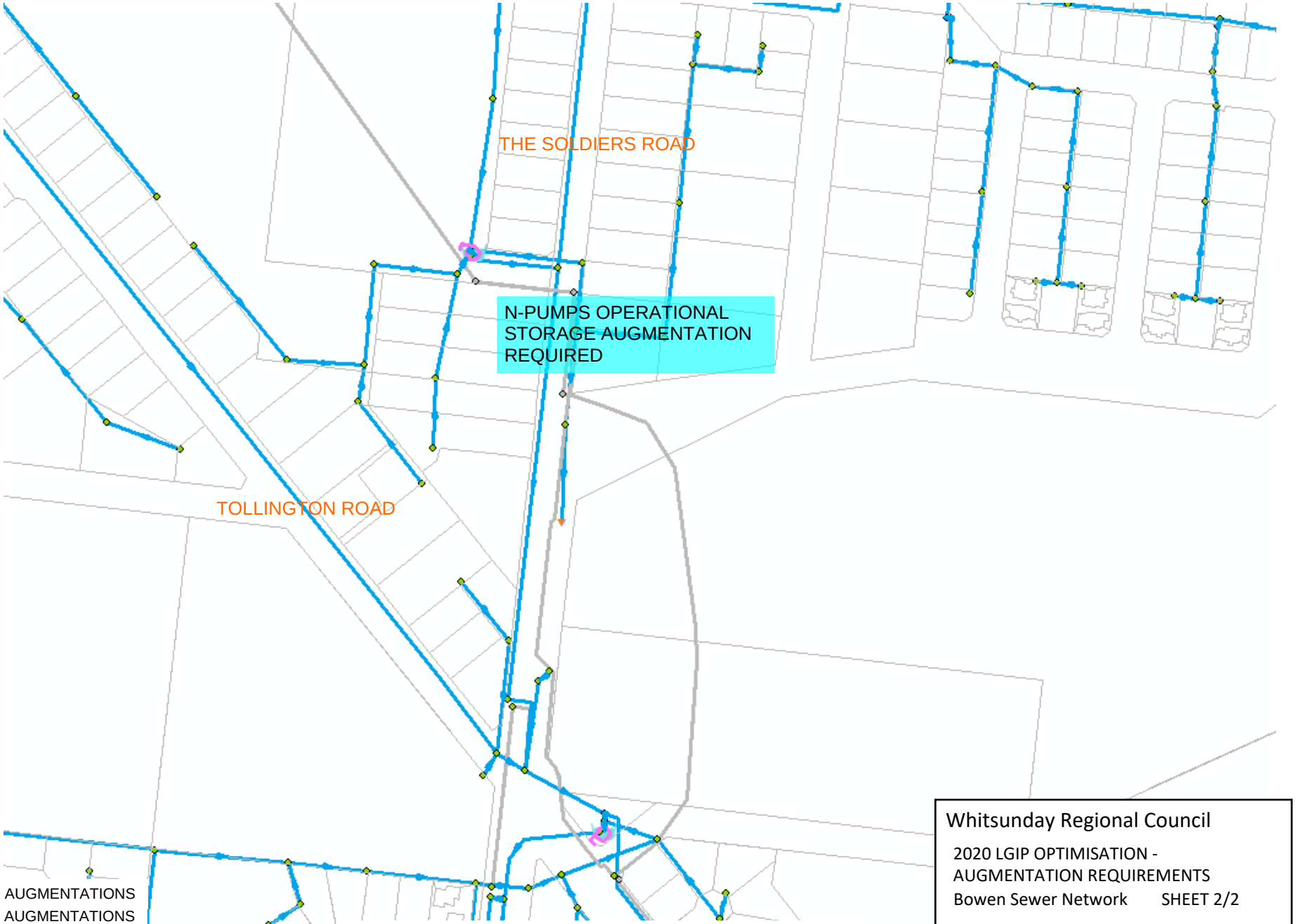
2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS

Bowen Sewer Network
SHEET 1/2

ARCADIS Design & Consultancy for natural and built assets

31/01/2020

SK004-10027536-02



Whitsunday Regional Council

2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS

Bowen Sewer Network SHEET 2/2

ARCADIS Design & Consultancy for natural and built assets

PROJECT:	Whitsundays Sewer Network Modelling	**Project Engineer:**	M.C/S,H
DOCUMENT NUMBER:	D004-10027536-AAC-03	**Software:**	InfoSWMM SA
DATE:	06.02.2020		

ARCADIS Design & Consultancy for natural and built assets

WHITSUNDAYS BOWEN SEWER NETWORK
2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENT SUMMARY

AUGMENTATION ID	LENGTH (m)	EXISTING PIPE SEGMENT		NEW/ DUPLICATION DN (mm)	DEPTH RANGE (m)	COST - $/m	ADJUSTMENT FACTOR FOR SOIL	SCALE FACTOR	10% ADDITIONAL REGIONAL COSTS	30% CONTINGENCY	COST OF NEW /DUPLICATION	PIPE REPLACEMENT							NON-LGIP AUGMENTATIONS	LGIP AUGMENTATIONS	2021	2026	2031	2036
		START NODE	END NODE									NOTES	ORIGINAL DN	REPLACEMENT DN	COST - $/m	CAP & GROUT @ $20/M	TOTAL COST	COST INCREASE COMPARED TO DUPLICATION						
CDT-31	1263.96	JCT-102	3-WELL	150		$ 205.00	1.35	0.907	10%	30%	$ 444,177.22	NEW RISING MAIN	200 - GRAVITY						$ 444,177.22					
CDT-39	723.807	3-PUMPS_SURROGATE	PJ-48				1.35	0.964	10%	30%		EX. RM BRITTLE	225 - RM	300	$ 362.00		$ 477,386.56			$ 477,386.56				
							TOTAL				$ 444,177.22						$ 477,386.56		$ 444,177.22	$ 477,386.56				

NOTES
No flooding in 2021 but nearing top of manhole and causing backup in upstream line
Augmentation solely for replacment of existing brittle/damaged pipe.

PUMP AUGMENTATIONS REQUIRED

PUMP STATION LABEL	AUGMENTATION TYPE	VALUE	COST - $/x	TOTAL COST	2021	2026	2031	2036
N-PUMPS	OPERATIONAL STORAGE	17.11 kL	$3988/kL	$68,234.68				

**Assumes 70% efficiency at duty*

ADDITIONAL EMERGENCY STORAGE REQUIREMENTS HAVE NOT BEEN COSTED - TO BE VERIFIED AGAINST EXISTING UPSTREAM NETWORK CAPACITY (PIPEWORK + MANHOLES)

REFERENCE

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0 - 0.5m	0	A0	a0	S0
0.5 - 1m	1	A1	a1	S1
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2 - 3m	3	A3	a3	S3
3 - 4m	4	A4	a4	S4
4 - 5m	5	A5	a5	S5
>5m	5+	A5+	a5+	S5+

NOTE:

- The depth codes above imply that a predominance of profiles in the map unit fall within the nominated depth range.
- Actual acid sulfate soil layers (designated with an A code) often overlie potential acid sulfate soil layers (designated with an S code). Where this occurs eg. ASS2 the map unit is coloured according to the depth of the upper surface of the 'actual' layer (A2) and overlayed with yellow dots. An 'a' preceding the soil depth code indicates a strong acid soil layer with field pH ranging from > 4.0 to ≤ 5.0. This may or may not be a result of sulfide oxidation. While 'a' depth code is shown on the map, no colour is assigned to it.
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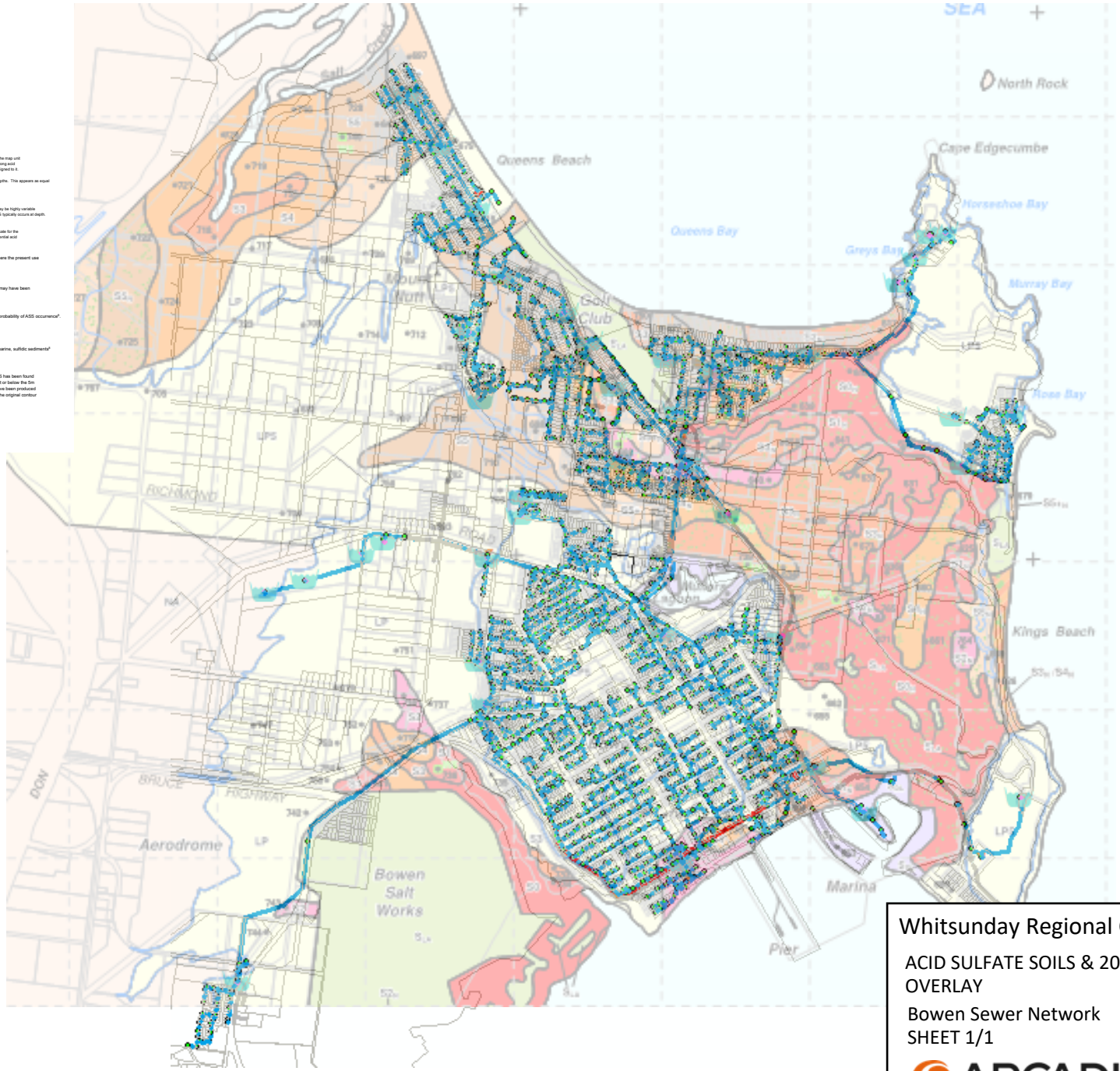


ACID SULFATE SOILS OVERLAY AND LEGEND SOURCED FROM QUEENSLAND GOVERMENT

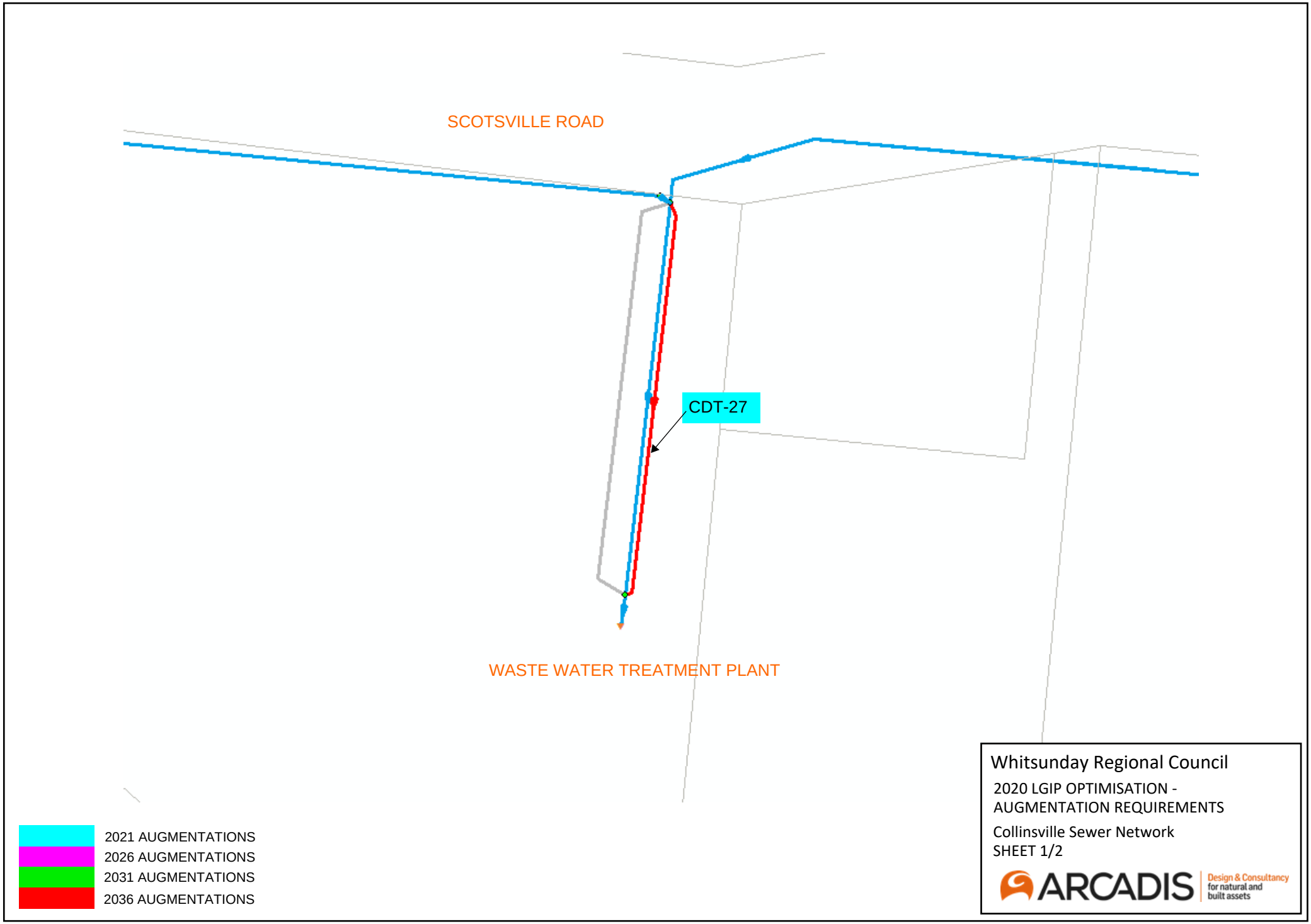
Whitsunday Regional Council

ACID SULFATE SOILS & 2020 LGIP SEWER OVERLAY

Bowen Sewer Network

SHEET 1/1

ARCADIS Design & Consultancy for natural and built assets



Whitsunday Regional Council

2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS

Collinsville Sewer Network
SHEET 1/2

ARCADIS Design & Consultancy for natural and built assets

31/01/2020

SK002-10027536-02

2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS

Whitsunday Regional Council

2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENTS

Collinsville Sewer Network
SHEET 2/2

ARCADIS Design & Consultancy for natural and built assets

31/01/2020

SK002-10027536-02

PROJECT:	Whitsundays Sewer Network Modelling	**Project Engineer:**	M.C/S.H
DOCUMENT NUMBER:	D002-10027536-AAC-03	**Software:**	InfoSWMM SA
DATE:	06.02.2020		

ARCADIS Design & Consultancy for natural and built assets

WHITSUNDAYS COLLINSVILLE SEWER NETWORK
2020 LGIP OPTIMISATION - AUGMENTATION REQUIREMENT SUMMARY

		EXISTING PIPE SEGMENT										PIPE REPLACEMENT												
AUGMENTATION ID	**LENGTH (m)**	**START NODE**	**END NODE**	**NEW/ DUPLICATION DN (mm)**	**DEPTH RANGE (m)**	**COST - $/m**	**ADJUSTMENT FACTOR FOR SOIL**	**SCALE FACTOR**	**10% ADDITIONAL REGIONAL COSTS**	**30% CONTINGENCY**	**COST OF NEW /DUPLICATION**	**NOTES**	**ORIGINAL DN**	**REPLACEMENT DN**	**COST - $/m**	**CAP & GROUT @ $20/M**	**TOTAL COST**	**COST INCREASE COMPARED TO DUPLICATION**	**NON-LGIP AUGMENTATIONS**	**LGIP AUGMENTATIONS**	**2021**	**2026**	**2031**	**2036**
CDT-27	174.774	FI-2	JCT-12	200		$ 240.00	1.35	1.23	10%	30%	$ 97,511.31	RISING MAIN	225	375	$ 821.00	$ 3,495.48	$ 337,065.41	$ 239,554.11	$ 97,511.31					
							TOTAL				$ 97,511.31						$ 337,065.41	$ 239,554.11	$ 97,511.31	$ -				

NOTES
This augment is solely to resolve velocity issues

PUMP AUGMENTATIONS REQUIRED

PUMP STATION LABEL	AUGMENTATION TYPE	VALUE	COST - $/x	TOTAL COST	2021	2026	2031	2036
2-C_PUMPS	PUMP CAPACITY	2 x 7.7 kW*	$7564/kW	$116,604.46				

*Assumes 70% efficiency at duty

ADDITIONAL EMERGENCY STORAGE REQUIREMENTS HAVE NOT BEEN COSTED - TO BE VERIFIED AGAINST EXISTING UPSTREAM NETWORK CAPACITY (PIPEWORK + MANHOLES)

APPENDIX D

SEWER NETWORK PUMP STATION ASSESSMENT SUMMARY

PROJECT: Whitsundays Sewer Network Modelling
Project Engineer: M.C/S.H
DOCUMENT N D006-10027536-03
Software: InfoSWMM SA
DATE:

ARCADIS Design & Consultancy for natural and built assets

WHITSUNDAYS CANNONVALE SEWER NETWORK
2020 LGIP OPTIMISATION - SEWER PUMP STATION ASSESSMENT SUMMARY

PUMP					CURRENT		PWWF FACTORS			0.680		0.789			0.890			PWWF			2036	
Pump ID (Char)	Startup Depth (m)	Shutoff Depth (m)	Max Depth	Area	Op. Storage	Em. Storage	Op. Storage	Emer. Storage	2021 (L/s)	Op. Storage	Emer. Storage	2026	Op. Storage	Emer. Storage	2031	Op. Storage	Emer. Storage	2036	HEAD GAIN	STORAGE UPGRADES REQUIRED	Op. Storage Upgrade Required	NOTES
PUMP-CANN1.2	2.6	1.1	6.6	10	15.00	37.00	2.82	108.16	37.55	3.26	125.36	43.53	3.68	141.49	49.13	4.14	158.98	55.20	35	Emergency storage beyond volume within wet well required		New pumps already ordered
PUMP-CANN11.1	0.87	0.27	4.37	4.34	2.60	13.89	1.14	43.65	15.15	1.32	50.59	17.56	1.49	57.09	19.82	1.67	64.15	22.28	22	Emergency storage beyond volume within wet well required		In line to be upgraded already
PUMP-CANN12.1	1.7	1.2	5.95	3.6	1.80	14.22	2.60	99.93	34.70	3.02	115.82	40.22	3.40	130.72	45.39	3.83	146.88	51.00	12	Emergency storage beyond volume within wet well required	2.03	Augmented
PUMP-CANN14.2	0.86	0.36	3.66	2.46	1.23	6.15	0.12	4.79	1.66	0.14	5.55	1.93	0.16	6.27	2.18	0.18	7.04	2.45	50	Emergency storage beyond volume within wet well required		Need to divert to RM, pumps to be installed 2020
PUMP-CANN15.2	0.47	0.17	5.8	1.43	0.43	7.19												0	0	OK		
PUMP-CANN17.1	2.6	1	5	10	16.00	21.00	0.02	0.62	0.21	0.02	0.72	0.25	0.02	0.81	0.28	0.02	0.91	0.32	0	OK		Depth in the wet well is not great enough to trigger the pump
PUMP-CANN18.1	2.6	1	5	10	16.00	21.00	0.17	6.57	2.28	0.20	7.62	2.65	0.22	8.60	2.99	0.25	9.66	3.36	53	OK		
PUMP-CANN2.2	2.82	1.82	5.22	2.04	2.04	4.28	0.37	14.12	4.90	0.43	16.36	5.68	0.48	18.47	6.41	0.54	20.75	7.21	3.9	Emergency storage beyond volume within wet well required		
PUMP-CANN3.1	4.25	2.75	6.85	10	15.00	23.00	2.08	79.85	27.72	2.41	92.54	32.13	2.72	104.45	36.27	3.06	117.36	40.75	30	Emergency storage beyond volume within wet well required		Already augmented
PUMP-CANN4.1	3.04	1.04	5.04	4.34	8.68	7.38	0.14	5.24	1.82	0.16	6.07	2.11	0.18	6.86	2.38	0.20	7.70	2.68	35	Emergency storage beyond volume within wet well required		New pumps already ordered
PUMP-CANN5.2	2.8	1.3	6.3	4.34	6.51	13.89	2.55	97.97	34.02	2.96	113.55	39.43	3.34	128.16	44.50	3.75	144.00	50.00	51	Emergency storage beyond volume within wet well required		
PUMP-CANN51.1	2.5	1.5	5	2	2.00	4.40	0.03	1.02	0.35	0.03	1.18	0.41	0.03	1.33	0.46	0.04	1.50	0.52	19	OK		Augmented
PUMP-CANN6.2	2.65	1.35	4.97	30	39.00	60.60	0.80	30.62	10.63	0.92	35.48	12.32	1.04	40.05	13.91	1.17	45.00	15.63	0	OK		Depth in the wet well is not great enough to trigger the pump
PUMP-JUBI1.1	3.85	1.85	8.1	4.34	8.68	17.14	4.54	174.21	60.49	5.26	201.92	70.11	5.93	227.89	79.13	6.67	256.06	88.91	55	Emergency storage beyond volume within wet well required		Augmented pre-2021
PUMP-JUBI2.2	2.6	0.6	6.05	2.49	4.98	7.84	1.80	69.17	24.02	2.09	80.17	27.84	2.36	90.48	31.42	2.65	101.66	35.30	6	Emergency storage beyond volume within wet well required		Augmented
PUMP-JUBI3.2	2.07	0.57	3.67	10	15.00	13.00	0.38	14.53	5.04	0.44	16.84	5.85	0.49	19.01	6.60	0.56	21.36	7.42	0	Emergency storage beyond volume within wet well required		Depth in the wet well is not great enough to trigger the pump
PUMP-JUBI4.2	1.61	1.11	6.06	2.66	1.33	11.04	0.47	17.89	6.21	0.54	20.73	7.20	0.61	23.40	8.13	0.68	26.29	9.13	6.7	Emergency storage beyond volume within wet well required		
PUMP-SHUT1.2	3	2	5	2.54	2.54	4.32	0.36	13.97	4.85	0.42	16.19	5.62	0.48	18.28	6.35	0.53	20.53	7.13	2.5	Emergency storage beyond volume within wet well required		
PUMP-SHUT2.1	2.6	1	5	2.54	4.06	5.33	0.17	6.64	2.31	0.20	7.70	2.67	0.23	8.69	3.02	0.25	9.76	3.39	28	Emergency storage beyond volume within wet well required		
PUMP-SHUT3.1	2.6	1	3	10	16.00	1.00	0.10	3.85	1.34	0.12	4.46	1.55	0.13	5.04	1.75	0.15	5.66	1.97	108	Emergency storage beyond volume within wet well required		

PROJECT: Whitsundays Sewer Network Modelling

Project Engineer: M.C/S.H

DOCUMENT NUMBER: 0007-10027536-AAC-03

Software: InfoSWMM SA

DATE:

ARCADIS Design & Consultancy for natural and built assets

WHITSUNDAYS COLLINSVILLE SEWER NETWORK
2020 LGIP OPTIMISATION - SEWER PUMP STATION ASSESSMENT SUMMARY

PUMP			WET WELL		CURRENT		PWWF FACTORS		0.930041152		0.9547325		0.979423868		PWWF	With ideal pump curves	2036		
Pump ID (Char)	Startup Depth (m)	Shutoff Depth (m)	Max Depth	Area	Op. Storage	Em. Storage	Op. Storage	Emer. Storage	2021 (L/s)	Op. Storage	Emer. Storage	2026	Op. Storage	Emer. Storage	2031	Op. Storage	Emer. Storage	2036	HEAD GAIN	UPGRADES REQUIRED	Op. Storage Upgrade Required	NOTES
PROS_6.1	0.7	0.3	5.2	3.98	1.59	16.716	0.92	35.21	12.23	0.94	36.14	12.55	0.97	37.08	12.87	0.99	37.86	13.145	25			
PROS_PS1.1	2.6	1.1	8.1	7.31	10.97	38.012	3.94	151.40	52.57	4.05	155.42	53.97	4.15	159.44	55.36	4.24	162.79	56.525	42	Emergency storage beyond volume within wet well required		PWWF quanitiy reduced with pipe augmentations (98.02 to 56.525)
PROS_PS10.1	0.78	0.38	3	2	0.80	3.84	0.10	3.95	1.37	0.11	4.06	1.41	0.11	4.16	1.44	0.11	4.25	1.475	2			
PROS_PS11.1	0.61	0.21	3	2	0.80	4.18	0.10	3.94	1.37	0.11	4.04	1.40	0.11	4.15	1.44	0.11	4.23	1.47	1.5			
PROS_PS12.1	0.8	0.4	6.3	2	0.80	10.4	1.03	39.66	13.77	1.06	40.71	14.13	1.09	41.76	14.50	1.11	42.64	14.805	52	Emergency storage beyond volume within wet well required	0.31	
PROS_PS2.1	1.1	0.3	7.35	7.31	5.85	43.4945	3.72	142.67	49.54	3.81	146.46	50.85	3.91	150.25	52.17	3.99	153.40	53.265	22			
PROS_PS3.1	0.8	0.4	7.65	7.31	2.92	47.8805	1.84	70.57	24.50	1.89	72.44	25.15	1.94	74.31	25.80	1.98	75.87	26.345	42			
PROS_PS4A.1	1.8	0.8	6	1.33	1.33	5.187												0				
PROS_PS5.1	1.4	0.5	5.77	1.33	1.20	5.4131	0.56	21.51	7.47	0.57	22.08	7.67	0.59	22.65	7.86	0.60	23.13	8.03	4.6	Emergency storage beyond volume within wet well required		
PROS_PS9.1	0.7	0.3	7	2.32	0.93	13.92	0.55	21.17	7.35	0.57	21.74	7.55	0.58	22.30	7.74	0.59	22.77	7.905	10			
PUMP-11	0.8	0.4	3	2	0.80	3.8	0.76	29.25	10.16	0.78	30.03	10.43	0.80	30.80	10.70	0.82	31.45	10.92	16	Emergency storage beyond volume within wet well required	0.02	

PROJECT: Whitsundays Sewer Network Modelling

Project Engine M.C/S.H

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ARCADIS Design & Consultancy for natural and built assets

WHITSUNDAYS BOWEN SEWER NETWORK
2020 LGIP OPTIMISATION - SEWER PUMP STATION ASSESSMENT SUMMARY

PUMP			WET WELL		CURRENT		PWWF FACTORS		0.829333333			0.917333333			0.970666667			PWWF		2036	
Pump ID (Char)	Startup Depth (m)	Shutoff Depth (m)	Max Depth	Area	Op. Storage	Em. Storage	Op. Storage	Emer. Storage	2021 (L/s)	Op. Storage	Emer. Storage	2026	Op. Storage	Emer. Storage	2031	Op. Storage	Emer. Storage	2036	HEAD GAIN	STORAGE UPGRADES REQUIRED	Op. Storage Upgrade Required	NOTES
1-PUMPS.1	2	0.4	5.562																			
1-PUMPS.2	2.51	0.4	5.562	29.22	61.6542	80.41344	10.89	417.98	145.13	12.04	462.34	160.53	12.74	489.22	169.87	13.13	504.00	175	22	Emergency storage beyond volume within wet well required		
10-PUMPS.1	0.8	0.4	6.08																			
10-PUMPS.2	1	0.4	6.08	2.54	1.524	12.1412	0.08	3.00	1.04	0.09	3.32	1.15	0.09	3.51	1.22	0.09	3.61	1.26	7.9	OK		
13-PUMPS.1	0.8	0.4	5.685																			
13-PUMPS.2	1	0.4	5.685	2.54	1.524	11.1379	0.20	7.80	2.71	0.22	8.63	3.00	0.24	9.13	3.17	0.24	9.40	3.27	4.4	OK		
15-PUMPS.1	0.8	0.4	5.17																			
15-PUMPS.2	1	0.4	5.17	2.54	1.524	9.8298	0.06	2.39	0.83	0.07	2.64	0.92	0.07	2.80	0.97	0.08	2.88	1.00	5	OK		
1A-PUMPS.1	0.8	0.4	4.035																			
1A-PUMPS.2	1	0.4	4.035	2.54	1.524	6.9469	0.01	0.25	0.09	0.01	0.28	0.10	0.01	0.29	0.10	0.01	0.30	0.11	2.7	OK		
1C-PUMPS.1	0.8	0.4	5																			
1C-PUMPS.2	1	0.4	5	2.54	1.524	9.398																
2-PUMPS.1	0.8	0.4	5.75																			
2-PUMPS.2	1	0.4	5.75	20.43	12.258	90.9135	1.68	64.35	22.34	1.85	71.17	24.71	1.96	75.31	26.15	2.02	77.59	26.94	16	OK		
2A-PUMPS.1	0.8	0.4	3.21																			
2A-PUMPS.2	1	0.4	3.21	2.54	1.524	4.8514	0.13	4.91	1.70	0.14	5.43	1.89	0.15	5.74	1.99	0.15	5.92	2.06	9	OK		
2B-PUMPS.1	0.8	0.4	3.91																			
2B-PUMPS.2	1	0.4	3.91	2.54	1.524	6.6294	0.25	9.60	3.33	0.28	10.62	3.69	0.29	11.24	3.90	0.30	11.58	4.02	5.4	OK		
2D-PUMPS.1	0.8	0.4	5																			
2D-PUMPS.2	1	0.4	5	2.54	1.524	9.398																
2E-PUMPS.1	0.8	0.4	5																			
2E-PUMPS.2	1	0.4	5	2.54	1.524	9.398																
2F-PUMPS.1	0.8	0.4	5																			
2F-PUMPS.2	1	0.4	5	2.54	1.524	9.398																
2G-PUMPS.1	0.8	0.4	5																			
2G-PUMPS.2	1	0.4	5	2.54	1.524	9.398																
3-PUMPS.1	0.8	0.4	7.5																			
3-PUMPS.2	1	0.4	7.5	29.22	17.532	181.164	3.26	125.31	43.51	3.61	138.61	48.13	3.82	146.67	50.93	3.93	151.10	52.47	34	OK		Pump Augmented
4-PUMPS.1	0.8	0.4	7.34																			
4-PUMPS.2	1	0.4	7.34	20.43	12.258	123.3972	1.56	60.01	20.84	1.73	66.38	23.05	1.83	70.24	24.39	1.88	72.36	25.13	28.5	OK		
4A-PUMPS.1	0.8	0.4	4.55																			
4A-PUMPS.2	1	0.4	4.55	2.54	1.524	8.255	0.09	3.31	1.15	0.10	3.66	1.27	0.10	3.87	1.34	0.10	3.99	1.39	3.5	OK		
A-PUMPS.1	0.736	0.44	5.18																			
A-PUMPS.2	0.936	0.44	5.18	3.56	1.76576	14.04064	0.29	11.18	3.88	0.32	12.36	4.29	0.34	13.08	4.54	0.35	13.48	4.68	14	OK		
B-PUMPS.1	0.84	0.44	6.76																			
B-PUMPS.2	1.04	0.44	6.76	3.56	2.136	19.2952	0.36	13.73	4.77	0.40	15.19	5.27	0.42	16.07	5.58	0.43	16.56	5.75	11.8	OK		
C-PUMPS.1	0.84	0.44	6.67																			
C-PUMPS.2	1.04	0.44	6.67	3.56	2.136	18.9748	0.41	15.80	5.49	0.46	17.48	6.07	0.48	18.49	6.42	0.50	19.05	6.62	9.8	OK		
D-PUMPS.1	0.74	0.44	5.18																			
D-PUMPS.2	0.94	0.44	5.18	3.56	1.78	14.0264	0.20	7.66	2.66	0.22	8.47	2.94	0.23	8.96	3.11	0.24	9.23	3.21	12.2	OK		
E-PUMPS.1	0.8	0.4	5.5																			
E-PUMPS.2	1	0.4	5.5	11.34	6.804	47.628	1.48	56.68	19.68	1.63	62.69	21.77	1.73	66.34	23.03	1.78	68.34	23.73	6.7	OK		
F-PUMPS.1	0.56	0.36	5.195																			
F-PUMPS.2	0.755	0.36	5.195	3.56	1.4062	14.7384	0.03	1.34	0.46	0.04	1.48	0.51	0.04	1.57	0.54	0.04	1.61	0.56	4.1	OK		
G-PUMPS.1	0.655	0.455	3.83																			
G-PUMPS.2	0.855	0.455	3.83	3.56	1.424	9.523	0.23	8.74	3.04	0.25	9.67	3.36	0.27	10.23	3.55	0.27	10.54	3.66	4.4	OK		
H-PUMPS.1	0.8	0.4	5.9																			
H-PUMPS.2	1	0.4	5.9	11.34	6.804	52.164	2.59	99.65	34.60	2.87	110.22	38.27	3.04	116.63	40.50	3.13	120.15	41.72	37	Emergency storage beyond volume within wet well required		
J-PUMPS.1	0.765	0.265	6.665																			
J-PUMPS.2	0.965	0.265	6.665	3.56	2.492	19.224	1.29	49.35	17.13	1.42	54.58	18.95	1.50	57.76	20.05	1.55	59.50	20.66	13.5	Emergency storage beyond volume within wet well required		
KING_ST	3	2	5.14	29.22	29.22	53.7648	0.03	1.03	0.36	0.03	1.14	0.39	0.03	1.20	0.42	0.03	1.24	0.43	6.1	OK		
L-PUMPS.1	0.9	0.5	4.73																			
L-PUMPS.2	1	0.5	4.73	3.46	1.73	11.8678	0.74	28.48	9.89	0.82	31.50	10.94	0.87	33.34	11.58	0.89	34.34	11.93	7	Emergency storage beyond volume within wet well required		
M-PUMPS.1	0.8	0.4	3.8																			
M-PUMPS.2	1	0.4	3.8	4.52	2.712	11.3	0.05	1.74	0.61	0.05	1.93	0.67	0.05	2.04	0.71	0.05	2.10	0.73	5.9	OK		
N-PUMPS.1	0.617	0.267	5.767																			
N-PUMPS.2	0.817	0.267	5.767	2.22	1.221	10.323	18.33	293.25	101.82	18.33	324.36	112.63	18.33	343.22	119.17	18.33	11.65	4.05	8.5	Emergency storage beyond volume within wet well required / Operational Storage Augment Required	17.11	
O-PUMPS.1	0.569	0.219	4.819																			
O-PUMPS.2	0.769	0.219	4.819	2.22	1.221	8.325	0.10	3.86	1.34	0.11	4.27	1.48	0.12	4.51	1.57	0.12	4.65	1.62	5.2	OK		
P-PUMPS.1	0.8	0.4	4.7																			
P-PUMPS.2	1	0.4	4.7	1.54	0.924	5.236	0.31	11.92	4.14	0.34	13.18	4.58	0.36	13.95	4.84	0.37	14.37	4.99	7	Emergency storage beyond volume within wet well required		
Q1-PUMPS.1	0.8	0.4	2.64																			
Q1-PUMPS.2	1	0.4	2.64	2.54	1.524	3.4036	0.13	4.92	1.71	0.14	5.44	1.89	0.15	5.76	2.00	0.15	5.93	2.06	7.3	Emergency storage beyond volume within wet well required		
Q3-PUMPS.1	0.8	0.4	5																			
Q3-PUMPS.2	1	0.4	5	2.54	1.524	9.398																
Q4-PUMPS.1	0.8	0.4	5																			
Q4-PUMPS.2	1	0.4	5	2.54	1.524	9.398																
R-PUMPS.1	0.734	0.234	6.034																			
R-PUMPS.2	0.934	0.234	6.034	3.56	2.492	17.088	0.42	16.30	5.66	0.47	18.03	6.26	0.50	19.08	6.62	0.51	19.66	6.83	3.9	Emergency storage beyond volume within wet well required		
S-PUMPS.1	0.8	0.4	5																			
S-PUMPS.2	1	0.4	5	2.54	1.524	9.398																
T-PUMPS.1	0.8	0.4	2.1																			
T-PUMPS.2	1	0.4	2.1	2.54	1.524	2.032	0.02	0.60	0.21	0.02	0.66	0.23	0.02	0.70	0.24	0.02	0.72	0.25	5.8	Emergency storage beyond volume within wet well required		
WS-PUMPS.1	0.8	0.4	5																			
WS-PUMPS.2	1	0.4	5	2.54	1.524	9.398																
Z-PUMPS.1	2	0.5	7.65																			
Z-PUMPS.2	2.5	0.5	7.65	11.34	22.68	54.999	4.83	185.53	64.42	5.34	205.21	71.25	5.65	217.14	75.40	5.83	223.70	77.68	25	Emergency storage beyond volume within wet well required		

WHITSUNDAY SHORES PUMPS

PUMP			WET WELL		CURRENT		PWWF FACTORS		0.829333333			0.917333333			0.970666667			PWWF			
Pump ID (Char)	Startup Depth (m)	Shutoff Depth (m)	Max Depth	Area	Op. Storage	Em. Storage	Op. Storage	Emer. Storage	2021 (L/s)	Op. Storage	Emer. Storage	2026	Op. Storage	Emer. Storage	2031	Op. Storage	Emer. Storage	2036	HEAD GAIN	STORAGE UPGRADES REQUIRED	Op. Storage Upgrade Required
PS_7_PUMPS	0.8	0.4	5.5	7.1	2.84	31.24	1.77	67.89	23.57	1.96	75.10	26.08	2.07	79.46	27.59	2.13	81.86	28.425	32	Emergency storage beyond volume within wet well required	
PS_9_PUMPS	0.8	0.4	5.5	7.1	2.84	31.24	0.90	34.48	11.97	0.99	38.14	13.24	1.05	40.35	14.01	1.08	41.57	14.435	4.7	Emergency storage beyond volume within wet well required	
PS_5_PUMPS	0.8	0.4	4.5	7.1	2.84	24.14	0.40	15.18	5.27	0.44	16.79	5.83	0.46	17.77	6.17	0.48	18.30	6.355	37		
PS_6_PUMPS	0.8	0.4	5.3	7.1	2.84	29.82	0.16	6.11	2.12	0.18	6.76	2.35	0.19	7.16	2.48	0.19	7.37	2.56	4.5		
PS_8_PUMPS	0.8	0.4	7.3	7.1	2.84	44.02	0.51	19.63	6.82	0.57	21.72	7.54	0.60	22.98	7.98	0.62	23.67	8.22	29		

PROJECT: Whitsundays Sewer Network Modelling
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WHITSUNDAYS COLLINSVILLE SEWER NETWORK
2020 LGIP OPTIMISATION - SEWER PUMP STATION ASSESSMENT SUMMARY

	PUMP		WET WELL		CURRENT		0.9609375			0.966145S			0.9973958			PWWF	With ideal pump curves		2036	
Pump ID (Char)	Startup Depth (m)	Shutoff Depth (m)	Max Depth	Area	Op. Storage	Em. Storage	Op. Storage	Emer. Storage	2021 (L/s)	Op. Storage	Emer. Storage	2026	Op. Storage	Emer. Storage	2031	Op. Storage	Emer. Storage	2036	HEAD GAIN	STORAGE UPGRADES REQUIRED	Op. Storage Upgrade Required	NOTES
1-C_PUMPS.1	1.15	0.61	5.11	15.8	8.532	57.828	3.33	127.93	44.42	3.35	128.62	44.66	3.46	132.78	46.10	3.47	133.13	46.225	28	Emergency storage beyond volume within wet well required		
1-C_PUMPS.2	1.75	0.61	5.11	15.8	18.012	48.348	3.33	127.93	44.42	3.35	128.62	44.66	3.46	132.78	46.10	3.47	133.13	46.225				
2-C_PUMPS.1	1.21	0.71	4.63	3.66	1.83	11.4192	0.68	26.22	9.10	0.69	26.36	9.15	0.71	27.22	9.45	0.71	27.29	9.475	55	Emergency storage beyond volume within wet well required		Pump augmentation required
2-C_PUMPS.2	2.27	0.71	4.63	3.66	5.7096	7.5396	0.68	26.22	9.10	0.69	26.36	9.15	0.71	27.22	9.45	0.71	27.29	9.475				
B-C_PUMP.1	0.7	0.3	6.5	2.54	1.016	13.97	0.02	0.84	0.29	0.02	0.85	0.29	0.02	0.88	0.30	0.02	0.88	0.305	0	OK		Not enough depth to trigger pump
B-C_PUMP.2	0.9	0.3	6.5	2.54	1.524	13.462	0.02	0.84	0.29	0.02	0.85	0.29	0.02	0.88	0.30	0.02	0.88	0.305				
A-C_PUMPS.1	0.7	0.3	2.7	2.54	1.016	4.318	0.07	2.71	0.94	0.07	2.73	0.95	0.07	2.82	0.98	0.07	2.82	0.98	4.8	OK		
A-C_PUMPS.2	0.9	0.3	2.7	2.54	1.524	3.81	0.07	2.71	0.94	0.07	2.73	0.95	0.07	2.82	0.98	0.07	2.82	0.98				

APPENDIX E

POTABLE WATER & SEWER NETWORK MCA ASSESSMENTS

PROJECT:	Whitsundays Water Network Modelling	**Project Engineer:**	M.C/S.H
DOCUMENT NUMBER:	D008-10027536-01	**Software:**	Bentley WaterCAD v8i
DATE:	03.02 2020		

ARCADIS Design & Consultancy for natural and built assets

WHITSUNDAYS POTABLE WATER NETWORK
2020 LGIP OPTIMISATION - MCA ASSESSMENT

ID	Change from Initial 2020 LGIP Optimisation	Need to Service	Operational (Known Bursts/Construction Fails)	Redundnacy/Management	Realistic Growth/Ability to Service/Climate Adaption?	Total Score	LGIP
2014_Aug_J-100_PR172						0	
2014_Aug_J-119_PR128	maintain Augment	3	3	3	3	12	
2014_Aug_JP60_JP121						0	YES
2014_Aug_JP83_JP89						0	
2014_Aug_PR106_PR107						0	
2014_Aug_PR108_J-126						0	
2014_Aug_PR171_PR173						0	
2014_Aug_PR226_PR229						0	
2014_Aug_PR229_PR143						0	
2014_Aug_PR24_PR25	maintain Augments	3	3	3	3	12	
2014_Aug_PR242_PR237	remove augmentation - not needed as will loop line.					0	
2014_Aug_PR244_PR243	maintain augmentation					0	
2014_Aug_PR25_PR27	maintain augments	2	3	2	2	9	
2014_Aug_PR54_J-116						0	
2021_Aug_BS107_JP58						0	YES
2021_Aug_BS116_JP77						0	
Air_Iso_Aug_01						0	
Air_Iso_Aug_02						0	
Air_Iso_Aug_03						0	
Air_Iso_Aug_04						0	
BS229_AB130						0	
CanW_Iso_Aug_06	remove - new loop from further west.					0	
CanW_Iso_Aug_09	possible additional tank and alternative alignment to maange head limits.					0	
CanW_Iso_Aug_17	retain augment					0	
CanW_Iso_Aug_18						0	
CanW_Iso_Aug_19						0	
CanW_Iso_Aug_21						0	
CanW_Iso_Aug_25						0	
CanW_Iso_Aug_26	retain augment					0	YES
CanW_Iso_Aug_27	retain augment					0	YES
CanW317b						0	
CanW76						0	
CanW76a						0	
CanW76b						0	
JubW_Iso_Aug_05						0	
JubW_Iso_Aug_06						0	
JubW_Iso_Aug_08						0	
JubW_Iso_Aug_09						0	
P-1012						0	
P-1022	maintain Augment	2	2	2	2	8	
P-1023	maintain Augment	3	3	3	3	12	
P-1030						0	
P-1039	retain augment	4	4	4	4	16	
P-1045						0	
P-1048						0	
P-1049	Maintain Augment	2	2	2	2	8	
P-1050	Maintain Augment	2	2	2	2	8	YES
P-1059						0	YES
P-1060	Maintain Agument	4	4	4	4	16	YES
P-1063						0	
P-1066	Maintain Augment	4	4	4	4	16	YES
P-1069						0	YES
P-1072						0	YES
P-1076						0	
P-1088						0	YES
P-1090						0	
P-1092	Maintain Augment	3	3	3	3	12	
P-1094	Maintain Augments	2	3	2	2	9	
P-1096						0	
P-1105	maintain augment	1	1	1	0	3	
P-1110	Maintain Augment	3	3	3	3	12	
P-1111	Matina Augment	1	1	2	1	5	
P-1112	Maintain Augment	2	2	2	2	8	
P-1115	Built remove from LGIP list					0	
P-1124	retain					0	
P-1125						0	
P-1126	required.					0	
P-1130	Required	3	3	3	3	12	
P-1133	retain augment					0	
P-1134	retain augment					0	
P-1135	retain augment					0	
P-1137						0	
P-1141						0	
P-1149	remove augment.			0		0	
P-1150						0	
P-1151	maintain					0	
P-1154						0	
P-1155	retain	1	1	2	1	5	
P-1156						0	
P-1162						0	
P-1164						0	
P-1165						0	
P-1170						0	YES
P-1173						0	
P-1174						0	YES
P-1176						0	YES
P-1178						0	
P-1179						0	
P-1180						0	
P-1181						0	
P-1183						0	
P-1184						0	
P-1188						0	
P-1191						0	
P-1196						0	
P-1200						0	
P-1201						0	
P-1204						0	YES
P-1205						0	
P-1206						0	
P-1208						0	
P-1223						0	
P-1224						0	
P-1225	remove augment					0	
P-1230						0	YES
P-1236						0	
P-1238						0	
P-1239						0	
P-1240	remains					0	
P-1241	remains					0	
P-1242	remains					0	
P-1244						0	
P-1271						0	YES
P-1274						0	
P-1275						0	
P-1276						0	
P-1292						0	
P-1293						0	
P-1310						0	
P-1311						0	
P-1324						0	
P-1346						0	
P-1354						0	
P-1355						0	
P-1356						0	
P-1357						0	
P-1358						0	
P-1359						0	
P-1362						0	
P-1363						0	
P-1364						0	
P-1365						0	
P-1366						0	YES
P-1367						0	YES
P-1368						0	YES
P-1369						0	
P-1371						0	
P-1372						0	
P-1373						0	
P-1374						0	YES
P-1375						0	
P-1378						0	YES
P-1380						0	YES
P-1381						0	YES
P-1382						0	
P-1391						0	
P-1394						0	
P-1397						0	
P-1403						0	
P-1404						0	YES
P-1405						0	YES
P-1406						0	YES

P-1407						0	YES
P-1408						0	YES
P-1409						0	YES
P-1410						0	YES
P-1411						0	YES
P-1412						0	YES
P-1415						0	
P-1416						0	
P-1419						0	YES
P-1420						0	
P-1430						0	
P-1434						0	
P-1436						0	
P-1439						0	
P-1440						0	YES
P-1441						0	YES
P-1442						0	YES
P-1444						0	YES
P-1445						0	YES
P-1446						0	
P-1461						0	
P-1462						0	
P-1463						0	
P-1476						0	
P-1482						0	
P-1486						0	
P-1487						0	
P-1488						0	
P-1494						0	
P-1495						0	YES
P-1496						0	YES
P-1497						0	YES
P-1498						0	YES
P-1501						0	
P-682						0	
P-835						0	
P-836						0	
P-867						0	
P-901						0	
P-902						0	
P-903						0	
P-906						0	
P-945						0	
P-946						0	
P-978						0	
P-982							YES
P-987						0	
ProW_Iso_Aug_14						0	
ShHW_Iso_Aug_03						0	

PROJECT:	Whitsundays Water Network Modelling	**Project Engineer:**	M.C/S.H
DOCUMENT NUMBER:	D008-10027536-01	**Software:**	Bentley WaterCAD v8i
DATE:	11.02.2020		

ARCADIS Design & Consultancy for natural and built assets

BOWEN POTABLE WATER NETWORK
2020 LGIP OPTIMISATION - MCA ASSESSMENT

ID	Change from initial 2019 LGIP	Need to Service	Operational (Known Bursts/Construction Fails)	Redundnacy/Management	Realistic Growth/Ability to Service/Climate Adaption?	Total Score	LGIP
2014_Aug_BNA160_BNA303	No change, needed	2	1	0	0	3	
2014_Aug_BNA581_BNA582	Change to DN200, abandon AC pipe	4	2	0	0	6	YES
2014_Aug_BNA669_BNA466							
2014_Aug_BNA87_BNA581							
2014_Aug_BNB074_J-1260							
2014_Aug_J-1253_BNB092							
P-1940							
P-1941							
P-1946		1	1	1	0	3	
P-1948	No change, needed	3	1	3	1	8	
P-1950	No change, needed	3	1	2	1	7	
P-1956	No change, needed	2	1	0	0	3	
P-1959	No change, needed	3	1	2	1	7	
P-1964	No change, needed	2	1	0	0	3	
P-1973	Needed, changed length..	3	1	2	1	7	
P-1981	No change, needed	3	1	2	1	7	
P-1983	Needed,verify construction status	3	2	2	0	7	
P-1987	No change, needed	3	2	2	0	7	
P-1988	No change, needed	3	2	2	0	7	
P-1990	No change, needed	3	2	2	0	7	
P-1991	No change, needed	3	2	2	0	7	
P-1993							
P-1994							
P-1995							
P-2016	No change, needed	3	1	2	1	7	
P-2018	No change, needed	1	0	0	0	1	
P-2019	No change, needed, low priority	2	1	0	0	3	
P-2020	No change, needed, low priority	2	1	0	0	3	
P-2021	No change, needed, low priority	2	1	0	0	3	
P-2030	No change, needed	3	0	2	0	5	
P-2032	No change, needed	3	0	2	0	5	
P-2057	Needed however Native Title area risk. Construction approval risk	2	0	2	1	5	
P-2069	No change, needed	3	1	3	2	9	
P-2071		3	0	2	0	5	
P-2077							
P-2078							
P-2081							
P-2082							
P-2087							
P-2088	New DN150, only neded for 500 2036	3	0	2	0	5	
P-2089	New DN150 aug for cross connection	3	2	2	0	7	
P-2090	New DN100 aug for cross connection	3	2	2	0	7	
P-2091	New DN200 to replace bad pipe	5	5	5	0	15	YES
P-2124							
P-2125							
P-2126							
P-2127							
	2 isolation valves added	3	0	2	0	5	
	Augments to area, pipes deactivated						
	Augs needed and tank change for Herenvale						
	Council policy changes needed for Whitsunday Shores - Yeaston to apply policy change for elevated are and low pressure						
	New aug to buLk water treatment pump - 230L/s						
	Koorelah Farms - Inverdon Road - Farming irrigation, nodes removed						
	Expired ag contracts, loading reduced/removed						
	No fireflow provision made to rural domestic supply/standard flow performance up to DSS only. Bottom of Smith Road, changes made.						

PROJECT:	Whitsundays Water Network Modelling	**Project Engineer:**	M.C/S.H
DOCUMENT NUMBER:	D008-10027536-01	**Software:**	Bentley WaterCAD v8i
DATE:	03.02.2020		

ARCADIS Design & Consultancy for natural and built assets

COLLINSVILLE POTABLE WATER NETWORK
2020 LGIP OPTIMISATION - MCA ASSESSMENT

ID	Change from initial 2019 LGIP	Need to Service	Operational (Known Bursts/Construction Fails)	Redundnacy/Management	Realistic Growth/Ability to Service/Climate Adaption?	Total Score	LGIP
P-23	Needed, no change	4	1	2	0	7	No
P-30	Needed, no change	3	1	2	0	6	No
P-35	Needed, no change	3	1	2	0	6	No
P-42	Needed, no change	0	0	0	0	0	No
P-43	New DN150	2	1	2	0	5	No
P-44	New DN150	2	1	2	0	5	No
P-47	New DN150	2	1	2	0	5	No
P-50	New DN150	4	1	2	0	7	No
P-53	New DN100	4	1	2	0	8	No
P-56	New DN150	4	1	2	0	7	No
P-57	New DN150	4	1	2	0	7	No
P-58	New DN100	4	1	2	0	7	No
P-61	New DN 100	3	1	2	0	6	No
P-629	Needed, no change	4	1	2	0	7	No
P-630	Needed, no change	4	1	2	0	7	No
P-630	New DN160						No
P-662	No change, needed	3	1	2	0	6	No
Alternative hydrant position							
CLC82 removed to CLC81 for Collinsville Caravan Park							
Isolation Valves to be confirmed and changed. Pipes to be deactivated							

PROJECT:	Whitsundays Sewer Network Modelling	**Project Engineer:**	M.C/S.H
DOCUMENT NUMBER:	D009-10027536-01	**Software:**	InfoSWMM SA
DATE:	03.02.2020		

ARCADIS Design & Consultancy for natural and built assets

CANNONVALE SEWER NETWORK
2020 LGIP OPTIMISATION - MCA ASSESSMENT

ID	Change from initial 2019 LGIP	Need to Service	Operational (Known Bursts/Construction Fails)	Realistic Growth/Ability to Service/Climate Adaption?	Total Score	LGIP	Notes
CDT-71	upgrade as per priorrity	2	2	5	9	Yes	
CDT-77	stays same	2	2	5	9	Yes	
CDT-79	upgrade as per priorrity	2	1	5	8	Yes	
CDT-81	upgrade as per priorrity	2	1	5	8	No	
CDT-85	upgrade as per priorrity	2	1	5	8	Yes	
CDT-113	maintain upgrade as per priority	3	2	5	10	Yes	
CDT-115	maintain upgrade as per priority	3	2	5	10	Yes	
CDT-117	maintain upgrade as per priority	3	2	5	10	Yes	
CDT-119	adopt as required.	2	2	5	12	No	
CDT-121	adopt as required.	2	2	5	12	Yes	
CDT-123	adopt as required.	2	2	5	12	Yes	
CDT-131	adopt as required.	2	2	5	12	No	
CDT-135	replace as a 200 gravity line note apply plastic to avoid HS2 impacts....note Hs2	2	1	1	4	Yes	
CDT-139	as required, additional existing alignment investigation may be required	2	2	5	12	Yes	
CDT-145	adopt as required.	2	2	5	12	Yes	
CDT-147	don't duplicate, replace with a 425 PVC.	3	3	5	11	No	
CDT-149		3	3	5	11	Yes	
CDT-151		3	3	5	11	Yes	
CDT-153		3	3	5	11	Yes	
CDT-155		3	3	5	11	Yes	
CDT-157		3	3	5	11	Yes	
CDT-159		3	3	5	11	Yes	
CDT-167		3	3	5	11	Yes	
SM_P_3076						Yes	
PUMP-JUBI1	Augment - Pump in-line to be upgraded pre 2021	4	5	5	14	Yes	PUMP CAPACITY
PUMP-JUBI2	apply augment	3	2	5	10		PUMP CAPACITY
PUMP-CANN12		3	3	3	9		OPERATIONAL STORAGE

PROJECT:	Whitsundays Sewer Network Modelling	**Project Engineer:**	M.C/S.H
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DATE:	03.02.2020		

ARCADIS Design & Consultancy for natural and built assets

BOWEN SEWER NETWORK
2020 LGIP OPTIMISATION - MCA ASSESSMENT

ID	Change from initial 2019 LGIP	Need to Service	Operational (Known Bursts/Construction Fails)	Realistic Growth/Ability to Service/Climate Adaption?	Total Score	LGIP
CDT-31	No change, needed	3	3	2	8	No
CDT-39	New DN pipe frpm PS3 towards PS1, existing pipe extremely worn	2	5	2	9	Yes

PROJECT:	Whitsundays Sewer Network Modelling	**Project Engineer:**	M.C/S.H
DOCUMENT NUMBER:	D009-10027536-01	**Software:**	InfoSWMM SA
DATE:	03.02.2020		

ARCADIS Design & Consultancy for natural and built assets

PROSERPINE SEWER NETWORK
2020 LGIP OPTIMISATION - MCA ASSESSMENT

ID	Change from initial 2019 LGIP	Need to Service	Operational (Known Bursts/Construction Fails)	Realistic Growth/Ability to Service/Climate Adaption?	Total Score	LGIP	Notes
CDT-87	Needed but don't parrallel. Go Replace	5	4	3	12	No	
CDT-91	No change, needed augmenting but must be poly because of school/trees etc	5	4	3	12	Yes	
CDT-93	No change, needed augmenting but must be poly because of school/trees etc	5	4	3	12	Yes	
DEACTIVATE CDT-15		5	4	3	12	Yes	
CDT-99	New DN355 pipe aug to treatment plant to avoid Bruce Highway	5	3	4	12	Yes	
CDT-101	New DN355 pipe aug to treatment plant to avoid Bruce Highway	5	3	4	12	Yes	
CDT-103	Augment is needed					No	
PROS_PS1		3	3	3	9	Yes	PUMP CAPACITY
PROS_PS12		3	3	3	9	Yes	PUMP CAPACITY
PROS_PS3		3	3	3	9	Yes	PUMP CAPACITY
PROS_6		3	3	3	9	Yes	PUMP CAPACITY
PROS_PS9	Needed	5	4	3	12	Yes	PUMP CAPACITY
PROS_PS2	Pump already updated, additional pump aug only required if augment CDT-103 does not take place.	3	3	3	9	Yes	PUMP CAPACITY
PROS_PS12							OPERATIONAL STORAGE
PUMP-11							OPERATIONAL STORAGE

PROJECT:	Whitsundays Sewer Network Modelling	**Project Engineer:**	M.C/S.H
DOCUMENT NUMBER:	D009-10027536-01	**Software:**	InfoSWMM SA
DATE:	03.02.2020		

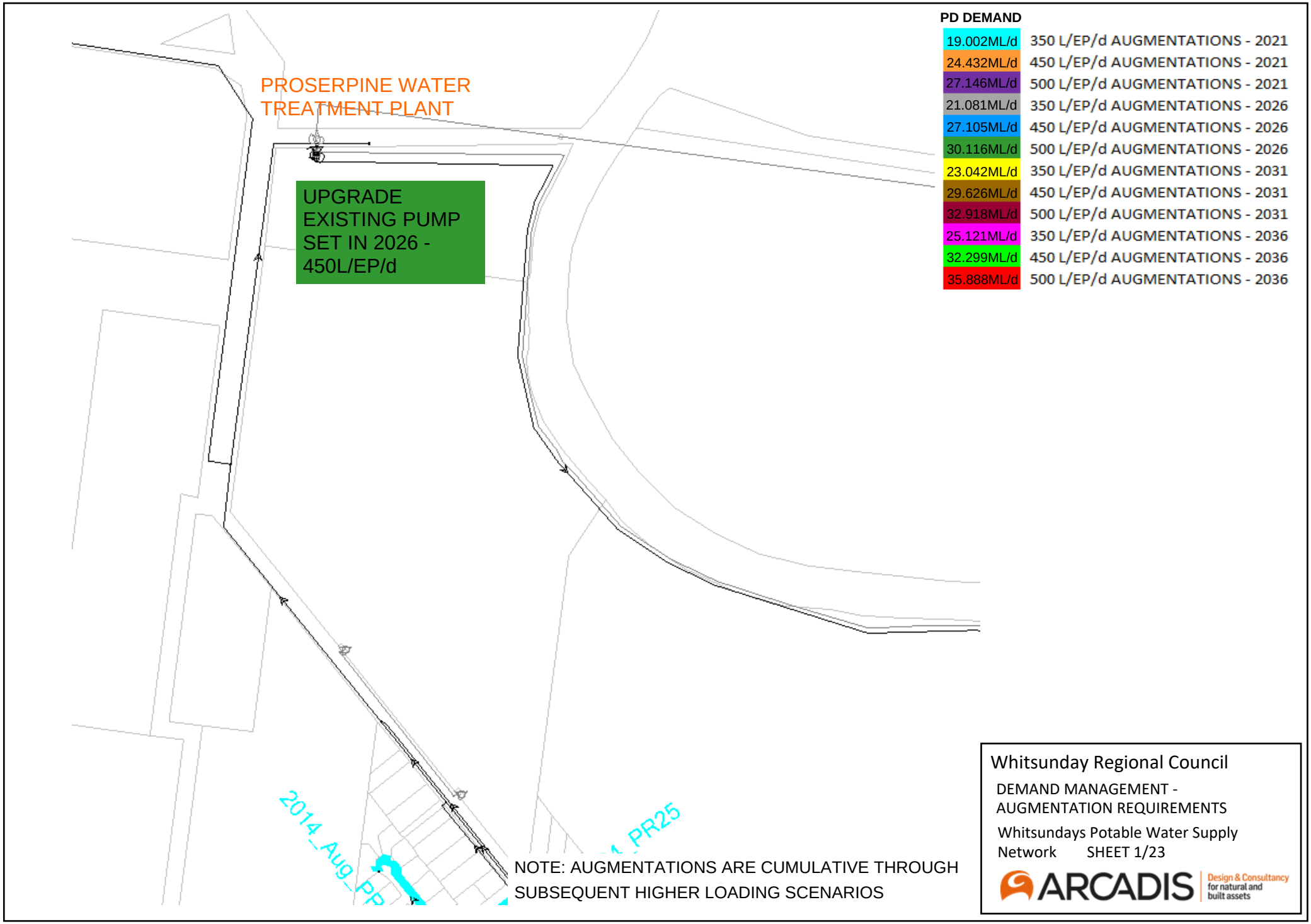
ARCADIS Design & Consultancy for natural and built assets

COLLINSVILLE SEWER NETWORK
2020 LGIP OPTIMISATION - MCA ASSESSMENT

ID	Change from initial 2019 LGIP	Need to Service	Operational (Known Bursts/Construction Fails)	Realistic Growth/Ability to Service/Climate Adaption?	Total Score	LGIP
CDT-27		1	1	0	2	No
2-C_PUMPS		2	2	0	4	Yes

APPENDIX F

INITIAL WATER NETWORK AUGMENTATION OUTPUTS PRE-WORKSHOP


PROSERPINE WATER TREATMENT PLANT
UPGRADE EXISTING PUMP SET IN 2026 - 450L/EP/d
PD DEMAND
19.002ML/d 350 L/EP/d AUGMENTATIONS - 2021
24.432ML/d 450 L/EP/d AUGMENTATIONS - 2021
27.146ML/d 500 L/EP/d AUGMENTATIONS - 2021
21.081ML/d 350 L/EP/d AUGMENTATIONS - 2026
27.105ML/d 450 L/EP/d AUGMENTATIONS - 2026
30.116ML/d 500 L/EP/d AUGMENTATIONS - 2026
23.042ML/d 350 L/EP/d AUGMENTATIONS - 2031
29.626ML/d 450 L/EP/d AUGMENTATIONS - 2031
32.918ML/d 500 L/EP/d AUGMENTATIONS - 2031
25.121ML/d 350 L/EP/d AUGMENTATIONS - 2036
32.299ML/d 450 L/EP/d AUGMENTATIONS - 2036
35.888ML/d 500 L/EP/d AUGMENTATIONS - 2036
2014_Aug_PR25
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS
Whitsunday Regional Council
DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS
Whitsundays Potable Water Supply Network SHEET 1/23
ARCADIS Design & Consultancy for natural and built assets

PD DEMAND

19.002ML/d	350 L/EP/d AUGMENTATIONS - 2021
24.432ML/d	450 L/EP/d AUGMENTATIONS - 2021
27.146ML/d	500 L/EP/d AUGMENTATIONS - 2021
21.081ML/d	350 L/EP/d AUGMENTATIONS - 2026
27.105ML/d	450 L/EP/d AUGMENTATIONS - 2026
30.116ML/d	500 L/EP/d AUGMENTATIONS - 2026
23.042ML/d	350 L/EP/d AUGMENTATIONS - 2031
29.626ML/d	450 L/EP/d AUGMENTATIONS - 2031
32.918ML/d	500 L/EP/d AUGMENTATIONS - 2031
25.121ML/d	350 L/EP/d AUGMENTATIONS - 2036
32.299ML/d	450 L/EP/d AUGMENTATIONS - 2036
35.888ML/d	500 L/EP/d AUGMENTATIONS - 2036

NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

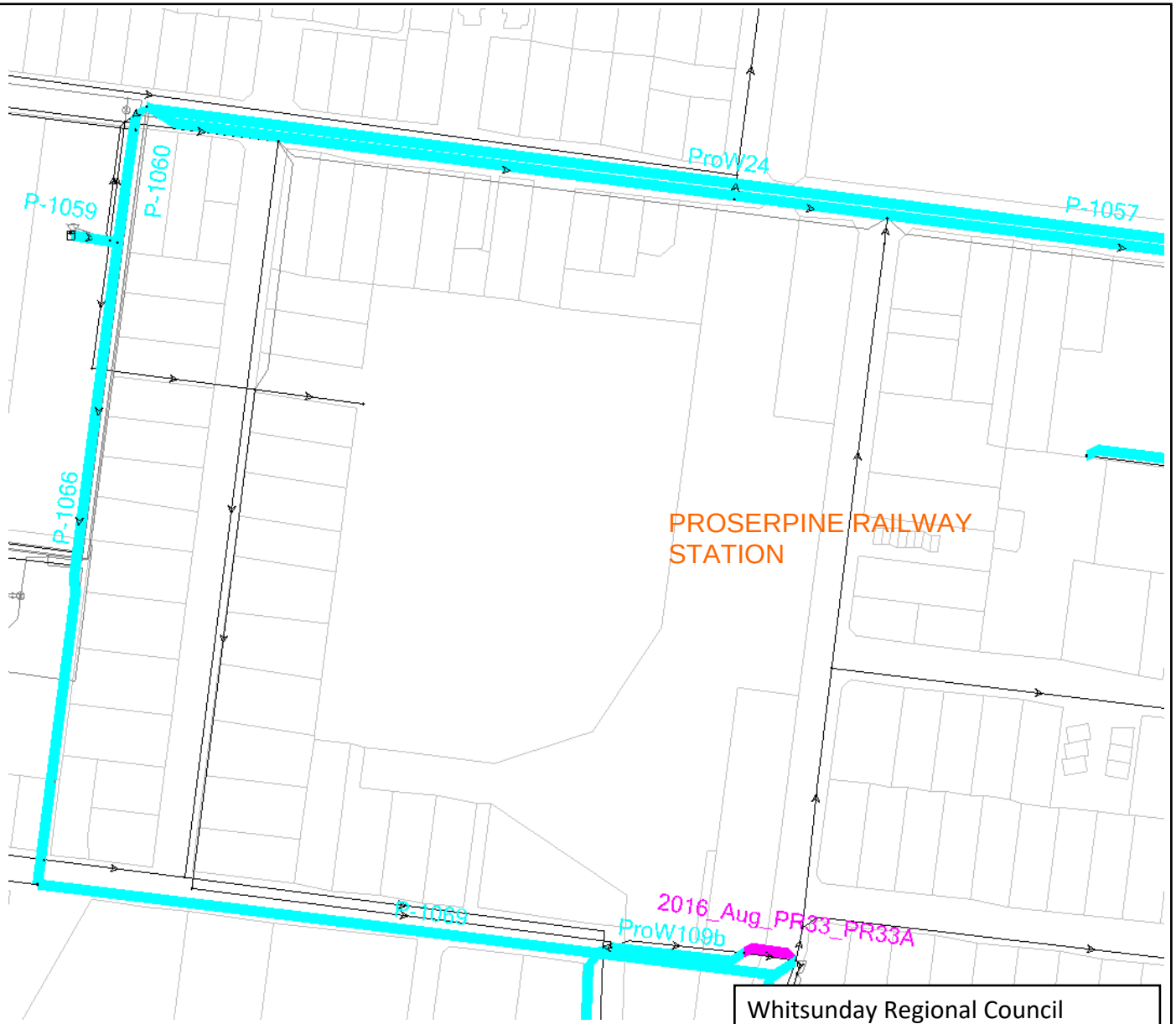
DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Whitsundays Potable Water Supply Network SHEET 2/23

ARCADIS Design & Consultancy for natural and built assets

PD DEMAND

19.002ML/d	350 L/EP/d AUGMENTATIONS - 2021
24.432ML/d	450 L/EP/d AUGMENTATIONS - 2021
27.146ML/d	500 L/EP/d AUGMENTATIONS - 2021
21.081ML/d	350 L/EP/d AUGMENTATIONS - 2026
27.105ML/d	450 L/EP/d AUGMENTATIONS - 2026
30.116ML/d	500 L/EP/d AUGMENTATIONS - 2026
23.042ML/d	350 L/EP/d AUGMENTATIONS - 2031
29.626ML/d	450 L/EP/d AUGMENTATIONS - 2031
32.918ML/d	500 L/EP/d AUGMENTATIONS - 2031
25.121ML/d	350 L/EP/d AUGMENTATIONS - 2036
32.299ML/d	450 L/EP/d AUGMENTATIONS - 2036
35.888ML/d	500 L/EP/d AUGMENTATIONS - 2036



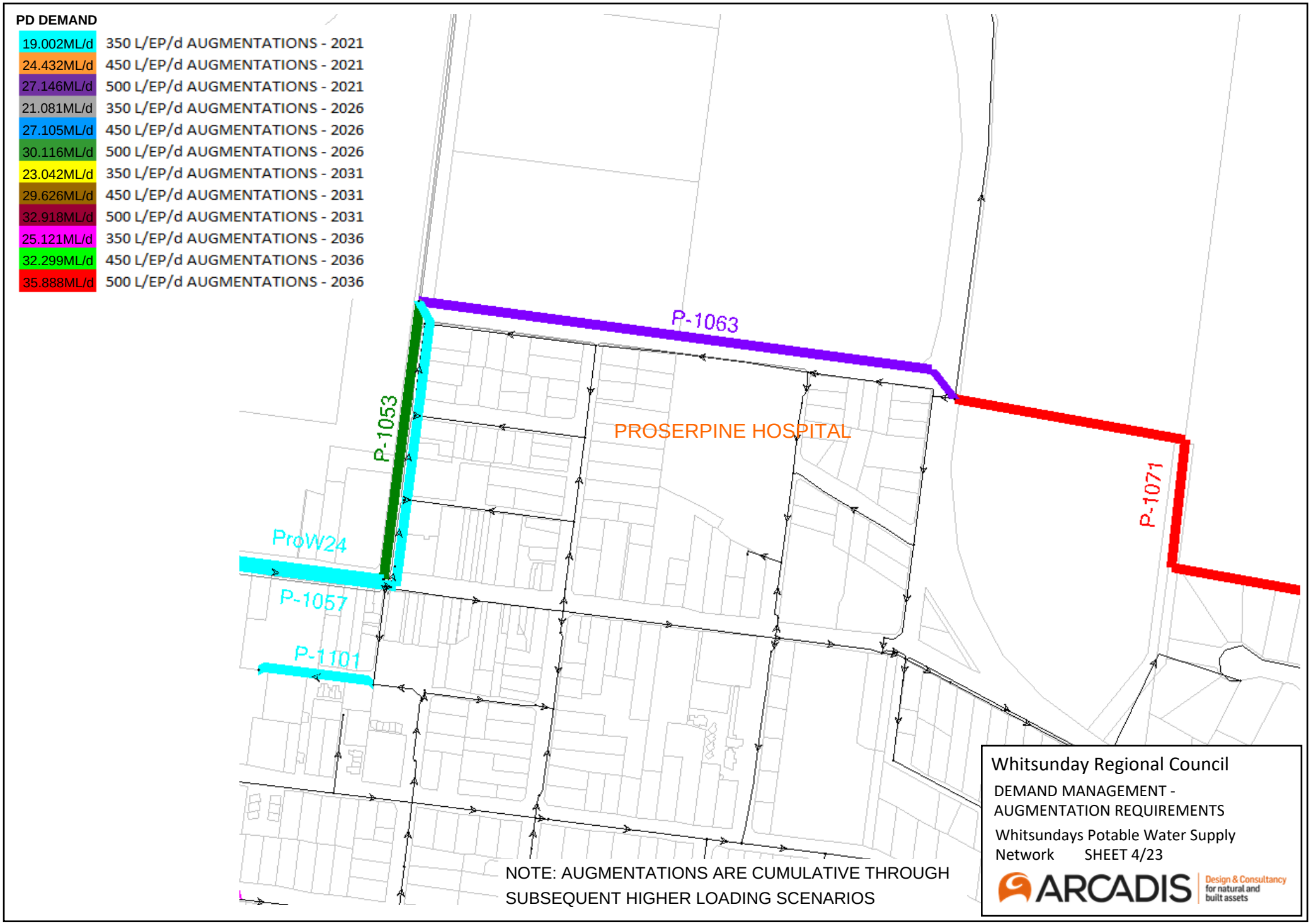
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

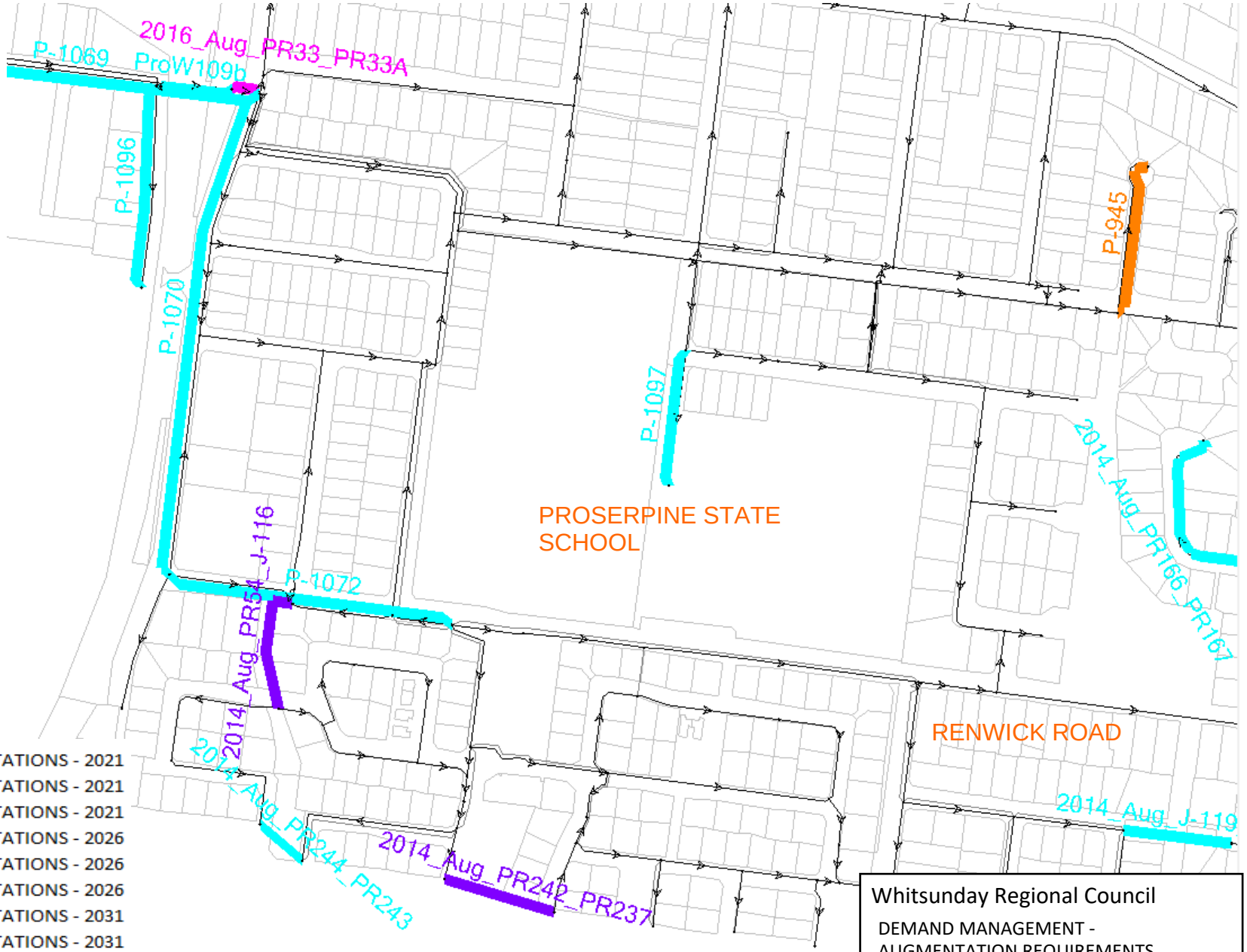
Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Whitsundays Potable Water Supply Network SHEET 3/23

ARCADIS Design & Consultancy for natural and built assets


PD DEMAND
19.002ML/d 350 L/EP/d AUGMENTATIONS - 2021
24.432ML/d 450 L/EP/d AUGMENTATIONS - 2021
27.146ML/d 500 L/EP/d AUGMENTATIONS - 2021
21.081ML/d 350 L/EP/d AUGMENTATIONS - 2026
27.105ML/d 450 L/EP/d AUGMENTATIONS - 2026
30.116ML/d 500 L/EP/d AUGMENTATIONS - 2026
23.042ML/d 350 L/EP/d AUGMENTATIONS - 2031
29.626ML/d 450 L/EP/d AUGMENTATIONS - 2031
32.918ML/d 500 L/EP/d AUGMENTATIONS - 2031
25.121ML/d 350 L/EP/d AUGMENTATIONS - 2036
32.299ML/d 450 L/EP/d AUGMENTATIONS - 2036
35.888ML/d 500 L/EP/d AUGMENTATIONS - 2036
P-1063
P-1053
PROSERPINE HOSPITAL
P-1071
ProW24
P-1057
P-1101
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS
Whitsunday Regional Council
DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS
Whitsundays Potable Water Supply Network SHEET 4/23
ARCADIS Design & Consultancy for natural and built assets



PD DEMAND

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24.432ML/d	450 L/EP/d AUGMENTATIONS - 2021
27.146ML/d	500 L/EP/d AUGMENTATIONS - 2021
21.081ML/d	350 L/EP/d AUGMENTATIONS - 2026
27.105ML/d	450 L/EP/d AUGMENTATIONS - 2026
30.116ML/d	500 L/EP/d AUGMENTATIONS - 2026
23.042ML/d	350 L/EP/d AUGMENTATIONS - 2031
29.626ML/d	450 L/EP/d AUGMENTATIONS - 2031
32.918ML/d	500 L/EP/d AUGMENTATIONS - 2031
25.121ML/d	350 L/EP/d AUGMENTATIONS - 2036
32.299ML/d	450 L/EP/d AUGMENTATIONS - 2036
35.888ML/d	500 L/EP/d AUGMENTATIONS - 2036

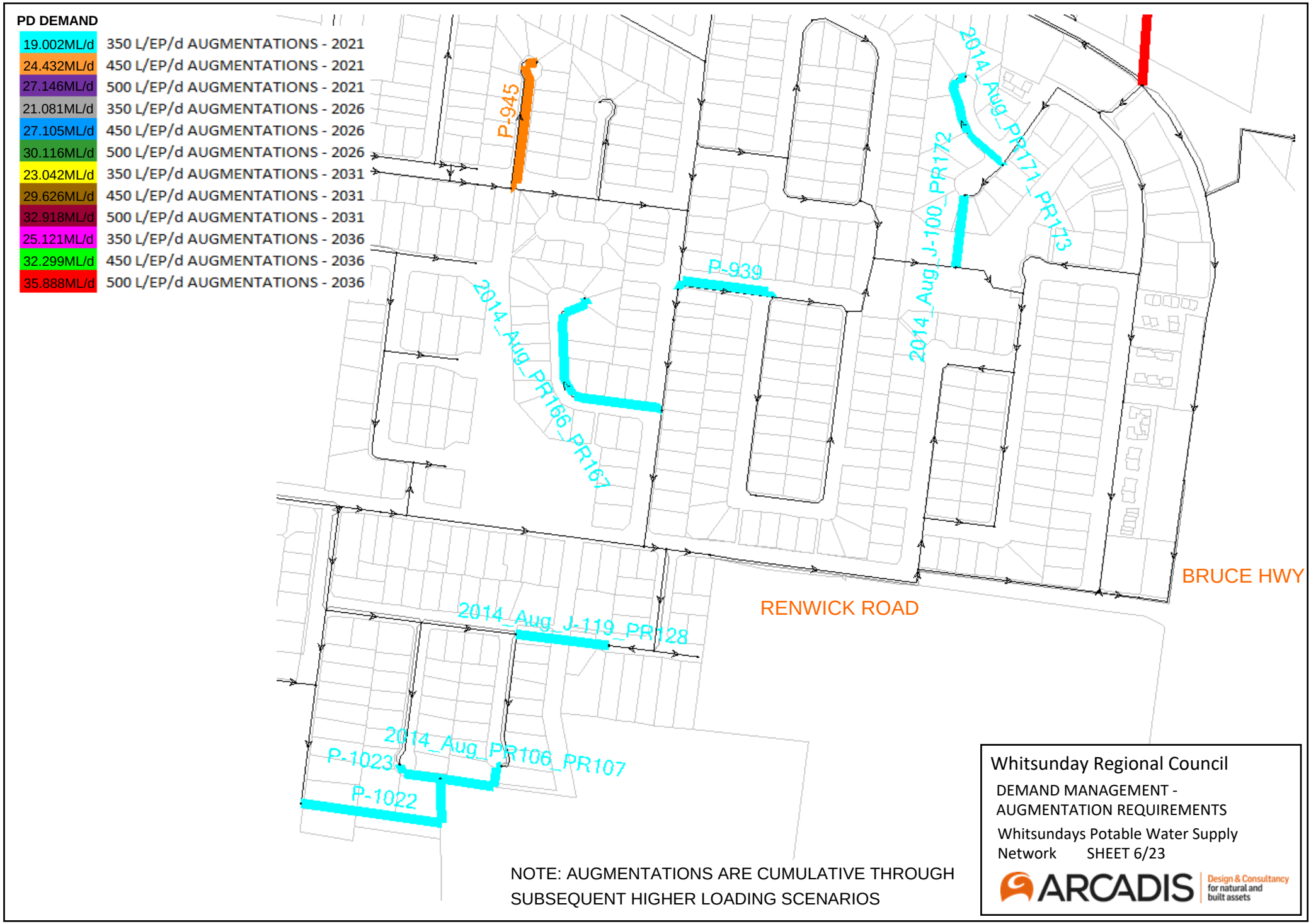
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Whitsundays Potable Water Supply Network SHEET 5/23

ARCADIS Design & Consultancy for natural and built assets


PD DEMAND
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24.432ML/d 450 L/EP/d AUGMENTATIONS - 2021
27.146ML/d 500 L/EP/d AUGMENTATIONS - 2021
21.081ML/d 350 L/EP/d AUGMENTATIONS - 2026
27.105ML/d 450 L/EP/d AUGMENTATIONS - 2026
30.116ML/d 500 L/EP/d AUGMENTATIONS - 2026
23.042ML/d 350 L/EP/d AUGMENTATIONS - 2031
29.626ML/d 450 L/EP/d AUGMENTATIONS - 2031
32.918ML/d 500 L/EP/d AUGMENTATIONS - 2031
25.121ML/d 350 L/EP/d AUGMENTATIONS - 2036
32.299ML/d 450 L/EP/d AUGMENTATIONS - 2036
35.888ML/d 500 L/EP/d AUGMENTATIONS - 2036
P-945
P-939
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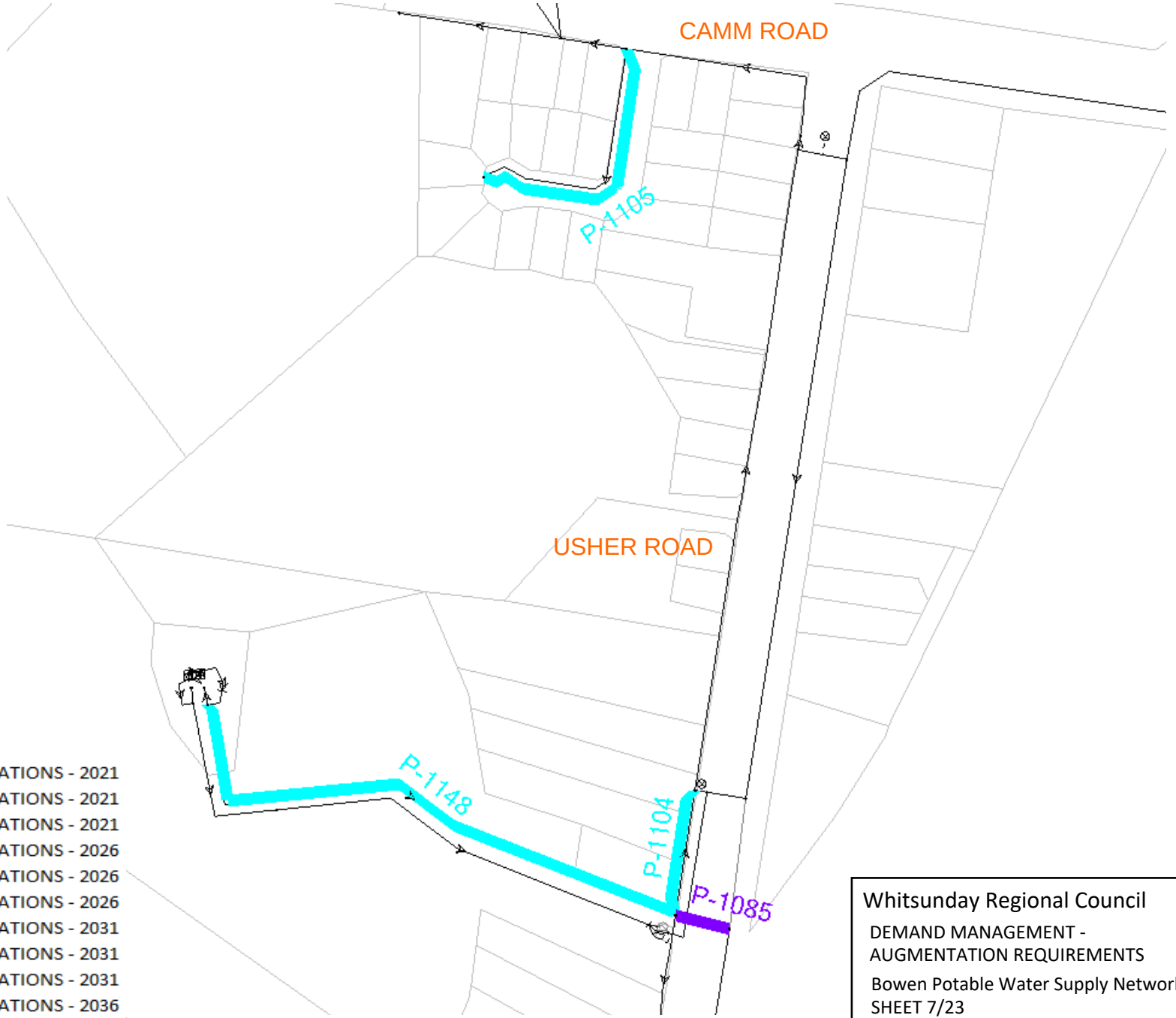
2014_Aug_J-100_PR172
2014_Aug_PR171_PR173
2014_Aug_J-119_PR128
2014_Aug_PR106_PR107
P-1023
P-1022
RENWICK ROAD
BRUCE HWY
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS
Whitsunday Regional Council
DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS
Whitsundays Potable Water Supply Network SHEET 6/23
ARCADIS Design & Consultancy for natural and built assets



PD DEMAND

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24.432ML/d	450 L/EP/d AUGMENTATIONS - 2021
27.146ML/d	500 L/EP/d AUGMENTATIONS - 2021
21.081ML/d	350 L/EP/d AUGMENTATIONS - 2026
27.105ML/d	450 L/EP/d AUGMENTATIONS - 2026
30.116ML/d	500 L/EP/d AUGMENTATIONS - 2026
23.042ML/d	350 L/EP/d AUGMENTATIONS - 2031
29.626ML/d	450 L/EP/d AUGMENTATIONS - 2031
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32.299ML/d	450 L/EP/d AUGMENTATIONS - 2036
35.888ML/d	500 L/EP/d AUGMENTATIONS - 2036

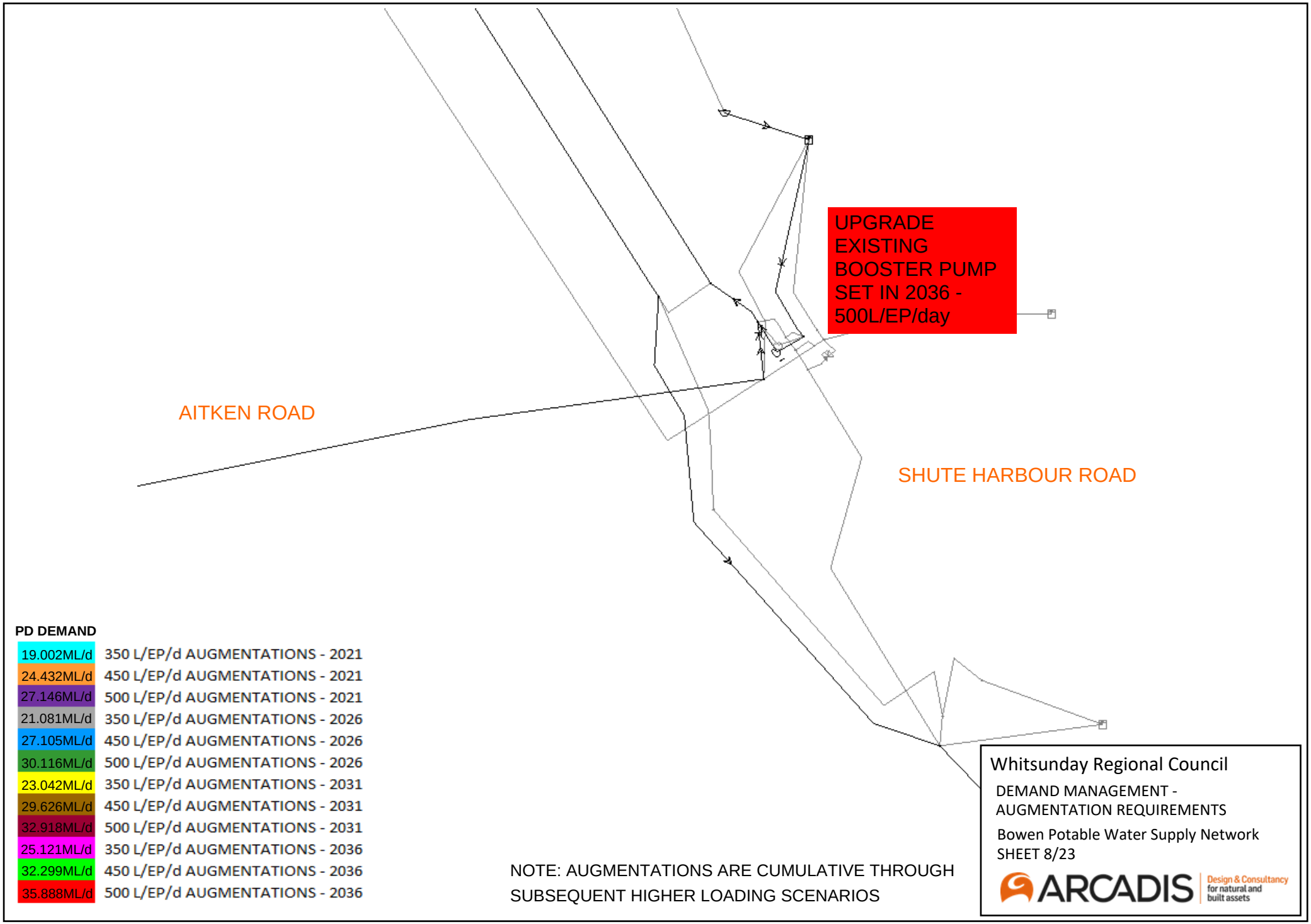
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Bowen Potable Water Supply Network
SHEET 7/23

ARCADIS Design & Consultancy for natural and built assets



PD DEMAND

19.002ML/d	350 L/EP/d AUGMENTATIONS - 2021
24.432ML/d	450 L/EP/d AUGMENTATIONS - 2021
27.146ML/d	500 L/EP/d AUGMENTATIONS - 2021
21.081ML/d	350 L/EP/d AUGMENTATIONS - 2026
27.105ML/d	450 L/EP/d AUGMENTATIONS - 2026
30.116ML/d	500 L/EP/d AUGMENTATIONS - 2026
23.042ML/d	350 L/EP/d AUGMENTATIONS - 2031
29.626ML/d	450 L/EP/d AUGMENTATIONS - 2031
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32.299ML/d	450 L/EP/d AUGMENTATIONS - 2036
35.888ML/d	500 L/EP/d AUGMENTATIONS - 2036

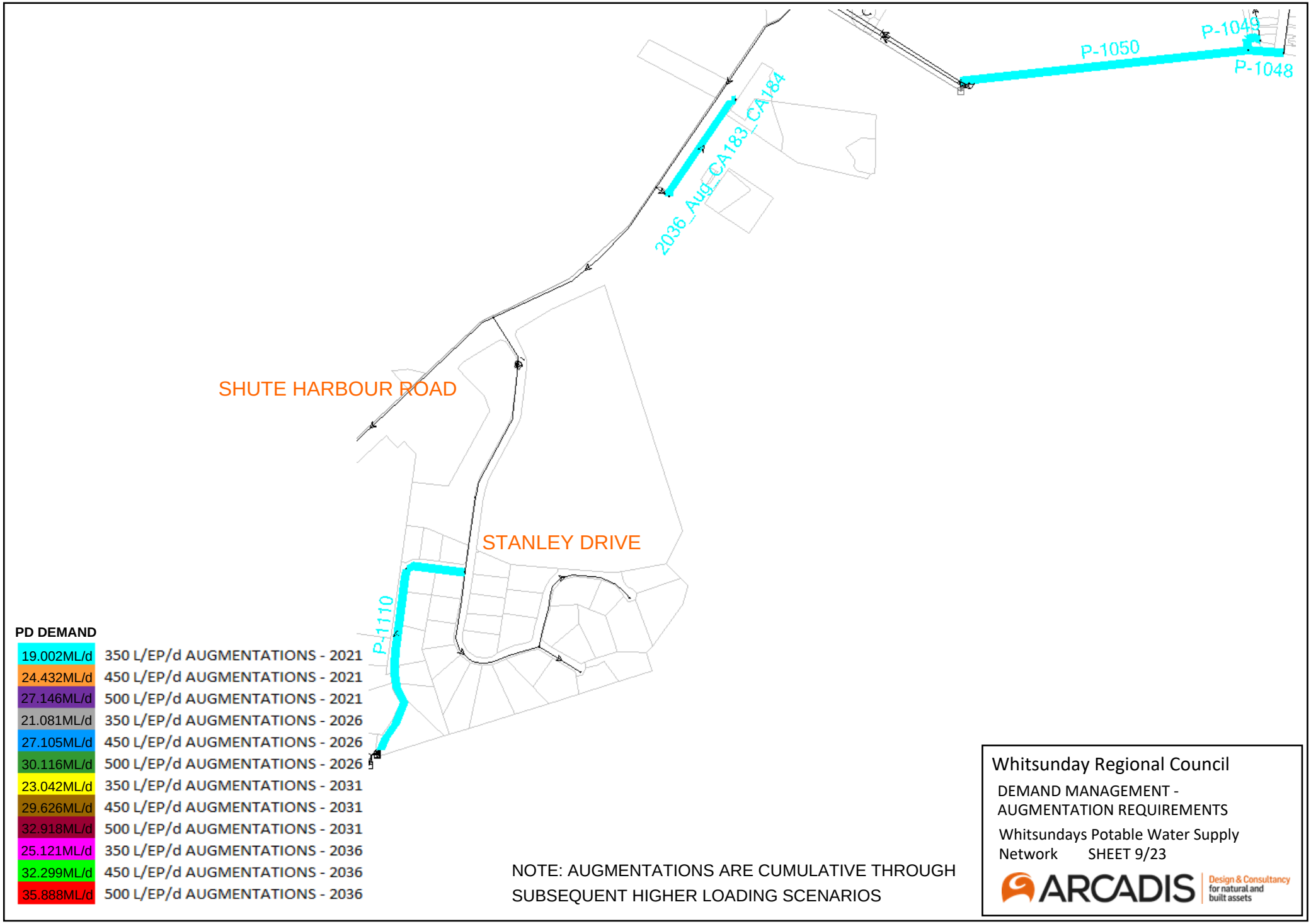
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Bowen Potable Water Supply Network
SHEET 8/23

ARCADIS Design & Consultancy for natural and built assets



PD DEMAND

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24.432ML/d	450 L/EP/d AUGMENTATIONS - 2021
27.146ML/d	500 L/EP/d AUGMENTATIONS - 2021
21.081ML/d	350 L/EP/d AUGMENTATIONS - 2026
27.105ML/d	450 L/EP/d AUGMENTATIONS - 2026
30.116ML/d	500 L/EP/d AUGMENTATIONS - 2026
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32.299ML/d	450 L/EP/d AUGMENTATIONS - 2036
35.888ML/d	500 L/EP/d AUGMENTATIONS - 2036

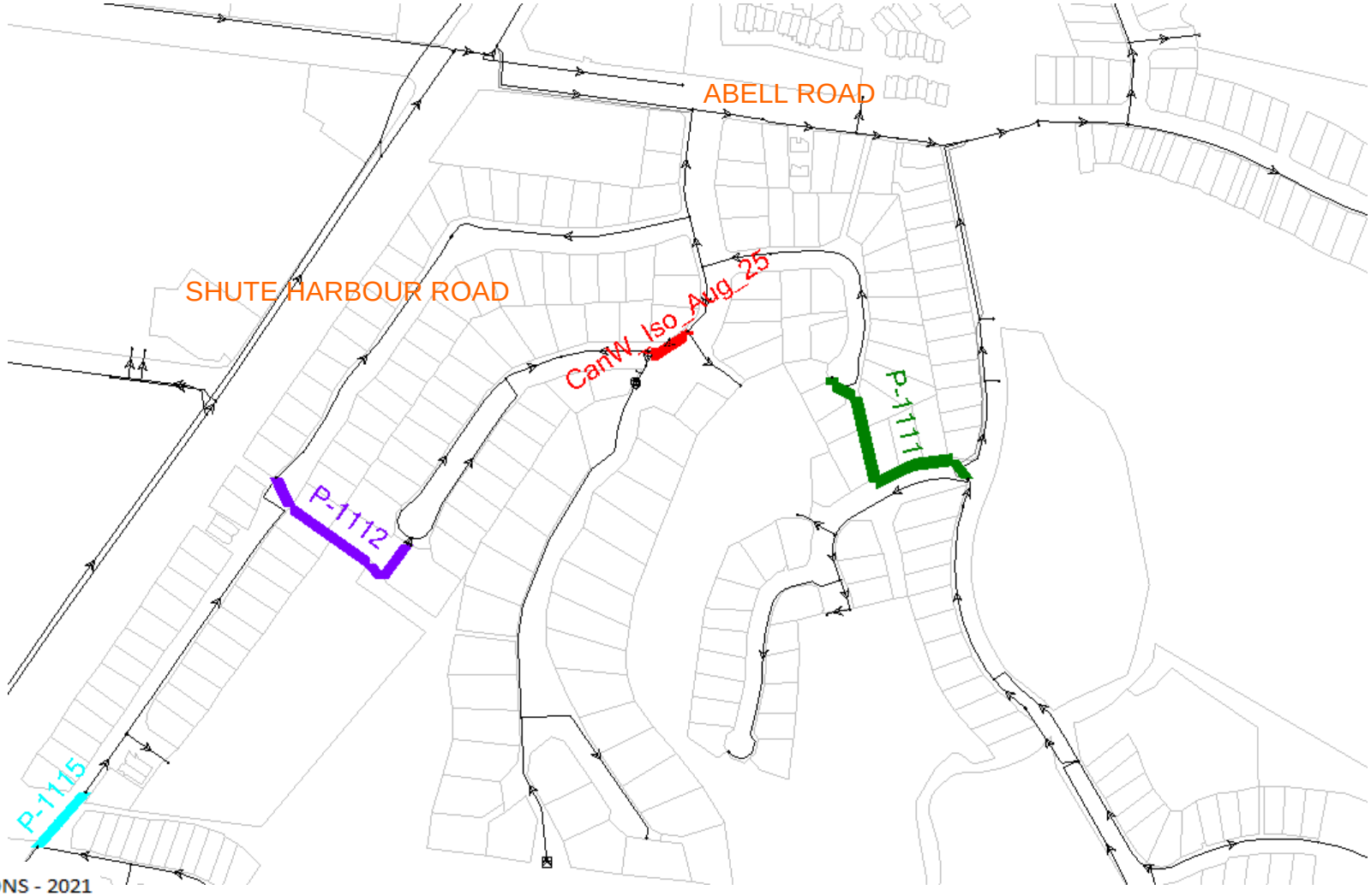
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Whitsundays Potable Water Supply Network SHEET 9/23

ARCADIS Design & Consultancy for natural and built assets



PD DEMAND

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24.432ML/d	450 L/EP/d AUGMENTATIONS - 2021
27.146ML/d	500 L/EP/d AUGMENTATIONS - 2021
21.081ML/d	350 L/EP/d AUGMENTATIONS - 2026
27.105ML/d	450 L/EP/d AUGMENTATIONS - 2026
30.116ML/d	500 L/EP/d AUGMENTATIONS - 2026
23.042ML/d	350 L/EP/d AUGMENTATIONS - 2031
29.626ML/d	450 L/EP/d AUGMENTATIONS - 2031
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32.299ML/d	450 L/EP/d AUGMENTATIONS - 2036
35.888ML/d	500 L/EP/d AUGMENTATIONS - 2036

NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

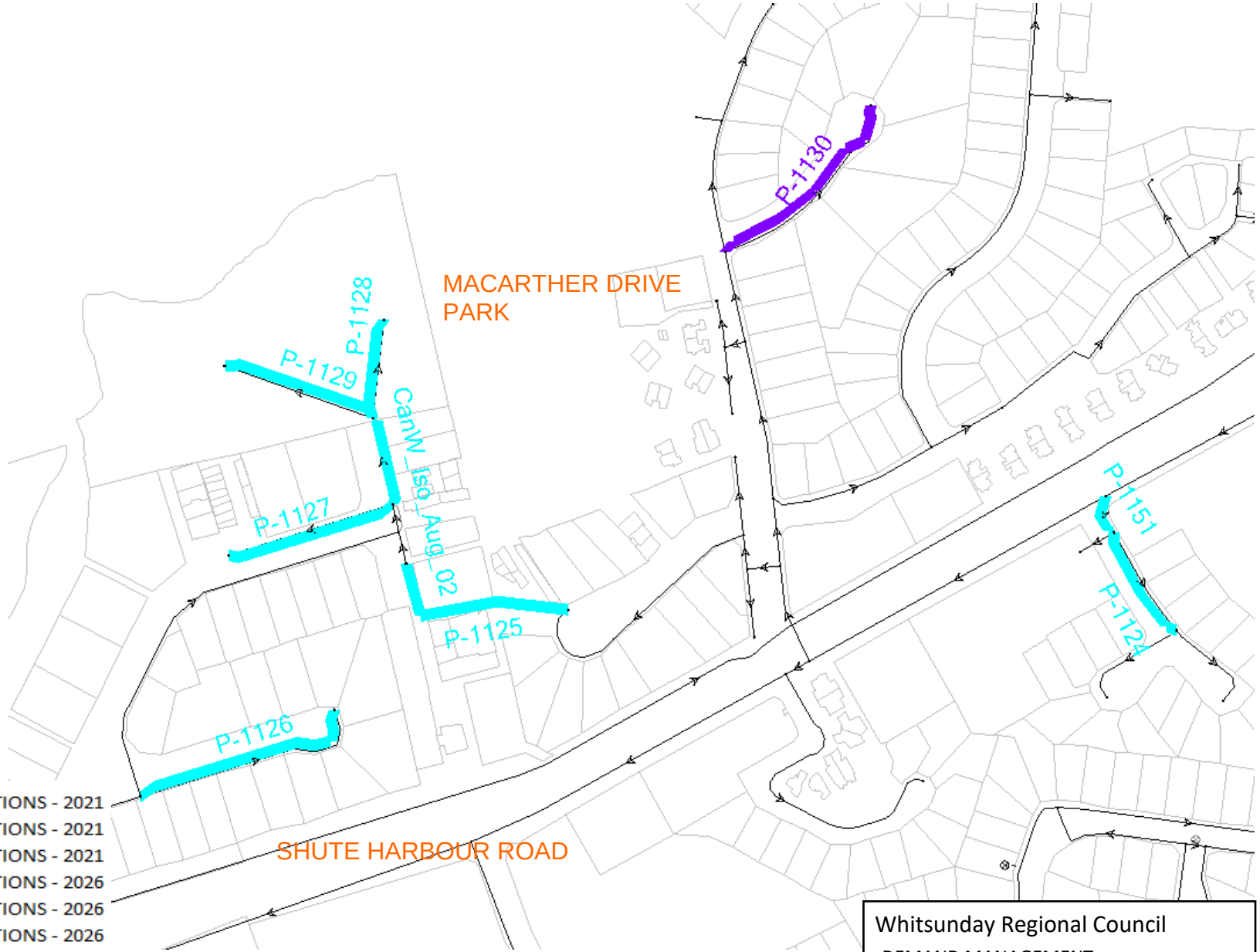
DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Whitsundays Potable Water Supply Network SHEET 10/23

ARCADIS Design & Consultancy for natural and built assets

20/12/2019

SK005-10027536-01



PD DEMAND

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24.432ML/d	450 L/EP/d AUGMENTATIONS - 2021
27.146ML/d	500 L/EP/d AUGMENTATIONS - 2021
21.081ML/d	350 L/EP/d AUGMENTATIONS - 2026
27.105ML/d	450 L/EP/d AUGMENTATIONS - 2026
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23.042ML/d	350 L/EP/d AUGMENTATIONS - 2031
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32.299ML/d	450 L/EP/d AUGMENTATIONS - 2036
35.888ML/d	500 L/EP/d AUGMENTATIONS - 2036

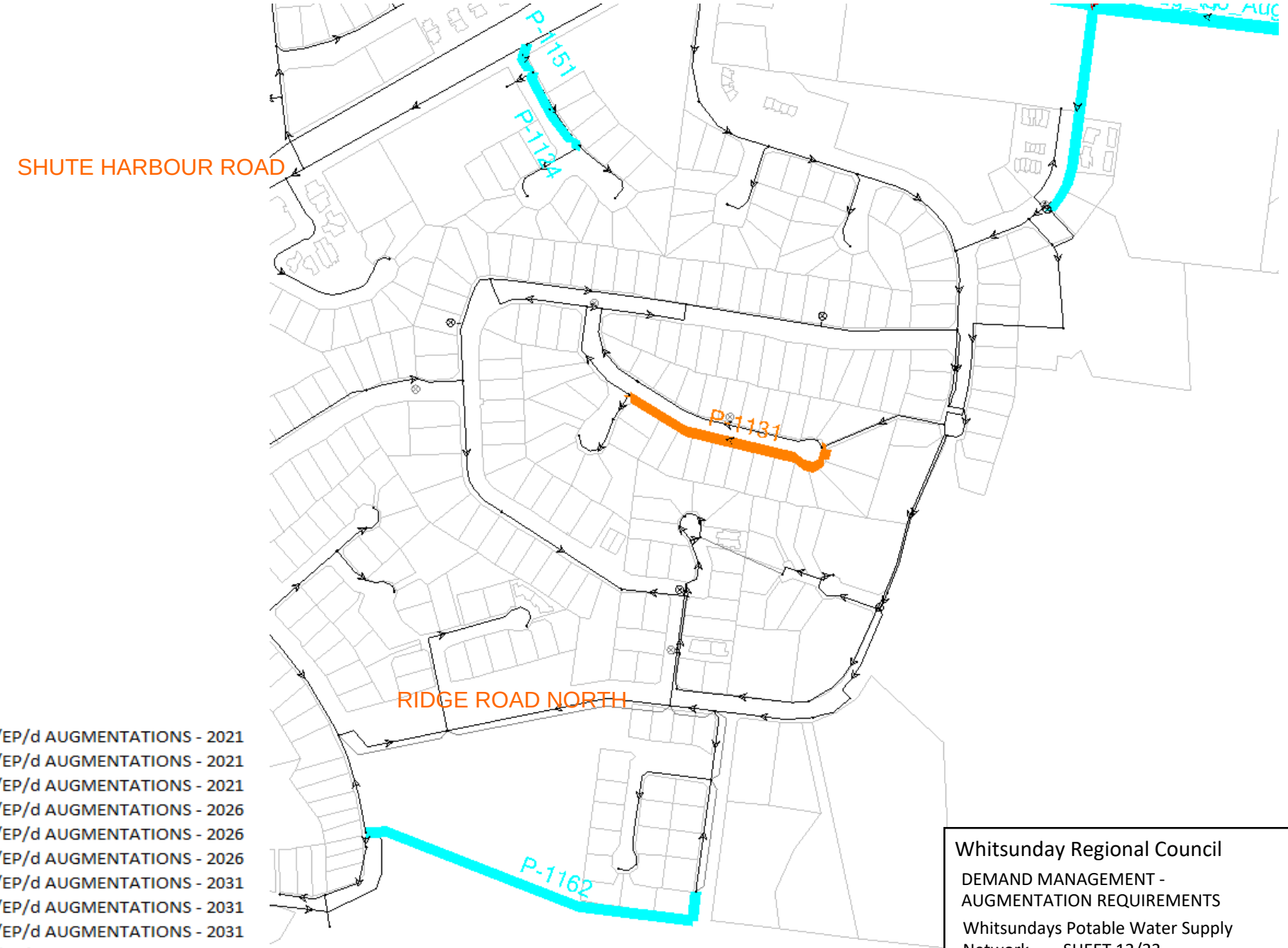
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Whitsundays Potable Water Supply Network SHEET 11/23

ARCADIS Design & Consultancy for natural and built assets



PD DEMAND

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24.432ML/d	450 L/EP/d AUGMENTATIONS - 2021
27.146ML/d	500 L/EP/d AUGMENTATIONS - 2021
21.081ML/d	350 L/EP/d AUGMENTATIONS - 2026
27.105ML/d	450 L/EP/d AUGMENTATIONS - 2026
30.116ML/d	500 L/EP/d AUGMENTATIONS - 2026
23.042ML/d	350 L/EP/d AUGMENTATIONS - 2031
29.626ML/d	450 L/EP/d AUGMENTATIONS - 2031
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32.299ML/d	450 L/EP/d AUGMENTATIONS - 2036
35.888ML/d	500 L/EP/d AUGMENTATIONS - 2036

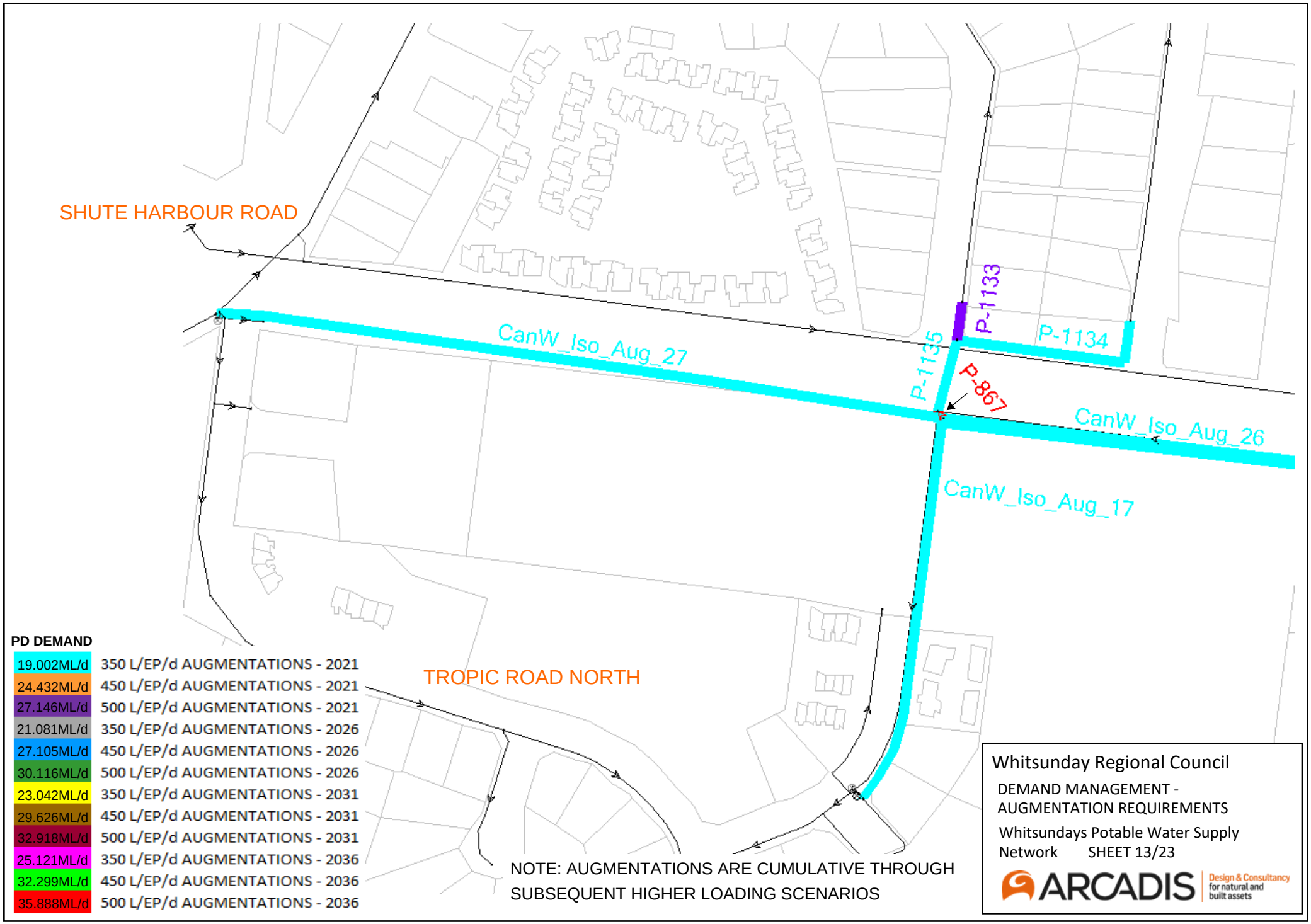
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

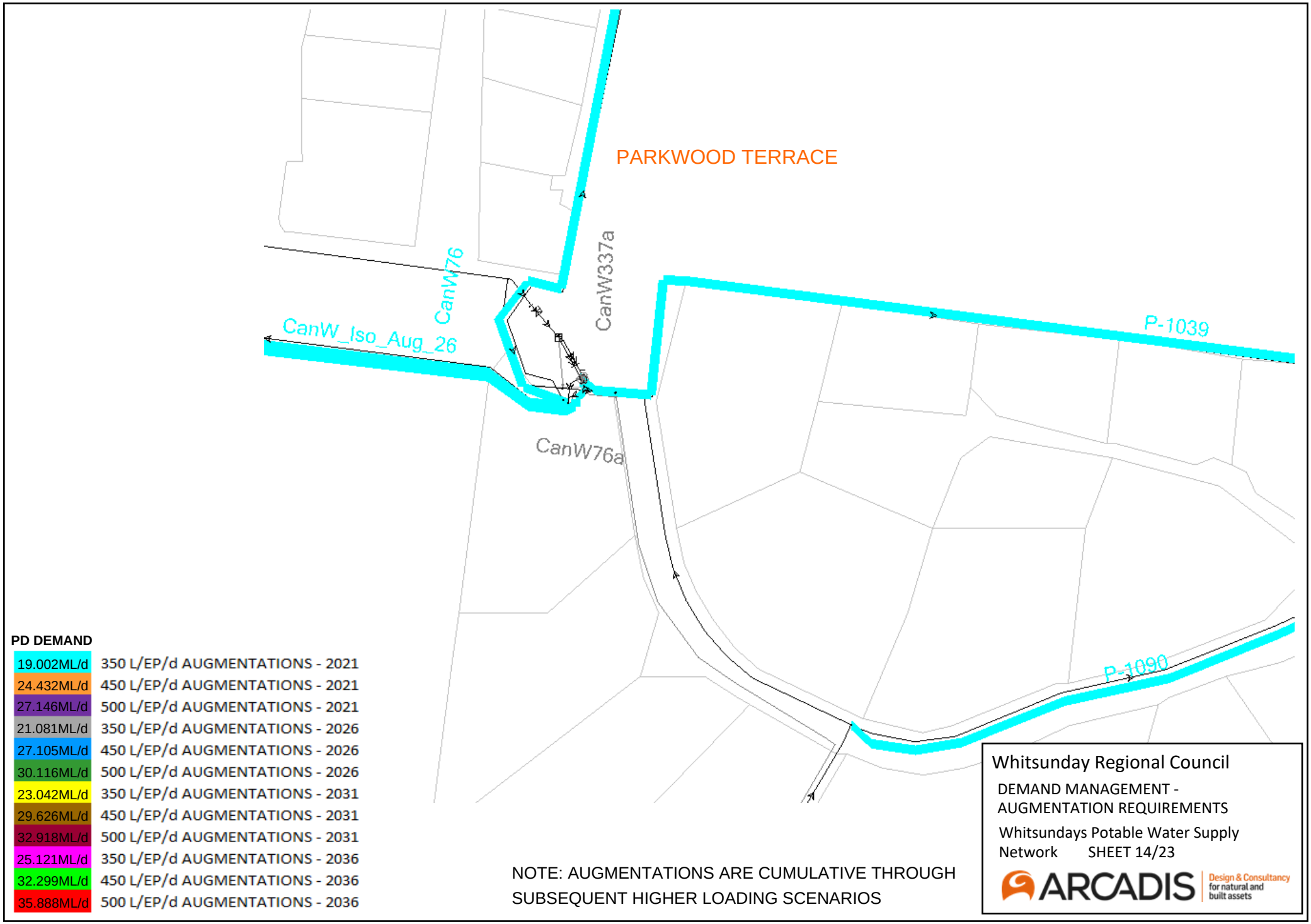
Whitsundays Potable Water Supply Network SHEET 12/23

ARCADIS Design & Consultancy for natural and built assets



20/12/2019

SK005-10027536-01



PD DEMAND

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24.432ML/d	450 L/EP/d AUGMENTATIONS - 2021
27.146ML/d	500 L/EP/d AUGMENTATIONS - 2021
21.081ML/d	350 L/EP/d AUGMENTATIONS - 2026
27.105ML/d	450 L/EP/d AUGMENTATIONS - 2026
30.116ML/d	500 L/EP/d AUGMENTATIONS - 2026
23.042ML/d	350 L/EP/d AUGMENTATIONS - 2031
29.626ML/d	450 L/EP/d AUGMENTATIONS - 2031
32.918ML/d	500 L/EP/d AUGMENTATIONS - 2031
25.121ML/d	350 L/EP/d AUGMENTATIONS - 2036
32.299ML/d	450 L/EP/d AUGMENTATIONS - 2036
35.888ML/d	500 L/EP/d AUGMENTATIONS - 2036

NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

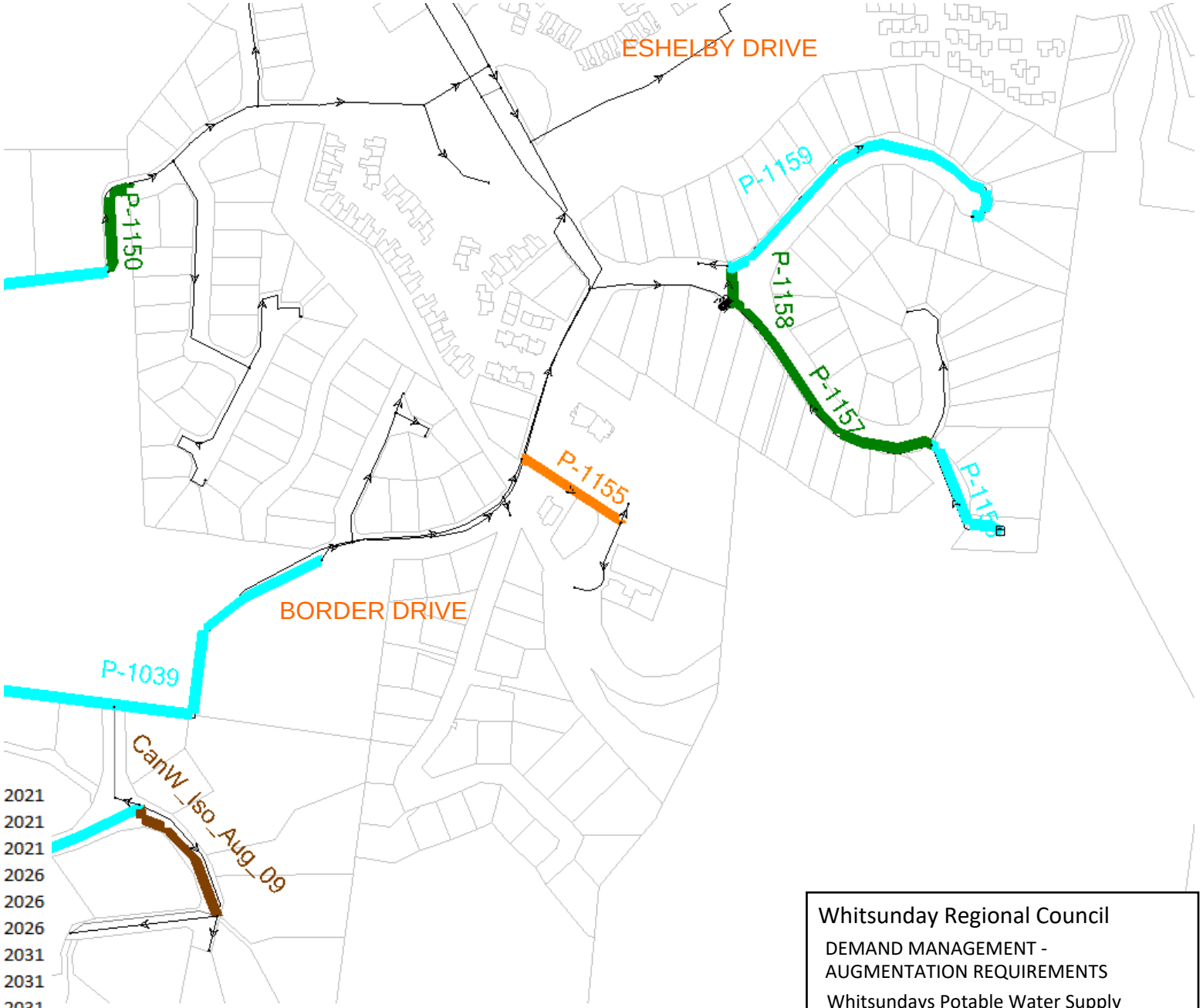
DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Whitsundays Potable Water Supply Network SHEET 14/23

ARCADIS Design & Consultancy for natural and built assets

20/12/2019

SK005-10027536-01



PD DEMAND

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24.432ML/d	450 L/EP/d AUGMENTATIONS - 2021
27.146ML/d	500 L/EP/d AUGMENTATIONS - 2021
21.081ML/d	350 L/EP/d AUGMENTATIONS - 2026
27.105ML/d	450 L/EP/d AUGMENTATIONS - 2026
30.116ML/d	500 L/EP/d AUGMENTATIONS - 2026
23.042ML/d	350 L/EP/d AUGMENTATIONS - 2031
29.626ML/d	450 L/EP/d AUGMENTATIONS - 2031
32.918ML/d	500 L/EP/d AUGMENTATIONS - 2031
25.121ML/d	350 L/EP/d AUGMENTATIONS - 2036
32.299ML/d	450 L/EP/d AUGMENTATIONS - 2036
35.888ML/d	500 L/EP/d AUGMENTATIONS - 2036

NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

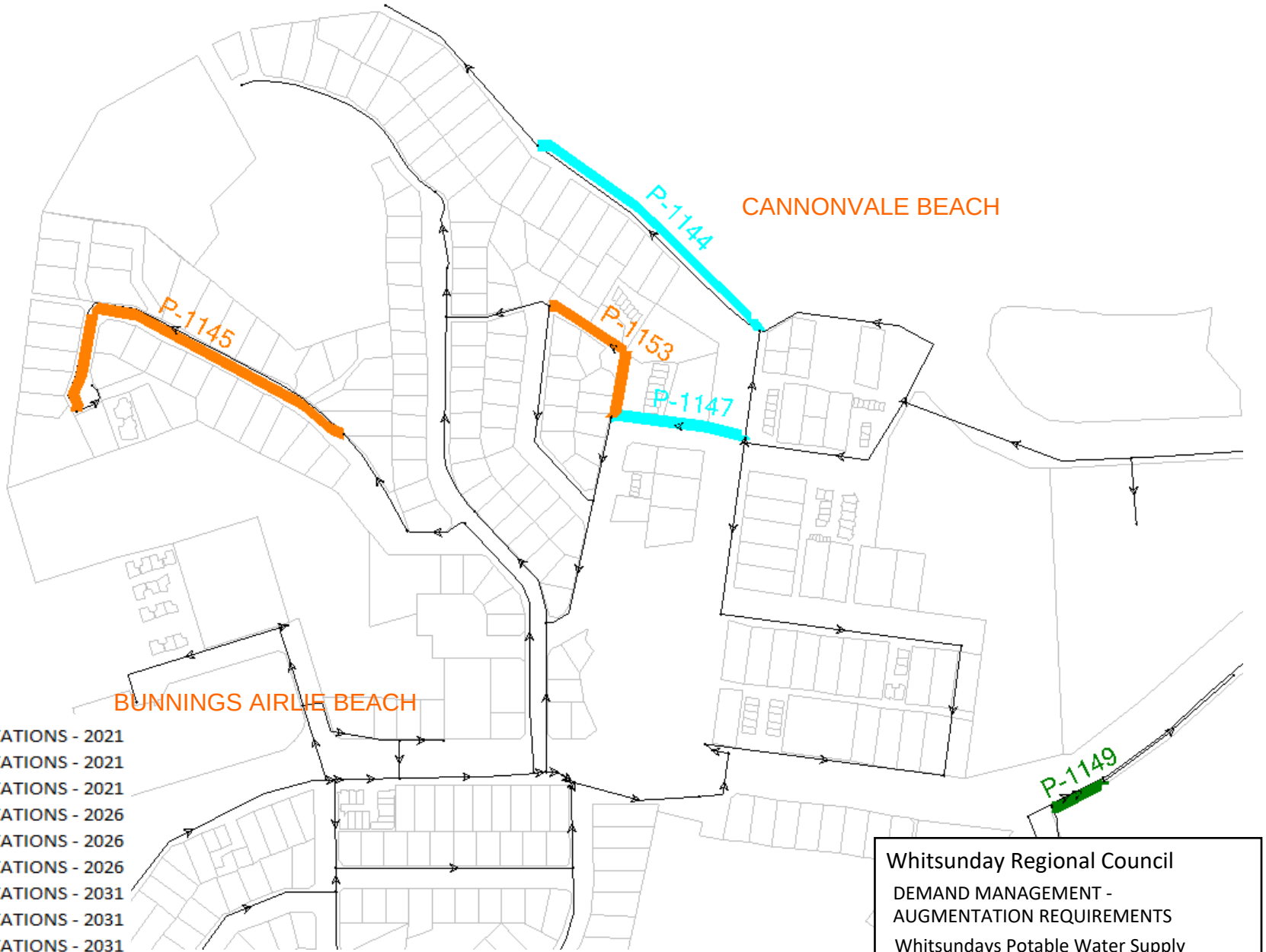
DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Whitsundays Potable Water Supply Network SHEET 15/23

ARCADIS Design & Consultancy for natural and built assets

20/12/2019

SK005-10027536-01



PD DEMAND

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24.432ML/d	450 L/EP/d AUGMENTATIONS - 2021
27.146ML/d	500 L/EP/d AUGMENTATIONS - 2021
21.081ML/d	350 L/EP/d AUGMENTATIONS - 2026
27.105ML/d	450 L/EP/d AUGMENTATIONS - 2026
30.116ML/d	500 L/EP/d AUGMENTATIONS - 2026
23.042ML/d	350 L/EP/d AUGMENTATIONS - 2031
29.626ML/d	450 L/EP/d AUGMENTATIONS - 2031
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32.299ML/d	450 L/EP/d AUGMENTATIONS - 2036
35.888ML/d	500 L/EP/d AUGMENTATIONS - 2036

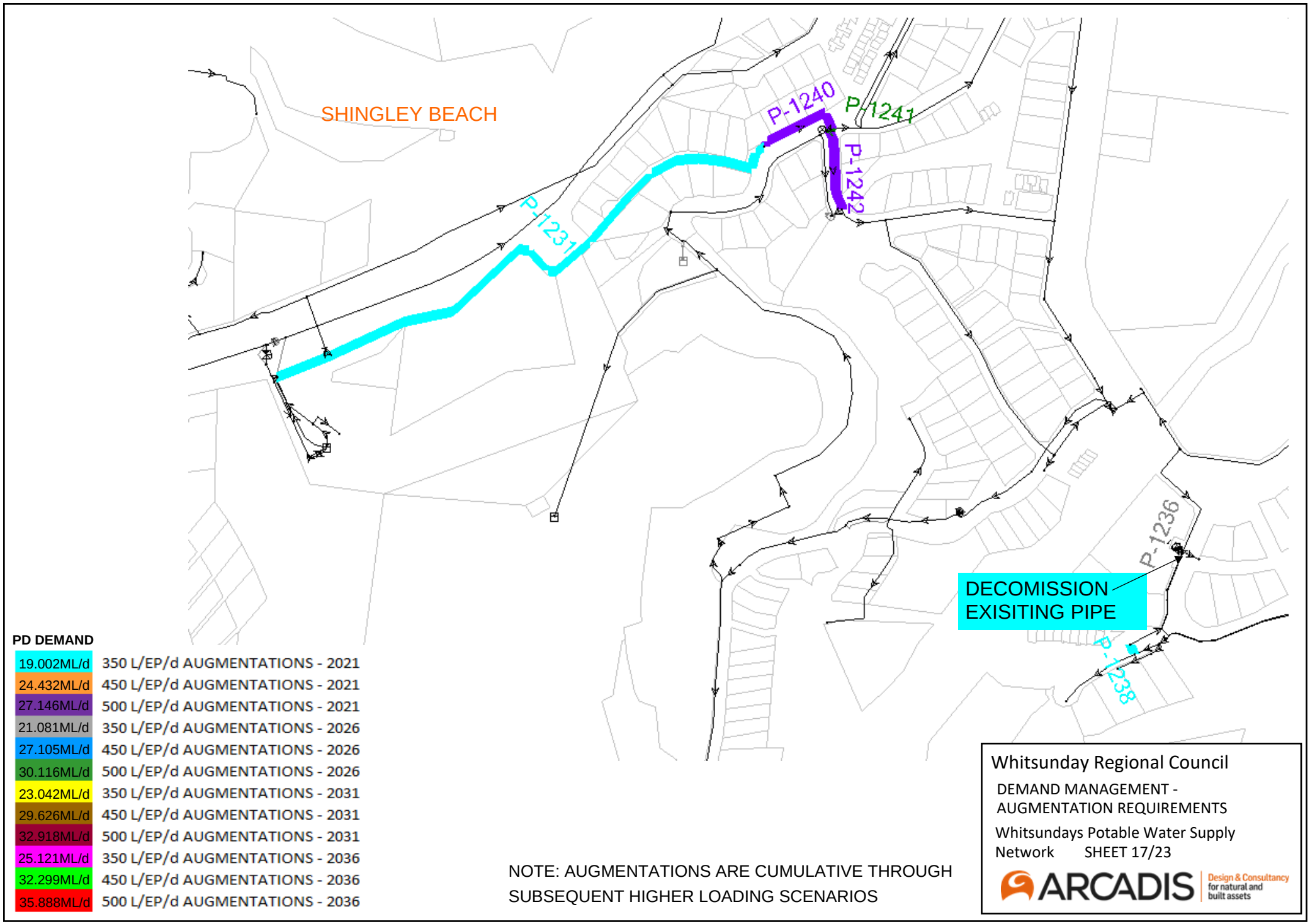
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Whitsundays Potable Water Supply Network SHEET 16/23

ARCADIS Design & Consultancy for natural and built assets



PD DEMAND

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24.432ML/d	450 L/EP/d AUGMENTATIONS - 2021
27.146ML/d	500 L/EP/d AUGMENTATIONS - 2021
21.081ML/d	350 L/EP/d AUGMENTATIONS - 2026
27.105ML/d	450 L/EP/d AUGMENTATIONS - 2026
30.116ML/d	500 L/EP/d AUGMENTATIONS - 2026
23.042ML/d	350 L/EP/d AUGMENTATIONS - 2031
29.626ML/d	450 L/EP/d AUGMENTATIONS - 2031
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32.299ML/d	450 L/EP/d AUGMENTATIONS - 2036
35.888ML/d	500 L/EP/d AUGMENTATIONS - 2036

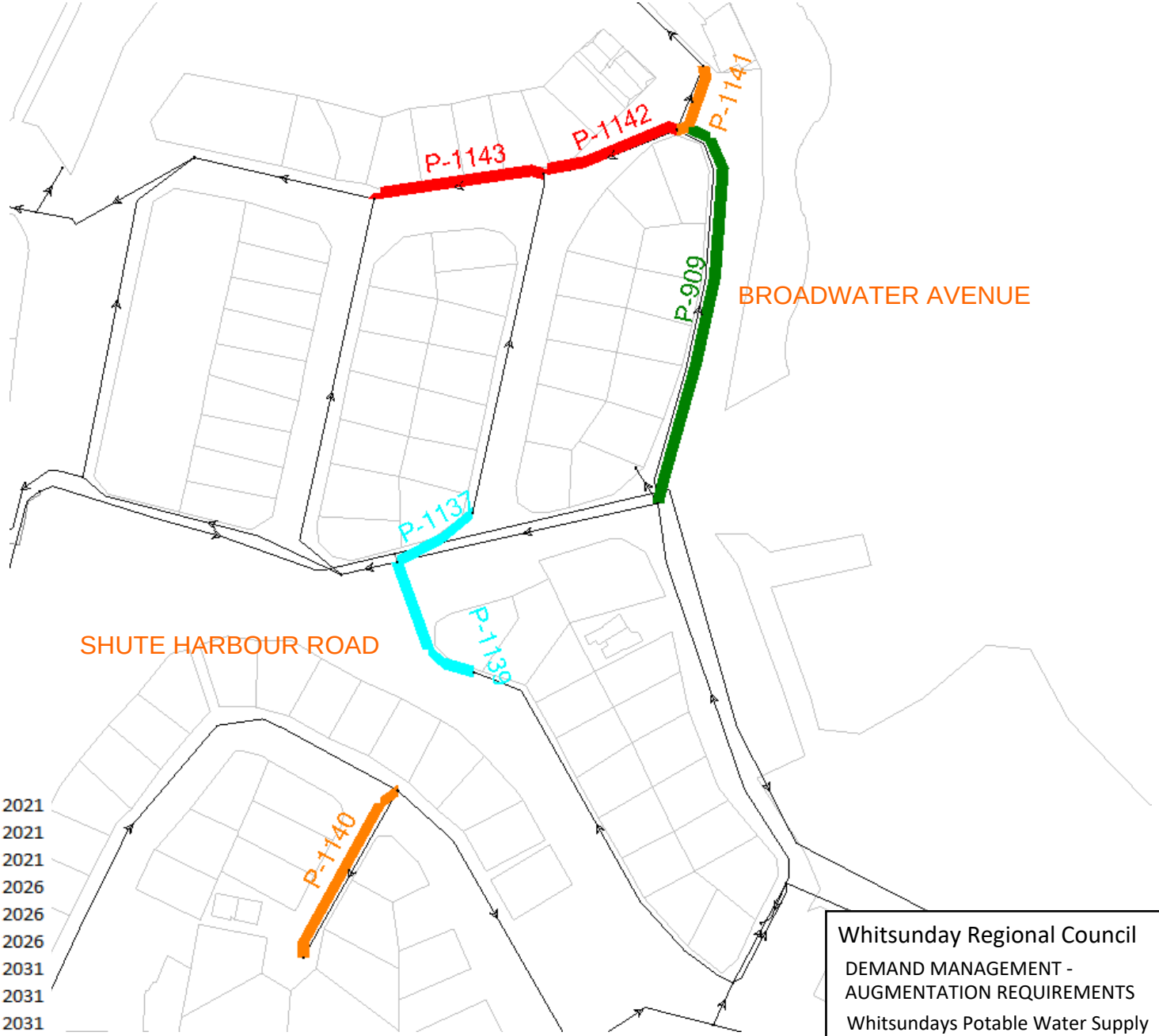
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Whitsundays Potable Water Supply Network SHEET 17/23

ARCADIS Design & Consultancy for natural and built assets



PD DEMAND

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24.432ML/d	450 L/EP/d AUGMENTATIONS - 2021
27.146ML/d	500 L/EP/d AUGMENTATIONS - 2021
21.081ML/d	350 L/EP/d AUGMENTATIONS - 2026
27.105ML/d	450 L/EP/d AUGMENTATIONS - 2026
30.116ML/d	500 L/EP/d AUGMENTATIONS - 2026
23.042ML/d	350 L/EP/d AUGMENTATIONS - 2031
29.626ML/d	450 L/EP/d AUGMENTATIONS - 2031
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32.299ML/d	450 L/EP/d AUGMENTATIONS - 2036
35.888ML/d	500 L/EP/d AUGMENTATIONS - 2036

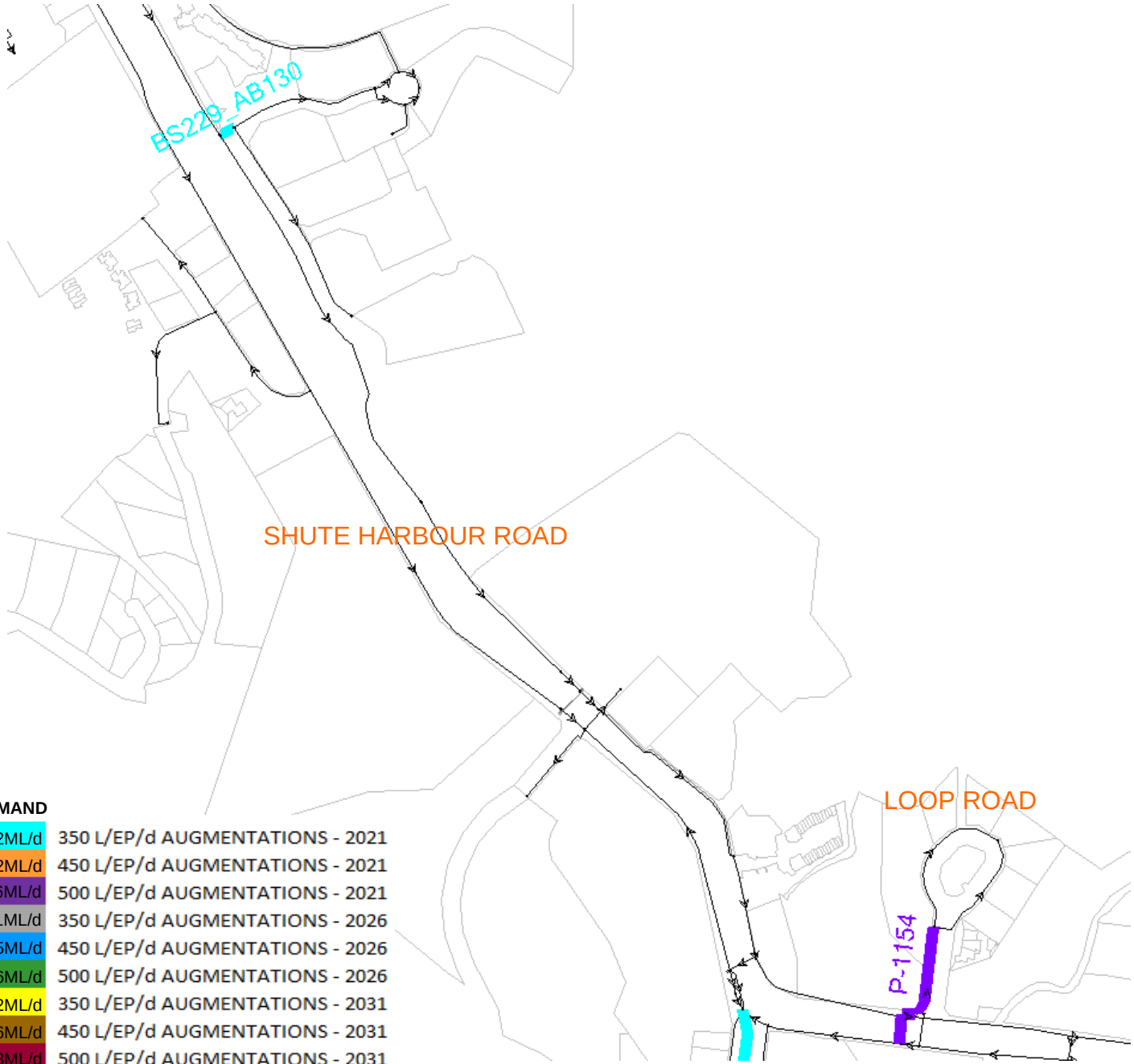
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Whitsundays Potable Water Supply Network SHEET 18/23

ARCADIS Design & Consultancy for natural and built assets



PD DEMAND

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27.146ML/d	500 L/EP/d AUGMENTATIONS - 2021
21.081ML/d	350 L/EP/d AUGMENTATIONS - 2026
27.105ML/d	450 L/EP/d AUGMENTATIONS - 2026
30.116ML/d	500 L/EP/d AUGMENTATIONS - 2026
23.042ML/d	350 L/EP/d AUGMENTATIONS - 2031
29.626ML/d	450 L/EP/d AUGMENTATIONS - 2031
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32.299ML/d	450 L/EP/d AUGMENTATIONS - 2036
35.888ML/d	500 L/EP/d AUGMENTATIONS - 2036

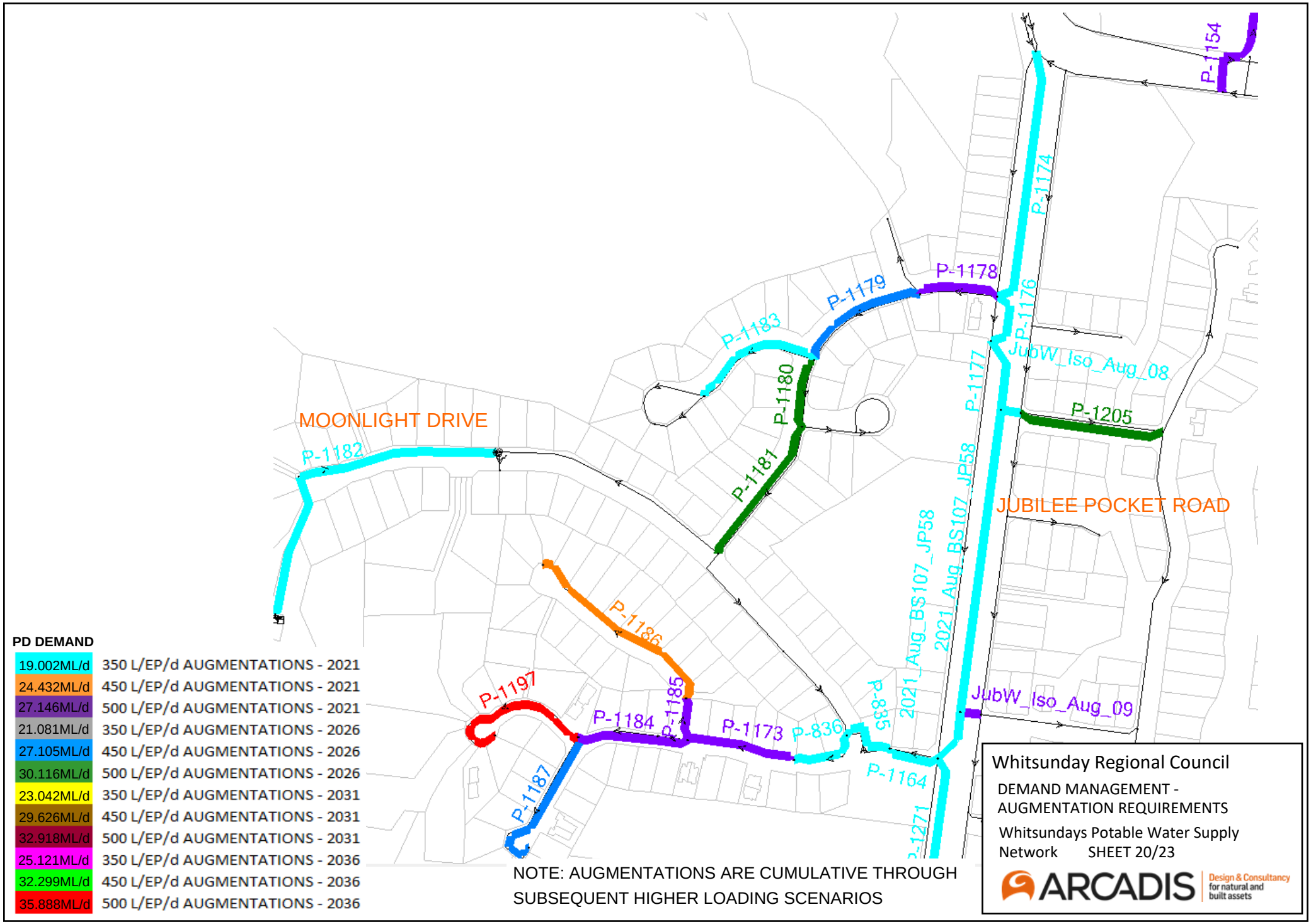
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Whitsundays Potable Water Supply Network SHEET 19/23

ARCADIS Design & Consultancy for natural and built assets



PD DEMAND

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30.116ML/d	500 L/EP/d AUGMENTATIONS - 2026
23.042ML/d	350 L/EP/d AUGMENTATIONS - 2031
29.626ML/d	450 L/EP/d AUGMENTATIONS - 2031
32.918ML/d	500 L/EP/d AUGMENTATIONS - 2031
25.121ML/d	350 L/EP/d AUGMENTATIONS - 2036
32.299ML/d	450 L/EP/d AUGMENTATIONS - 2036
35.888ML/d	500 L/EP/d AUGMENTATIONS - 2036

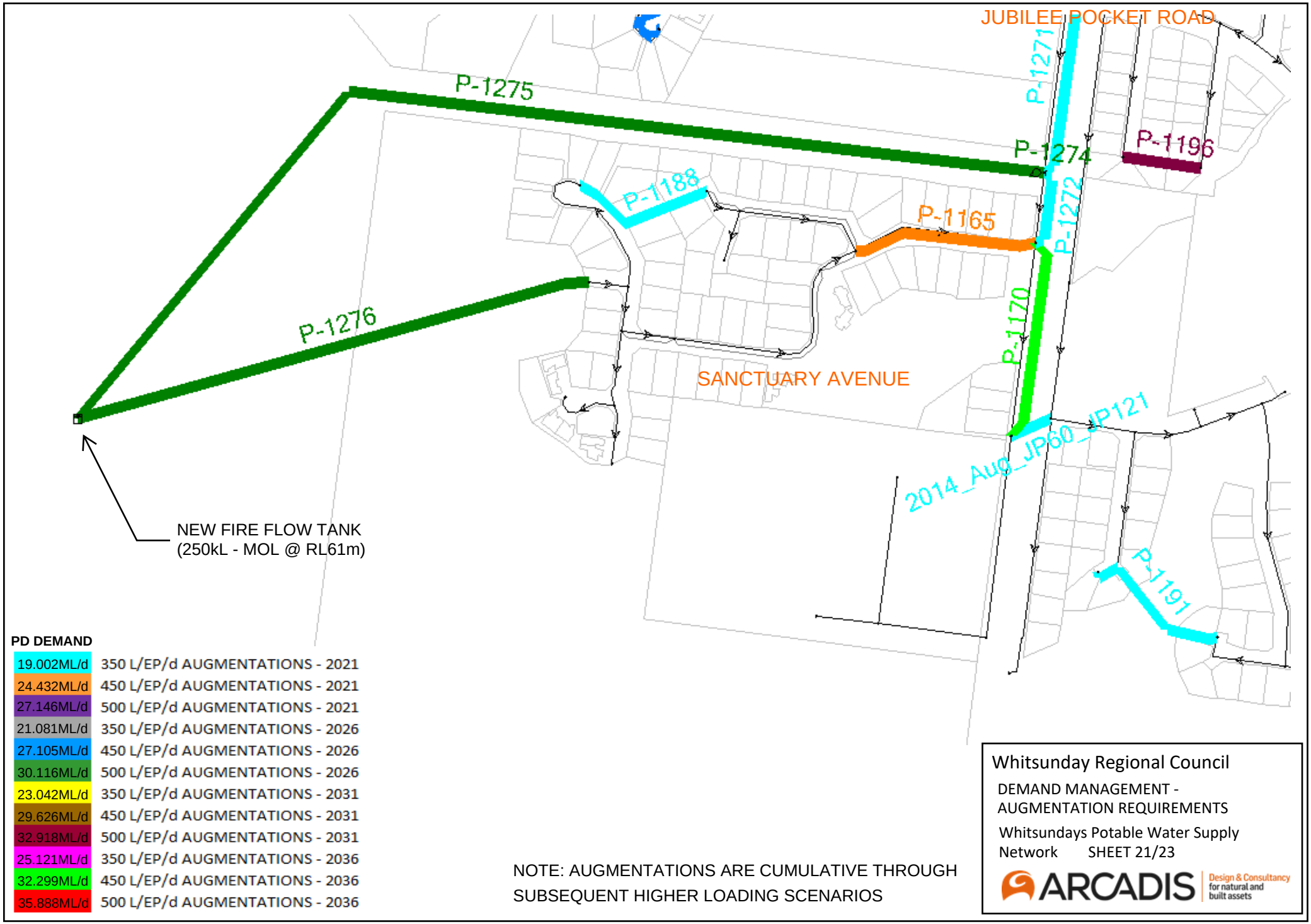
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Whitsundays Potable Water Supply Network SHEET 20/23

ARCADIS Design & Consultancy for natural and built assets



PD DEMAND

19.002ML/d	350 L/EP/d AUGMENTATIONS - 2021
24.432ML/d	450 L/EP/d AUGMENTATIONS - 2021
27.146ML/d	500 L/EP/d AUGMENTATIONS - 2021
21.081ML/d	350 L/EP/d AUGMENTATIONS - 2026
27.105ML/d	450 L/EP/d AUGMENTATIONS - 2026
30.116ML/d	500 L/EP/d AUGMENTATIONS - 2026
23.042ML/d	350 L/EP/d AUGMENTATIONS - 2031
29.626ML/d	450 L/EP/d AUGMENTATIONS - 2031
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NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Whitsundays Potable Water Supply Network SHEET 21/23

ARCADIS Design & Consultancy for natural and built assets

20/12/2019

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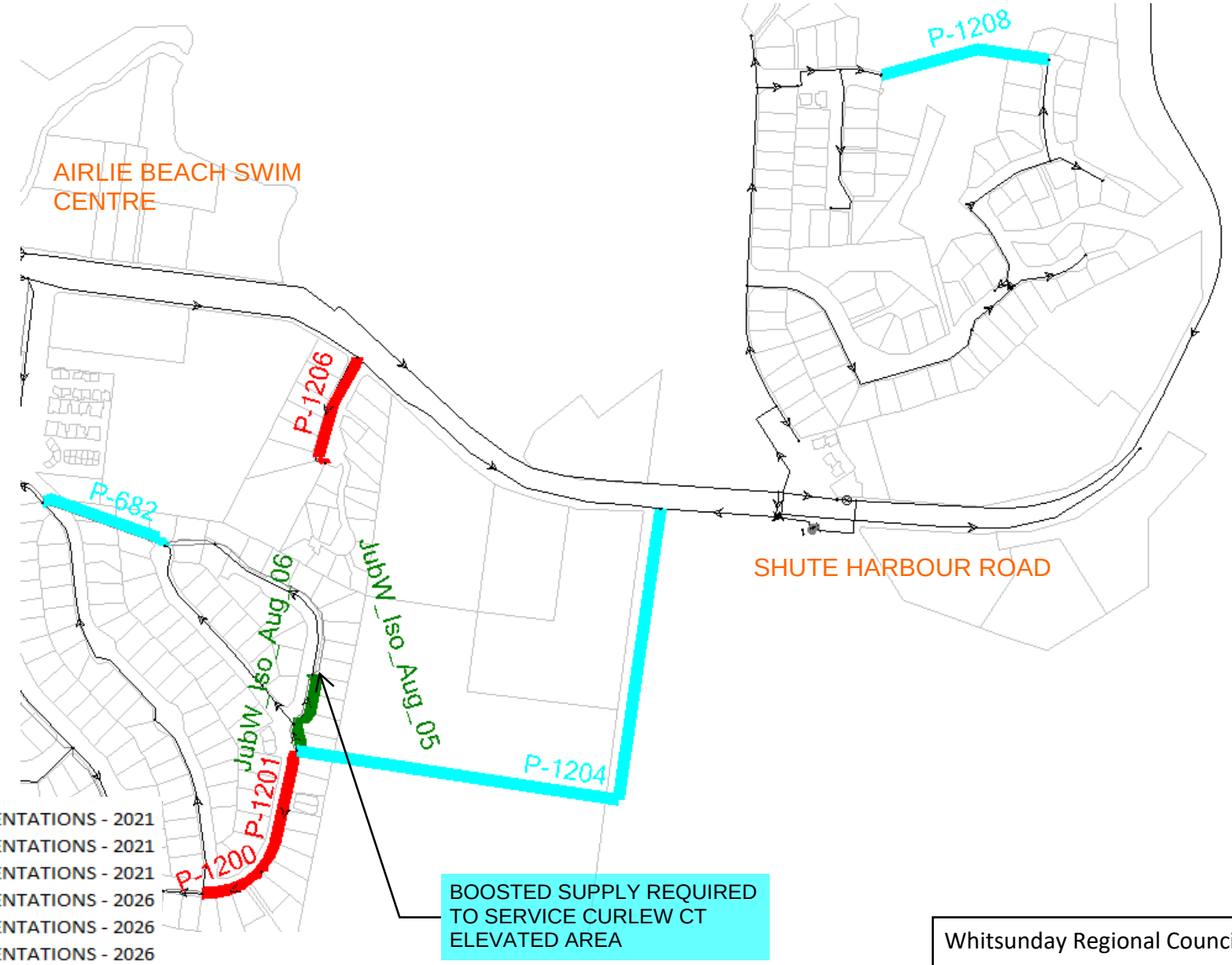

PD DEMAND	
19.002ML/d	350 L/EP/d AUGMENTATIONS - 2021
24.432ML/d	450 L/EP/d AUGMENTATIONS - 2021
27.146ML/d	500 L/EP/d AUGMENTATIONS - 2021
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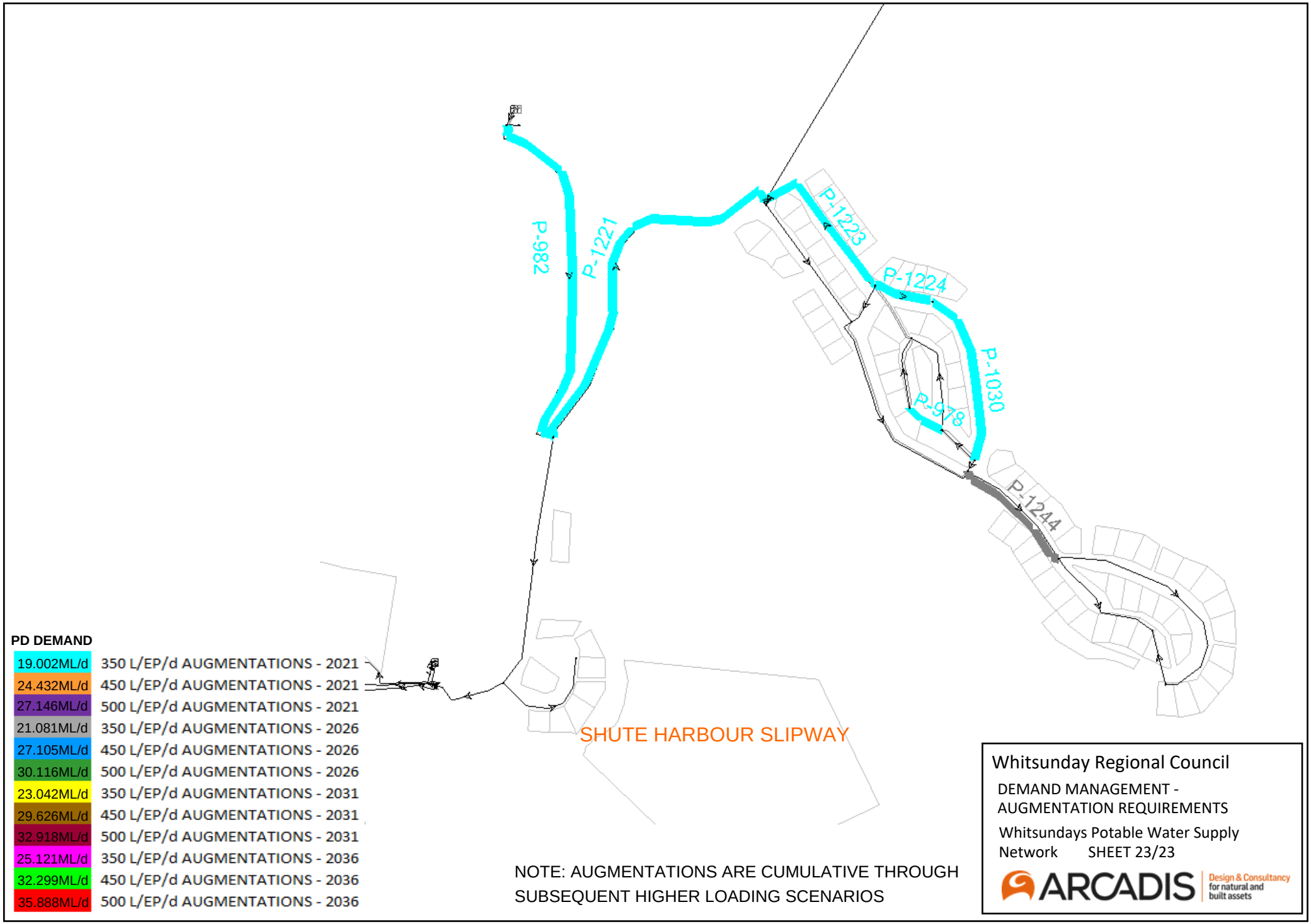
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Whitsundays Potable Water Supply Network SHEET 22/23

ARCADIS Design & Consultancy for natural and built assets



PD DEMAND

19.002ML/d	350 L/EP/d AUGMENTATIONS - 2021
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Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Whitsundays Potable Water Supply Network SHEET 23/23

ARCADIS Design & Consultancy for natural and built assets

PROJECT: Whitsundays Potable Water Network Modelling | **Project Engineer:** M.C

DOCUMENT NUMBER: | **Software:** WaterCad v8i

DATE: 18.12.2019

ARCADIS Design & Consultancy for natural and built assets

WHITSUNDAYS POTABLE WATER NETWORK
DEMAND MANAGEMENT ASSESSMENT - AUGMENTATION REQUIREMENT SUMMARY

AUGMENTATION ID	LENGTH (m)	EXISTING PIPE SEGMENT		DN	DUPLICATION DN	NEW PIPE DN	COST - $/m	ADJUSTMENT FACTOR FOR SOIL	10% ADDITIONAL REGIONAL COSTS	30% CONTINGENCY	COST OF NEW/DUPLICATION	AC PIPE							
		START NODE	END NODE									YEAR INSTALLED	AC DN	REPLACEMENT DN	COST - $/m	CAP & GROUT @ $20/M	TOTAL COST OF DECOMMISSIONING AND REPLACEMENT	COST INCREASE COMPARED TO DUPLICATION	% OF INCREASE COMPARED TO DUPLICATION
2014_Aug_J-100_PR172	77.3	J-100	PR172	150		150	262	1.26	10%	30%	$ 35,725.59								
2014_Aug_J-119_PR128	99.98	J-119	PR128	150		150	262	1.26	10%	30%	$ 46,207.56								
2014_Aug_JP60_JP121	38.82	JP60	JP121	200		200	310	1.26	10%	30%	$ 21,228.33								
2014_Aug_PR106_PR107	82.95	J-216	PR107	100		100	205	1.26	10%	30%	$ 29,996.38								
2014_Aug_PR166_PR167	219.12	PR166	PR167	150	150		262	1.26	10%	30%	$ 101,270.25								
2014_Aug_PR173_ PR173	120.09	PR171	PR173	150	150		262	1.26	10%	30%	$ 55,501.76								
2014_Aug_PR242_PR237	104.53	PR242	PR237	100	100		205	1.26	10%	30%	$ 37,800.14								
2014_Aug_PR244_PR243	51.04	PR244	PR243	100	100		205	1.26	10%	30%	$ 18,457.08								
2014_Aug_PR24_PR25	104.08	PR24	PR25	150	150		262	1.26	10%	30%	$ 48,518.40	-	100	200	310	$ 2,099.60	$ 63,607.38	$ 15,088.99	24%
2014_Aug_PR25_PR27	156.29	PR25	PR27	150	150		262	1.26	10%	30%	$ 72,232.24	-	100	200	310	$ 3,125.80	$ 94,696.11	$ 22,463.87	24%
2014_Aug_PR54_J-116	118.46	PR54	J-116	150	150		262	1.26	10%	30%	$ 54,748.42	175	150	250	384	$ 2,369.20	$ 88,342.73	$ 33,594.31	38%
2016_Aug_PR33_PR33A	27.94	PR33A	PR33	200	200		310	1.26	10%	30%	$ 15,278.71								
2021_Aug_BS107_JP58	278.2	J-200	J-201	300	300		459	1.26	10%	30%	$ 225,251.86								
2021_Aug_BS107_JP58	50.35	J-201	JP58	300	300		459	1.26	10%	30%	$ 40,767.19								
2036_Aug_CA183_CA184	278.69	CA183	CA184	150	150		262	1.26	10%	30%	$ 128,801.60								
BS229_AB130	17.48	AB130	BS229	200		200	310	1.26	10%	30%	$ 9,558.76								
CanW76	2.8	BS200	BS195	175.6	175.6		272	1.26	10%	30%	$ 1,343.46								
CanW76a	0.65	WCPS01/P2	BS200	175.6	175.6		272	1.26	10%	30%	$ 311.88								
CanW337a	0.68	BS201	WCPS03/P2	150	150		262	1.26	10%	30%	$ 314.27								
CanW_Iso_Aug_02	64.77	CA20	CA23	150	150		262	1.26	10%	30%	$ 29,916.13		100	200	310	$ 1,294.60	$ 39,219.91	$ 9,303.77	24%
CanW_Iso_Aug_09	303.4	J-168	CA201	100	100		205	1.26	10%	30%	$ 37,301.51								
CanW_Iso_Aug_17	427.54	J-188	J-186	250	250		384	1.26	10%	30%	$ 289,605.34								
CanW_Iso_Aug_21	565	CA243	CA189	250		250	384	1.26	10%	30%	$ 380,007.94								
CanW_Iso_Aug_25	39.61	CA10	CA12	157	157		262	1.26	10%	30%	$ 18,306.47								
CanW_Iso_Aug_26	219.43	CA243	J-192	300	300		459	1.26	10%	30%	$ 177,667.20								
CanW_Iso_Aug_27	373.92	J-192	BS66	300		300	459	1.26	10%	30%	$ 302,754.05								
IsoW_Iso_Aug_05	32.62	J-199	JP80	200	200		310	1.26	10%	30%	$ 17,837.02								
IsoW_Iso_Aug_06	64.79	JP80	JP82	200	200		310	1.26	10%	30%	$ 35,429.76								
IsoW_Iso_Aug_08	17.96	JP12	J-200	200		200	310	1.26	10%	30%	$ 9,821.25								
IsoW_Iso_Aug_09	18.98	JP17	J-201	157		157	262	1.26	10%	30%	$ 8,771.95								
P-682	139.44	JP33	JP83	157		157	262	1.26	10%	30%	$ 64,444.71								
P-835	57.87	JP69	JP67	200	200		310	1.26	10%	30%	$ 31,645.63								
P-836	62.63	JP67	JP68	200	200		310	1.26	10%	30%	$ 34,248.59								
P-867	4.67	J-192	J-193	250		250	384	1.26	10%	30%	$ 3,163.35								
P-909	181.11	AB4	AB28	150	150		262	1.26	10%	30%	$ 83,703.25		100	200	310	$ 3,622.20	$ 109,734.55	$ 26,031.30	24%
P-939	109.56	PR120	PR122	150	150		262	1.26	10%	30%	$ 50,635.13		100	200	310	$ 2,191.20	$ 66,382.40	$ 15,747.28	24%
P-945	147.96	PR112	PR113	150	150		262	1.26	10%	30%	$ 68,382.38								
P-978	42.58	SH13	SH10	150	150		262	1.26	10%	30%	$ 19,679.51								
P-982	388.7	BS129	BS128	300	300		459	1.26	10%	30%	$ 314,721.06		150	375	878	$ 7,774.00	$ 652,790.55	$ 338,069.49	52%
P-1022	197.91	PR104	J-216	100	100		205	1.26	10%	30%	$ 71,568.21								
P-1023	49.62	J-216	PR106	100	100		205	1.26	10%	30%	$ 17,943.58								
P-1030	190.25	SH12	J-218	150	150		262	1.26	10%	30%	$ 87,927.46								
P-1039	530.92	BS201	CA196	200	200		310	1.26	10%	30%	$ 290,328.29		525	565	1356	$ 10,618.40	$ 1,371,281.41	$ 1,080,953.12	79%
P-1048	82.77	J-223	CA359	200		200	310	1.26	10%	30%	$ 45,261.95								
P-1049	60.75	J-223	CA356	200		200	310	1.26	10%	30%	$ 33,220.53								
P-1050	675.51	PRV-8	J-223	300		300	459	1.26	10%	30%	$ 546,944.23								
P-1053	292.84	BS28	J-224	203.9		203.9	310	1.26	10%	30%	$ 160,136.63								
P-1057	911.51	J-226	J-224	200	200		310	1.26	10%	30%	$ 498,450.13								
P-1059	23.36	WPWT	J-227	523	523		1278	1.26	10%	30%	$ 52,662.60								
P-1060	69.55	J-227	J-226	523	523		1278	1.26	10%	30%	$ 156,792.96								
P-1063	578.07	J-224	PR62	250	250		384	1.26	10%	30%	$ 391,570.74								
P-1066	316.48	J-227	BS329	523	523		1278	1.26	10%	30%	$ 713,469.98								
P-1069	375.48	BS329	PR33	375	375		878	1.26	10%	30%	$ 581,540.42		100	411	943	$ 7,509.60	$ 676,716.34	$ 95,175.92	14%
P-1070	459	PR33	PR48	375	375		878	1.26	10%	30%	$ 710,895.53								
P-1071	1,344.81	PR62	PR168	250	250		384	1.26	10%	30%	$ 910,942.02								
P-1072	266.01	PR48	PR208	375	375		878	1.26	10%	30%	$ 411,994.16								
P-1085	30.47	MI9	J-233	200	200		310	1.26	10%	30%	$ 16,662.21								
P-1090	211.45	BS196	J-168	200	200		310	1.26	10%	30%	$ 115,629.32								
P-1092	155.71	PR18	PR19	150	150		262	1.26	10%	30%	$ 71,964.18		100	200	310	$ 3,114.20	$ 94,344.69	$ 22,380.51	24%
P-1093	205.16	PR15	PR157	150	150		262	1.26	10%	30%	$ 94,818.39		100	200	310	$ 4,103.20	$ 124,306.44	$ 29,488.06	24%
P-1094	121	PR25	PR26	150	150		262	1.26	10%	30%	$ 56,121.06		100	200	310	$ 2,428.60	$ 73,574.44	$ 17,453.38	24%
P-1095	99.72	PR22	PR23	150	150		262	1.26	10%	30%	$ 46,087.39		100	200	310	$ 1,994.40	$ 60,420.35	$ 14,332.96	24%
P-1096	189.51	PR35	PR36	150	150		262	1.26	10%	30%	$ 87,585.46		100	200	310	$ 3,790.20	$ 114,824.11	$ 27,238.65	24%
P-1097	127.57	PR85	PR86	150	150		262	1.26	10%	30%	$ 58,958.77		100	200	310	$ 2,551.40	$ 77,294.66	$ 18,335.89	24%
P-1101	122.69	PR194	PR73	150	150		262	1.26	10%	30%	$ 56,703.39		100	200	310	$ 2,453.80	$ 74,337.87	$ 17,634.48	24%
P-1104	71.1	MI9	MI8	150	150		262	1.26	10%	30%	$ 32,860.14		100	200	310	$ 1,422.00	$ 43,079.49	$ 10,219.35	24%
P-1105	155.42	MI5	MI6	150	150		262	1.26	10%	30%	$ 71,830.15		100	200	310	$ 3,108.40	$ 94,168.98	$ 22,338.83	24%
P-1110	584.37	CA169	J-238	150	150		262	1.26	10%	30%	$ 270,077.11								
P-1111	184.41	CA181	CA322	150	150		262	1.26	10%	30%	$ 85,228.40								
P-1112	155.83	CA177	CA180	150	150		262	1.26	10%	30%	$ 72,019.64								
P-1115	58.58	J-239	CA340	100	100		205	1.26	10%	30%	$ 21,183.70								
P-1124	85.43	CA241	CA222	150	150		262	1.26	10%	30%	$ 39,483.01		100	200	310	$ 1,708.60	$ 51,762.04	$ 12,279.02	24%
P-1125	144.67	CA22	CA25	150	150		262	1.26	10%	30%	$ 66,861.84								
P-1126	166.14	CA17	CA18	150	150		262	1.26	10%	30%	$ 76,784.59								
P-1127	123.52	CA20	CA265	150	150		262	1.26	10%	30%	$ 57,086.99		100	200	310	$ 2,470.40	$ 74,840.77	$ 17,753.78	24%
P-1128	72.17	CA23	CA27	150	150		262	1.26	10%	30%	$ 33,354.66		100	200	310	$ 1,443.40	$ 43,727.80	$ 10,373.14	24%
P-1129	114.4	CA23	CA28	150	150		262	1.26	10%	30%	$ 52,872.02		100	200	310	$ 2,288.00	$ 69,314.96	$ 16,442.94	24%
P-1130	155.38	CA35	CA36	150	150		262	1.26	10%	30%	$ 71,811.66		100	200	310	$ 3,107.60	$ 94,144.74	$ 22,333.08	24%
P-1131	216.28	CA58	CA278	150	150		262	1.26	10%	30%	$ 99,957.70		100	200	310	$ 4,325.60	$ 131,044.05	$ 31,086.36	24%
P-1133	19.66	CA86	J-241	150	150		262	1.26	10%	30%	$ 9,086.22								
P-1134	107.5	J-241	CA87	150	150		262	1.26	10%	30%	$ 49,683.06								
P-1135	37.61	J-241	J-193	150	150		262	1.26	10%	30%	$ 17,382.14								
P-1137	39.85	AB10	AB76	150	150		262	1.26	10%	30%	$ 18,417.39								
P-1139	63.87	AB76	AB6	150	150		262	1.26	10%	30%	$ 29,518.67								
P-1140	86.16	AB8	AB9	150	150		262	1.26	10%	30%	$ 39,820.39		100	200	310	$ 1,723.20	$ 52,204.34	$ 12,383.95	24%
P-1141	33.53	AB28	AB29	150	150		262	1.26	10%	30%	$ 15,496.49		100	200	310	$ 670.60	$ 20,315.83	$ 4,819.33	24%
P-1142	63.57	AB28	AB3	150	150		262	1.26	10%	30%	$ 29,380.02		100	200	310	$ 1,271.40	$ 38,517.06	$ 9,137.04	24%
P-1143	76.63	AB3	AB2	150	150		262	1.26	10%	30%	$ 35,415.93		100	200	310	$ 1,532.60	$ 46,430.12	$ 11,014.18	24%
P-1144	255.26	CA62	CA72	150	150		262	1.26	10%	30%	$ 117,973.00		100	200	310	$ 5,105.20	$ 154,662.03	$ 36,689.03	24%
P-1145	337.77	CA330	CA329	150	150		262	1.26	10%	30%	$ 156,106.49								
P-1147	119.76	CA257	CA66	200	200		310	1.26	10%	30%	$ 65,489.58		100	250	384	$ 2,395.20	$ 89,312.22	$ 23,822.66	27%
P-1148	315.95	BS294	MI9	150	150		262	1.26	10%	30%	$ 146,021.98		150	225	348	$ 6,319.00	$ 214,125.63	$ 68,103.65	32%
P-1149	52.17	CA92	CA281	150	150		262	1.26	10%	30%	$ 24,111.30		100	200	310	$ 1,043.40	$ 31,609.80	$ 7,498.50	24%
P-1150	73.62	CA189	CA245	200	200		310	1.26	10%	30%	$ 40,258.36								
P-1151	31.27	BS65	CA241	150	150		262	1.26	10%	30%	$ 14,451.99		100	200	310	$ 625.40	$ 18,946.49	$ 4,494.50	24%
P-1153	137.57	CA66	CA65	150	150		262	1.26	10%	30%	$ 63,580.45		100	200	310	$ 2,751.40	$ 83,351.66	$ 19,773.21	24%
P-1154	146.01	BS231	JP55	150	150		262	1.26	10%	30%	$ 67,481.15								
P-1155	85.07	CA97	CA99	150	150		262	1.26	10%	30%	$ 39,316.63		100	200	310	$ 1,701.40	$ 51,543.91	$ 12,227.28	24%
P-1156	88.21	WCG807	BS84	200	200		310	1.26	10%	30%	$ 48,236.76		100	250	384	$ 1,764.20	$ 65,781.49	$ 17,546.73	27%
P-1157	194.36	BS84	BS207	150	150		262	1.26	10%	30%	$ 89,826.97		100	200	310	$ 3,887.20	$ 117,762.72	$ 27,935.75	24%
P-1158	29.6	BS207	CA249	150	150		262	1.26	10%	30%	$ 13,680.17		100	200	310	$ 592.00	$ 17,934.64	$ 4,254.47	24%
P-1159	255.93	CA249	CA95	150	150		262	1.26	10%	30%	$ 118,282.66		100	200	310	$ 5,118.60	$ 155,067.99	$ 36,785.33	24%
P-1162	349.99	CA213	CA402	200	200		310	1.26	10%	30%	$ 191,388.53								
P-1164	48.29	JP58	JP69	200	200		310	1.26	10%	30%	$ 26,406.90								
P-1165	165.4	JP59	JP61	200	150		310	1.26	10%	30%	$ 90,447.34								
P-1170	182.18	JP59	JP60	250	250		384	1.26	10%	30%	$ 123,404.36								
P-1173	100.82	JP68	JP84	200	200		310	1.26	10%	30%	$ 55,132.41								
P-1174	236.72	BS107	BS108	300	300		459	1.26	10%	30%	$ 191,666.50		150	375	878	$ 4,734.40	$ 397,552.30	$ 205,885.80	52%
P-1176	57.51	BS108	JP57	300	300		459	1.26	10%	30%	$ 46,564.47								
P-1177	67.14	JP57	J-200	300	300		459	1.26	10%	30%	$ 54,361.65								
P-1178	75.13	BS108	JP133	200	200		310	1.26	10%	30%	$ 41,084.09		100	250	384	$ 1,502.60	$ 56,028.95	$ 14,944.86	27%
P-1179	123.26	JP133	BS109	200	200		310	1.26	10%	30%	$ 67,403.50		100	250	384	$ 2,465.20	$ 91,922.38	$ 24,518.88	27%
P-1180	65.97	BS109	BS110	150	150		262	1.26	10%	30%	$ 30,489.22		100	200	310	$ 1,319.40	$ 39,971.22	$ 9,482.00	24%
P-1181	141.12	BS110	BS111	150	150		262	1.26	10%	30%	$ 65,221.15		100	200	310	$ 2,822.40	$ 85,504.61	$ 20,283.46	24%
P-1182	314.27	BS113a	BS113	150	150		262	1.26	10%	30%	$ 145,245.54		100	200	310	$ 6,285.40	$ 190,416.19	$ 45,170.66	24%
P-1183	125.73	BS109	JP6	150	150		262	1.26	10%	30%	$ 58,108.38		100	200	310	$ 2,514.60	$ 76,179.81	$ 18,071.42	24%
P-1184	102.19	JP84	JP109	152.4	152.4		262	1.26	10%	30%	$ 47,228.91								
P-1185	39.68	JP84	JP86	152.4	152.4		262	1.26	10%	30%	$ 18,338.83								
P-1186	192.29	JP86	JP120	150	150		262	1.26	10%	30%	$ 88,870.28								
P-1187	149.37	JP109	JP107	150	150		262	1.26	10%	30%	$ 69,034.03								
P-1188	132.65	JP96	JP65	150	150		262	1.26	10%	30%	$ 61,306.59								
P-1191	140.5	JP124	JP129	100	100		205	1.26	10%	30%	$ 50,807.61								
P-1196	70.61	JP72	JP74	100	100		205	1.26	10%	30%	$ 25,533.99								
P-1197	150.8	JP109	JP108	150	150		262	1.26	10%	30%	$ 69,694.91								
P-1200	67.98	JP78	JP79	200	200		310	1.26	10%	30%	$ 37,174.18								
P-1201	133.36	JP79	J-199	200	200		310	1.26	10%	30%	$ 72,926.58								
P-1204	648.04	J-199	J-197	300	300		459	1.26	10%	30%	$ 524,702.44								
P-1205	133.87	JP12	JP13	150	150		262	1.26	10%	30%	$ 61,870.43		100	200	310	$ 2,677.40	$ 81,111.83	$ 19,241.40	24%
P-1206	122.47	BS117	JP4	150	150		262	1.26	10%	30%	$ 56,601.71		100	200	310	$ 2,449.40	$ 74,204.57	$ 17,602.86	24%
P-1208	179.63	JP111	JP54	100	100		205	1.26	10%	30%	$ 64,957.80								
P-1221	415.32	BS128	BS130	200	200		310	1.26	10%	30%	$ 227,113.59		150	250	384	$ 8,306.40	$ 309,729.04	$ 82,615.45	27%
P-1223	181.7	BS130	SH15	200	200		310	1.26	10%	30%	$ 99,360.83		150	250	384	$ 3,634.00	$ 135,504.59	$ 36,143.76	27%
P-1224	64.76	SH15	SH12	150	150		262	1.26	10%	30%	$ 29,930.00		100	200	310	$ 1,295.20	$ 39,238.08	$ 9,308.08	24%
P-1231	584.42	BS214	AB80	200	200		310	1.26	10%	30%	$ 319,584.23								
P-1236	0.49	AB46	J-247	134.7	EXISTING		262	1.26	10%	30%	$ 226.46								
P-1238	10.74	AB47	J-246	150	150		262	1.26	10%	30%	$ 4,963.68								
P-1240	86.93	AB80	AB79	150	150		262	1.26	10%	30%	$ 40,176.26								
P-1241	5.11	AB79	AB14	150	150		262	1.26	10%	30%	$ 2,361.68		100	200	310	$ 102.20	$ 3,096.15	$ 734.47	24%
P-1242	80.9	AB14	AB15	150	150		262	1.26	10%	30%	$ 37,389.39		100	200	310	$ 1,618.00	$ 49,017.31	$ 11,627.92	24%
P-1244	140.3	SH9	SH8	150	150		262	1.26	10%	30%	$ 64,842.17		100	200	310	$ 2,806.00	$ 85,007.77	$ 20,165.60	24%
P-1271	218.07	JP58	J-270	300	300		459	1.26	10%	30%	$ 176,566.05								
P-1272	71.53	J-270	JP59	300	300		459	1.26	10%	30%	$ 57,916.12								
P-1274	7.53	J-270	PMP-29	250	250		384	1.26	10%	30%	$ 5,100.64								
P-1275	997.71	PMP-29	T-10	250	250		384	1.26	10%	30%	$ 675,824.81								
P-1276	473.22	T-10	JP95	250	250		384	1.26	10%	30%	$ 320,547.87								
ProW24	594.58	J-226	BS28	203.9	203.9		310	1.26	10%	30%	$ 325,140.13								
ProW109b	66.56	PR32	PR33A	175.6	175.6		272	1.26	10%	30%	$ 31,936.02								
	25832.87							TOTAL			$ 16,363,007.56						$ 7,256,011.54	$ 2,758,400.72	38.02%

PROJECT:	Whitsundays Potable Water Network Modelling	**Project Engineer:**	M.C
DOCUMENT NUMBER:		**Software:**	WaterCad v8i
DATE:	18.12.2019		

ARCADIS Design & Consultancy for natural and built assets

WHITSUNDAYS POTABLE WATER NETWORK
DEMAND MANAGEMENT ASSESSMENT - AUGMENTATION REQUIREMENT SUMMARY

AUGMENTATION ID	350 L/EP/d DEMAND - 2021	450 L/EP/d DEMAND - 2021	BASELINE 500 L/EP/d DEMAND - 2021	350 L/EP/d DEMAND - 2026	450 L/EP/d DEMAND - 2026	BASELINE 500 L/EP/d DEMAND - 2026	350 L/EP/d DEMAND - 2031	450 L/EP/d DEMAND - 2031	BASELINE 500 L/EP/d DEMAND - 2031	350 L/EP/d DEMAND - 2036	450 L/EP/d DEMAND - 2036	BASELINE 500 L/EP/d DEMAND - 2036
2014_Aug_J-100_PR172												
2014_Aug_J-119_PR128												
2014_Aug_JP60_JP121												
2014_Aug_PR106_PR107												
2014_Aug_PR166_PR167												
2014_Aug_PR171_PR173												
2014_Aug_PR242_PR237												
2014_Aug_PR244_PR243												
2014_Aug_PR24_PR25												
2014_Aug_PR25_PR27												
2014_Aug_PR54_J-116												
2016_Aug_PR33_PR33A												
2021_Aug_BS107_JP58												
2021_Aug_BS107_JP58												
2036_Aug_CA183_CA184												
BS229_AB130												
CanW76												
CanW76a												
CanW337a												
CanW_Iso_Aug_02												
CanW_Iso_Aug_09												
CanW_Iso_Aug_17												
CanW_Iso_Aug_21												
CanW_Iso_Aug_25												
CanW_Iso_Aug_26												
CanW_Iso_Aug_27												
JubW_Iso_Aug_05												
JubW_Iso_Aug_06												
JubW_Iso_Aug_08												
JubW_Iso_Aug_09												
P-682												
P-835												
P-836												
P-867												
P-909												
P-939												
P-945												
P-978												
P-982												
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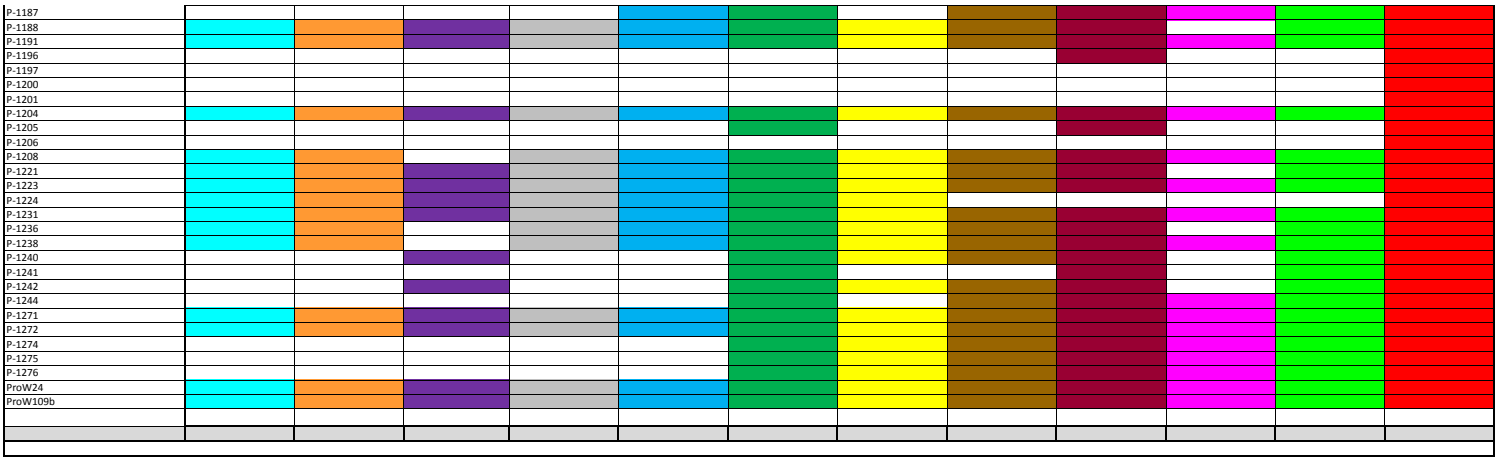
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P-1188
P-1191
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P-1197
P-1200
P-1201
P-1204
P-1205
P-1206
P-1208
P-1221
P-1223
P-1224
P-1231
P-1236
P-1238
P-1240
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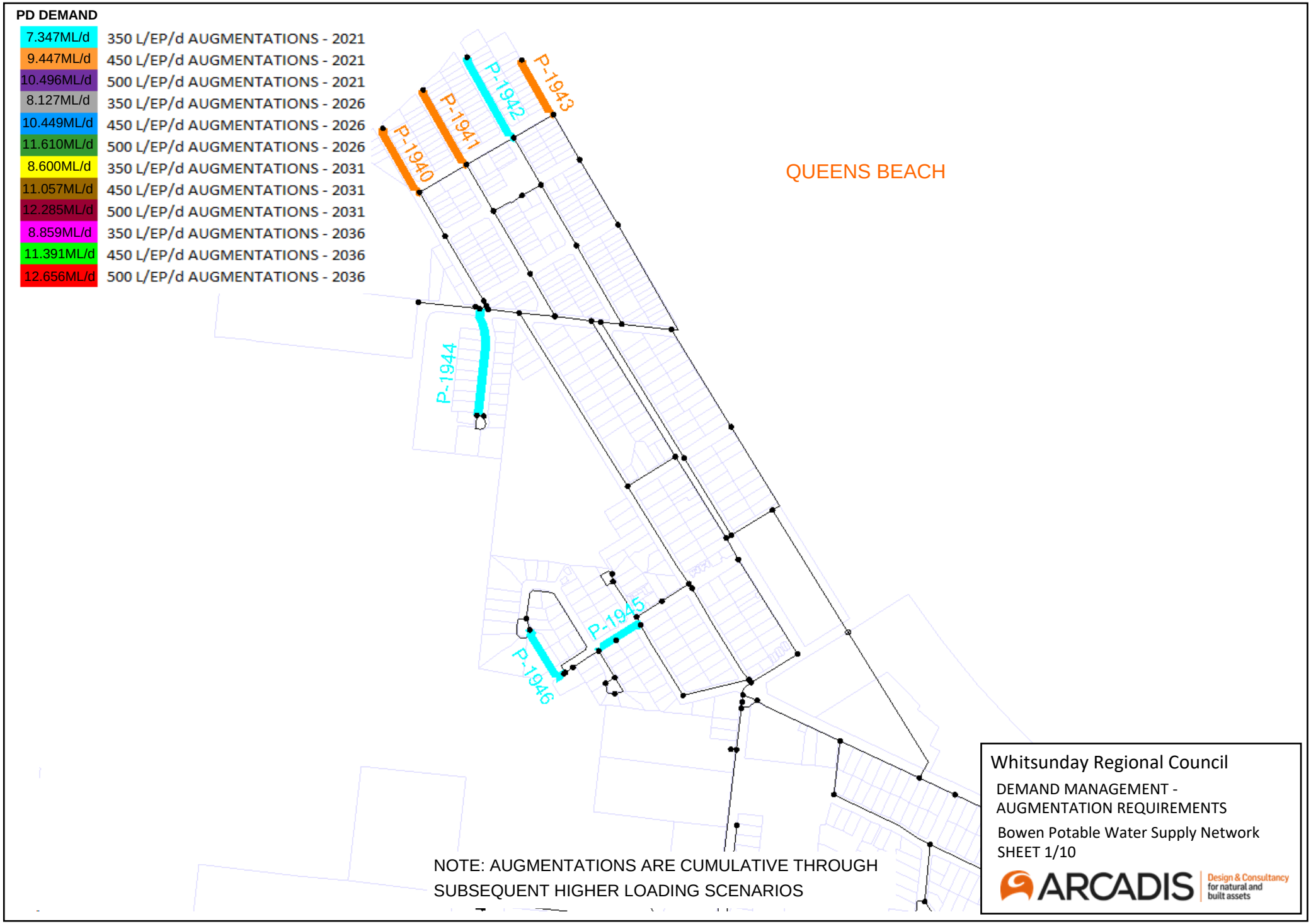
P-1272
P-1274
P-1275
P-1276
ProW24
ProW109b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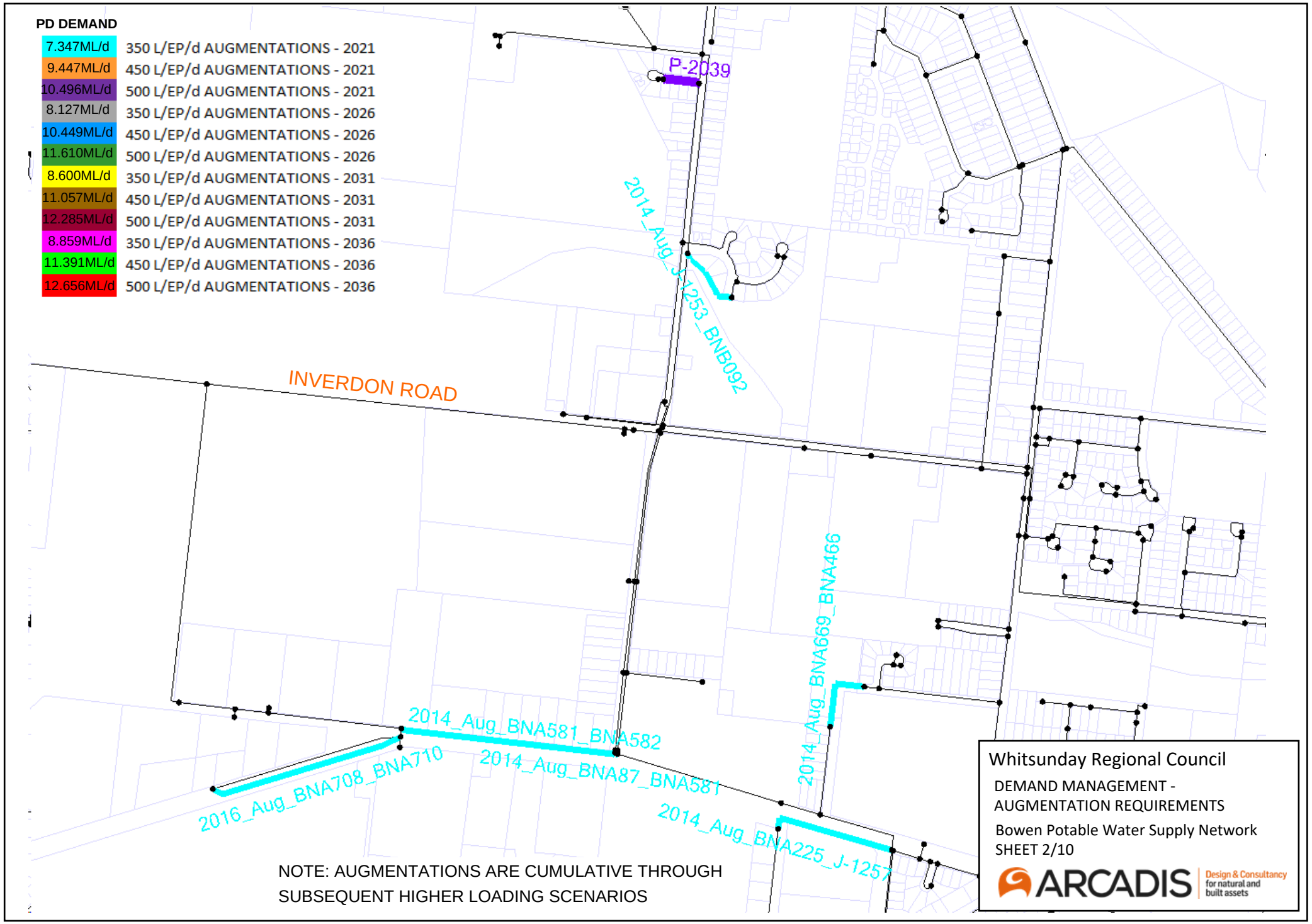
9.447ML/d 450 L/EP/d AUGMENTATIONS - 2021
10.496ML/d 500 L/EP/d AUGMENTATIONS - 2021
8.127ML/d 350 L/EP/d AUGMENTATIONS - 2026
10.449ML/d 450 L/EP/d AUGMENTATIONS - 2026
11.610ML/d 500 L/EP/d AUGMENTATIONS - 2026
8.600ML/d 350 L/EP/d AUGMENTATIONS - 2031
11.057ML/d 450 L/EP/d AUGMENTATIONS - 2031
12.285ML/d 500 L/EP/d AUGMENTATIONS - 2031
8.859ML/d 350 L/EP/d AUGMENTATIONS - 2036
11.391ML/d 450 L/EP/d AUGMENTATIONS - 2036
12.656ML/d 500 L/EP/d AUGMENTATIONS - 2036
QUEENS BEACH
P-1940
P-1941
P-1942
P-1943
P-1944
P-1945
P-1946
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS
Whitsunday Regional Council
DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS
Bowen Potable Water Supply Network
SHEET 1/10
ARCADIS
Design & Consultancy for natural and built assets


PD DEMAND
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9.447ML/d 450 L/EP/d AUGMENTATIONS - 2021
10.496ML/d 500 L/EP/d AUGMENTATIONS - 2021
8.127ML/d 350 L/EP/d AUGMENTATIONS - 2026
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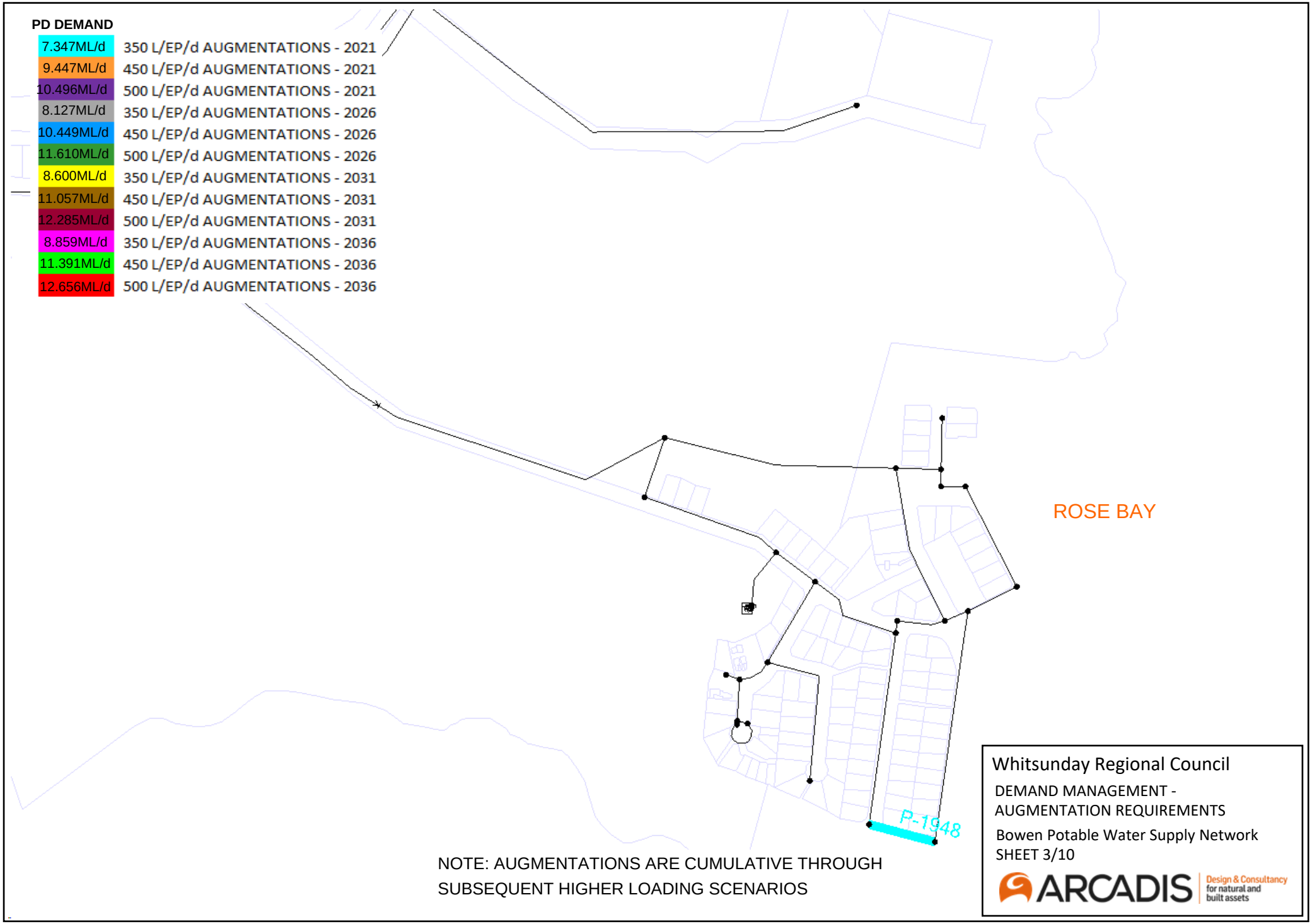
11.057ML/d 450 L/EP/d AUGMENTATIONS - 2031
12.285ML/d 500 L/EP/d AUGMENTATIONS - 2031
8.859ML/d 350 L/EP/d AUGMENTATIONS - 2036
11.391ML/d 450 L/EP/d AUGMENTATIONS - 2036
12.656ML/d 500 L/EP/d AUGMENTATIONS - 2036
P-2039
2014_Aug_J-1253_BNB092
INVERDON ROAD
2014_Aug_BNA669_BNA466
2014_Aug_BNA581_BNA582
2014_Aug_BNA87_BNA581
2016_Aug_BNA708_BNA710
2014_Aug_BNA225_J-1257
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS
Whitsunday Regional Council
DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS
Bowen Potable Water Supply Network
SHEET 2/10
ARCADIS
Design & Consultancy for natural and built assets



NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

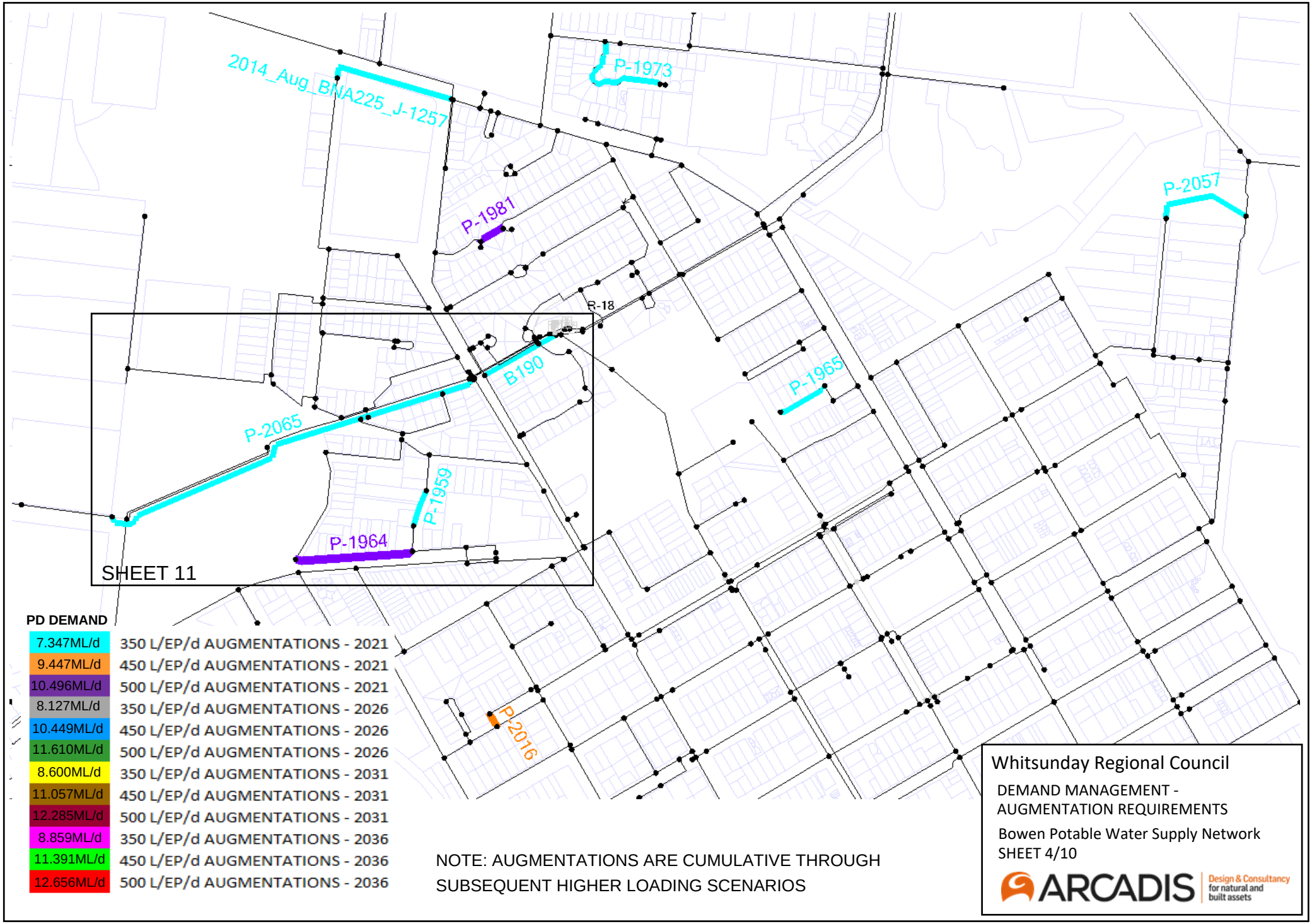
Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Bowen Potable Water Supply Network

SHEET 3/10

ARCADIS Design & Consultancy for natural and built assets



PD DEMAND	
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10.496ML/d	500 L/EP/d AUGMENTATIONS - 2021
8.127ML/d	350 L/EP/d AUGMENTATIONS - 2026
10.449ML/d	450 L/EP/d AUGMENTATIONS - 2026
11.610ML/d	500 L/EP/d AUGMENTATIONS - 2026
8.600ML/d	350 L/EP/d AUGMENTATIONS - 2031
11.057ML/d	450 L/EP/d AUGMENTATIONS - 2031
12.285ML/d	500 L/EP/d AUGMENTATIONS - 2031
8.859ML/d	350 L/EP/d AUGMENTATIONS - 2036
11.391ML/d	450 L/EP/d AUGMENTATIONS - 2036
12.656ML/d	500 L/EP/d AUGMENTATIONS - 2036

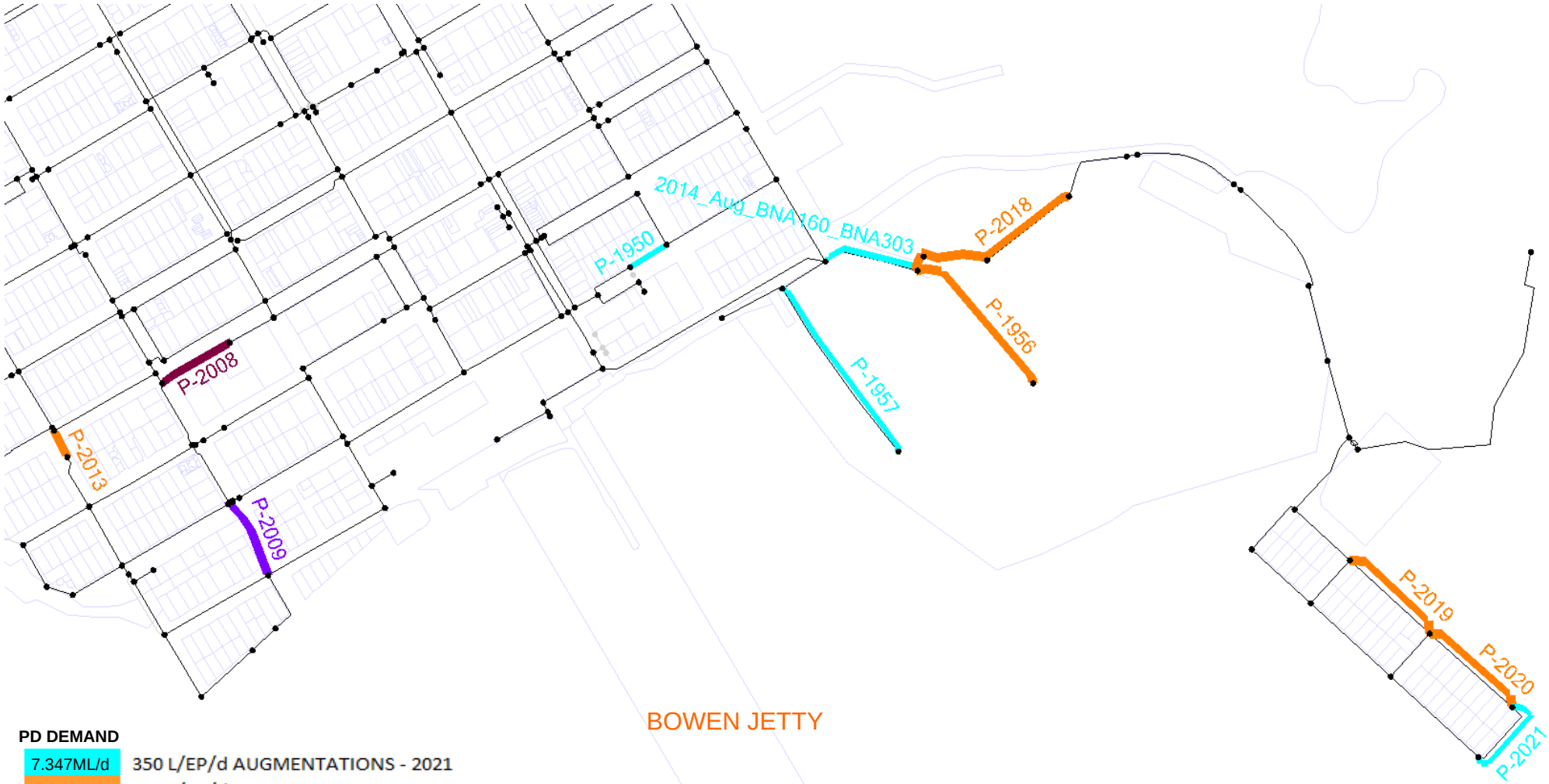
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Bowen Potable Water Supply Network
SHEET 4/10

ARCADIS Design & Consultancy for natural and built assets



PD DEMAND

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10.496ML/d	500 L/EP/d AUGMENTATIONS - 2021
8.127ML/d	350 L/EP/d AUGMENTATIONS - 2026
10.449ML/d	450 L/EP/d AUGMENTATIONS - 2026
11.610ML/d	500 L/EP/d AUGMENTATIONS - 2026
8.600ML/d	350 L/EP/d AUGMENTATIONS - 2031
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11.391ML/d	450 L/EP/d AUGMENTATIONS - 2036
12.656ML/d	500 L/EP/d AUGMENTATIONS - 2036

NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

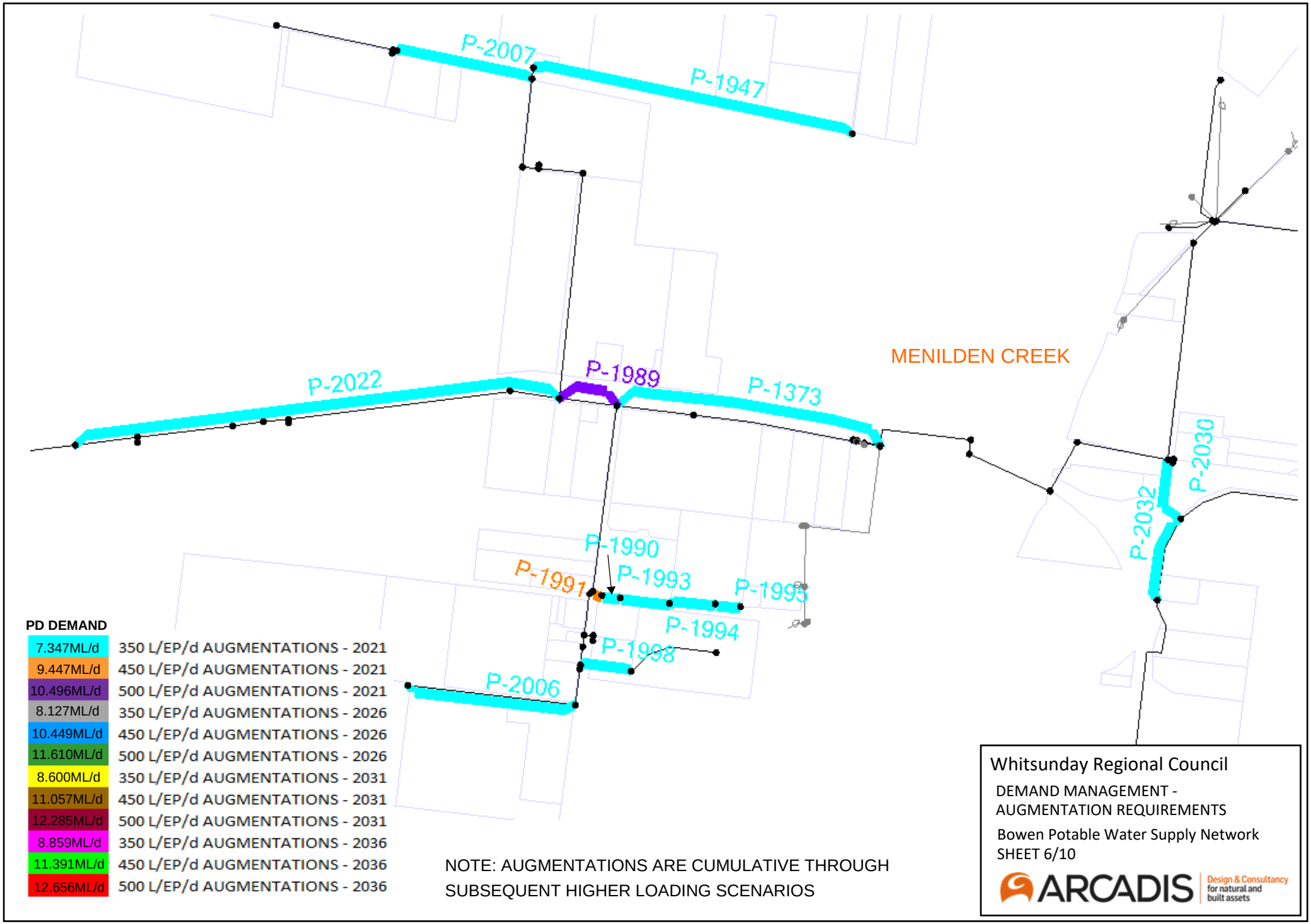
Whitsunday Regional Council

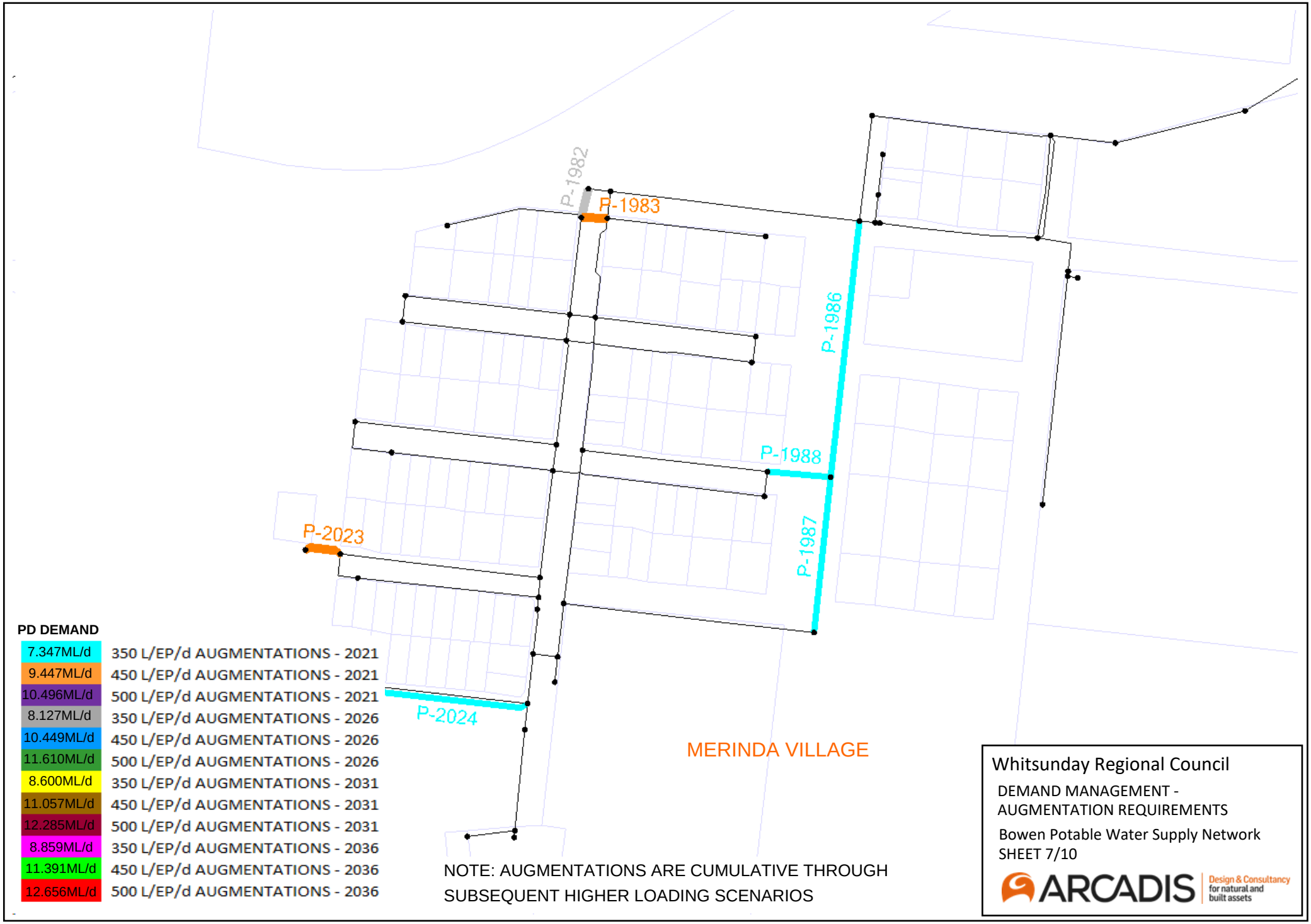
DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Bowen Potable Water Supply Network

SHEET 5/10

ARCADIS Design & Consultancy for natural and built assets


P-2007
P-1947
P-2022
P-1989
P-1373
MENILDEN CREEK
P-2030
P-2032
P-1990
P-1991
P-1993
P-1995
P-1994
P-1998
P-2006
PD DEMAND
7.347ML/d 350 L/EP/d AUGMENTATIONS - 2021
9.447ML/d 450 L/EP/d AUGMENTATIONS - 2021
10.496ML/d 500 L/EP/d AUGMENTATIONS - 2021
8.127ML/d 350 L/EP/d AUGMENTATIONS - 2026
10.449ML/d 450 L/EP/d AUGMENTATIONS - 2026
11.610ML/d 500 L/EP/d AUGMENTATIONS - 2026
8.600ML/d 350 L/EP/d AUGMENTATIONS - 2031
11.057ML/d 450 L/EP/d AUGMENTATIONS - 2031
12.285ML/d 500 L/EP/d AUGMENTATIONS - 2031
8.859ML/d 350 L/EP/d AUGMENTATIONS - 2036
11.391ML/d 450 L/EP/d AUGMENTATIONS - 2036
12.656ML/d 500 L/EP/d AUGMENTATIONS - 2036
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS
Whitsunday Regional Council
DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS
Bowen Potable Water Supply Network
SHEET 6/10
ARCADIS
Design & Consultancy for natural and built assets



PD DEMAND

7.347ML/d	350 L/EP/d AUGMENTATIONS - 2021
9.447ML/d	450 L/EP/d AUGMENTATIONS - 2021
10.496ML/d	500 L/EP/d AUGMENTATIONS - 2021
8.127ML/d	350 L/EP/d AUGMENTATIONS - 2026
10.449ML/d	450 L/EP/d AUGMENTATIONS - 2026
11.610ML/d	500 L/EP/d AUGMENTATIONS - 2026
8.600ML/d	350 L/EP/d AUGMENTATIONS - 2031
11.057ML/d	450 L/EP/d AUGMENTATIONS - 2031
12.285ML/d	500 L/EP/d AUGMENTATIONS - 2031
8.859ML/d	350 L/EP/d AUGMENTATIONS - 2036
11.391ML/d	450 L/EP/d AUGMENTATIONS - 2036
12.656ML/d	500 L/EP/d AUGMENTATIONS - 2036

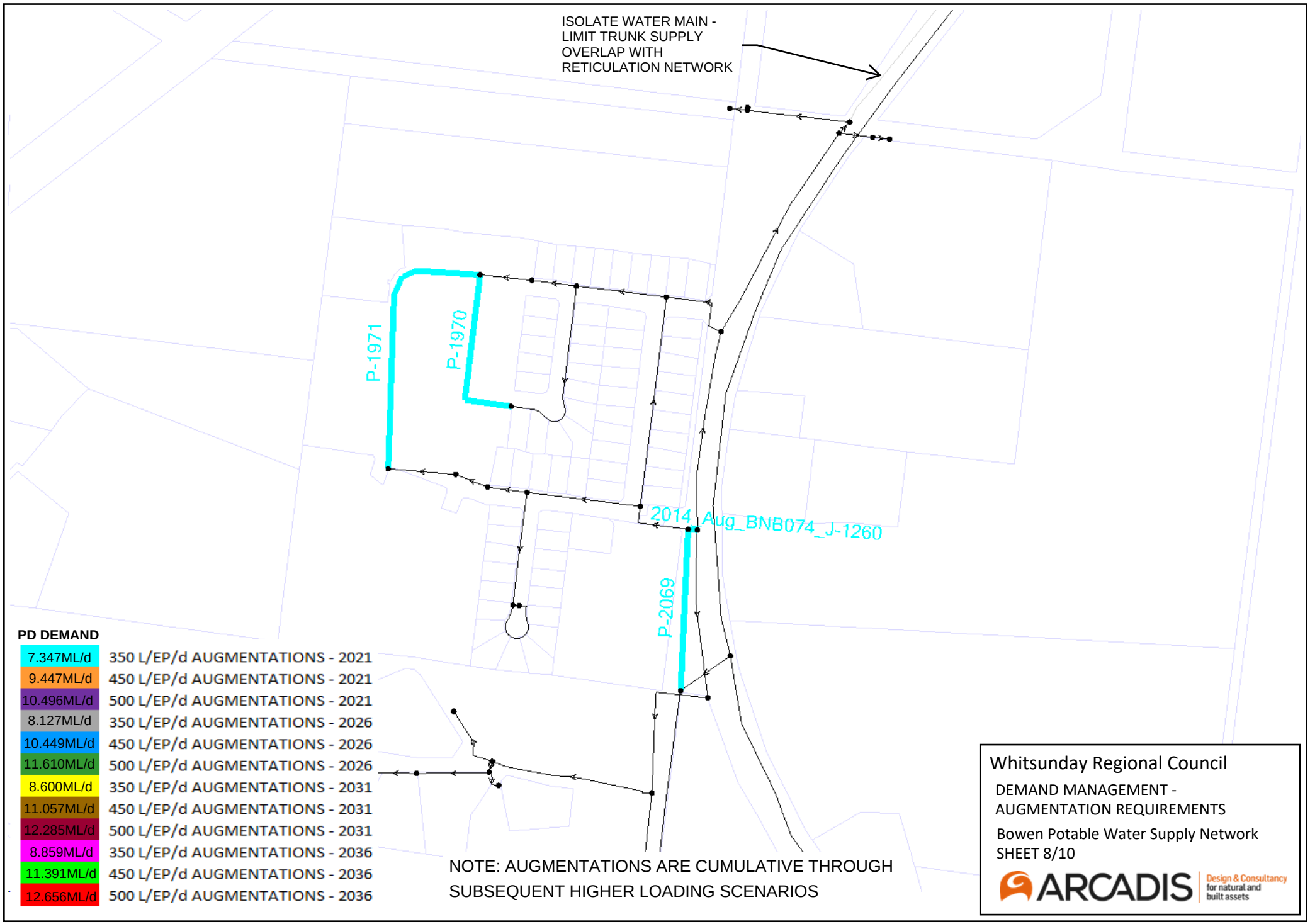
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Bowen Potable Water Supply Network
SHEET 7/10

ARCADIS Design & Consultancy for natural and built assets


ISOLATE WATER MAIN - LIMIT TRUNK SUPPLY OVERLAP WITH RETICULATION NETWORK
P-1971
P-1970
2014_Aug_BNB074_J-1260
P-2069
PD DEMAND
7.347ML/d 350 L/EP/d AUGMENTATIONS - 2021
9.447ML/d 450 L/EP/d AUGMENTATIONS - 2021
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8.127ML/d 350 L/EP/d AUGMENTATIONS - 2026
10.449ML/d 450 L/EP/d AUGMENTATIONS - 2026
11.610ML/d 500 L/EP/d AUGMENTATIONS - 2026
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11.057ML/d 450 L/EP/d AUGMENTATIONS - 2031
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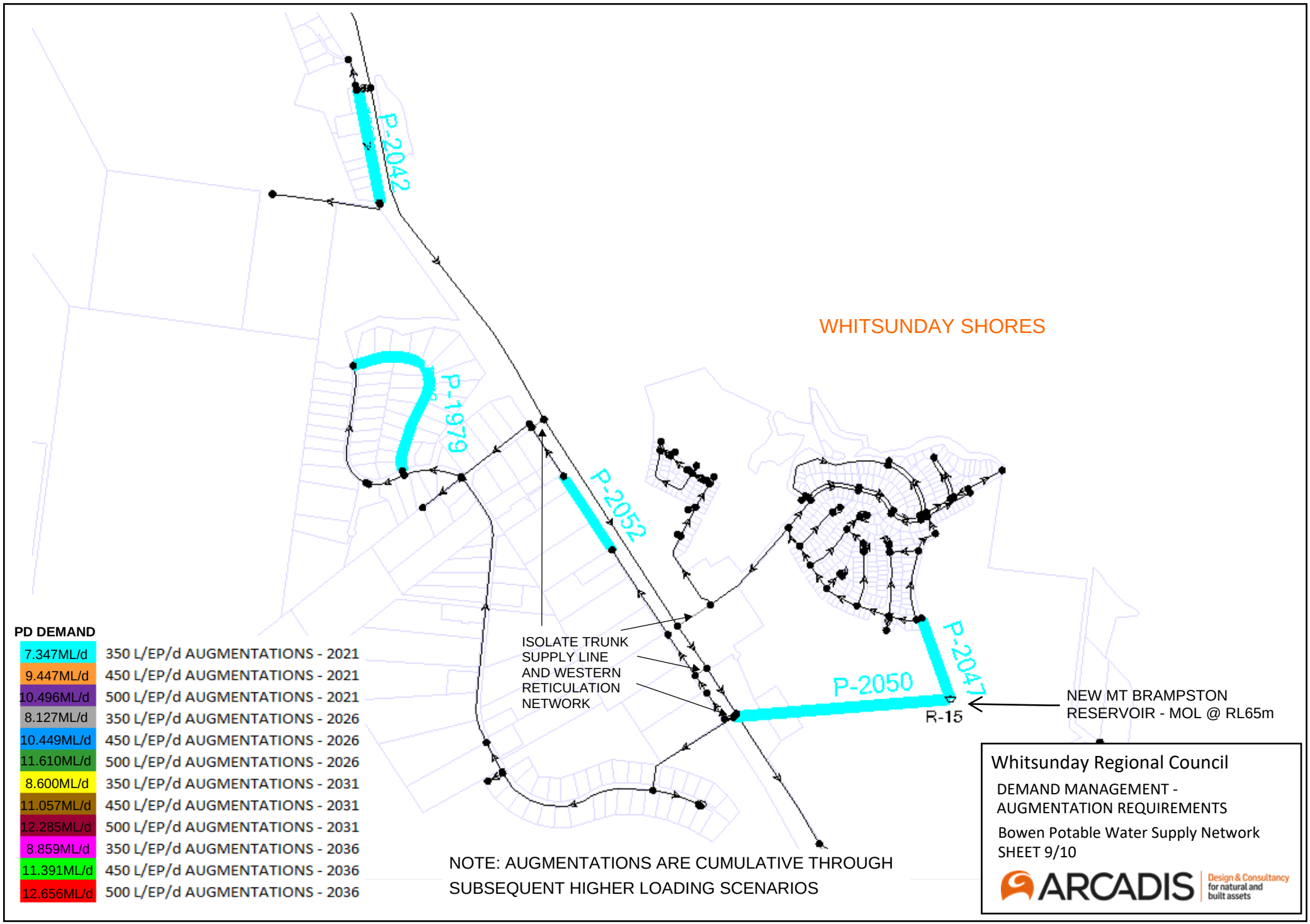
8.859ML/d 350 L/EP/d AUGMENTATIONS - 2036
11.391ML/d 450 L/EP/d AUGMENTATIONS - 2036
12.656ML/d 500 L/EP/d AUGMENTATIONS - 2036
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS
Whitsunday Regional Council
DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS
Bowen Potable Water Supply Network
SHEET 8/10
ARCADIS
Design & Consultancy for natural and built assets


P-2042
P-1979
P-2052
P-2050
P-2047
R-15
WHITSUNDAY SHORES
ISOLATE TRUNK SUPPLY LINE AND WESTERN RETICULATION NETWORK
NEW MT BRAMPSTON RESERVOIR - MOL @ RL65m
PD DEMAND
7.347ML/d 350 L/EP/d AUGMENTATIONS - 2021
9.447ML/d 450 L/EP/d AUGMENTATIONS - 2021
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11.057ML/d 450 L/EP/d AUGMENTATIONS - 2031
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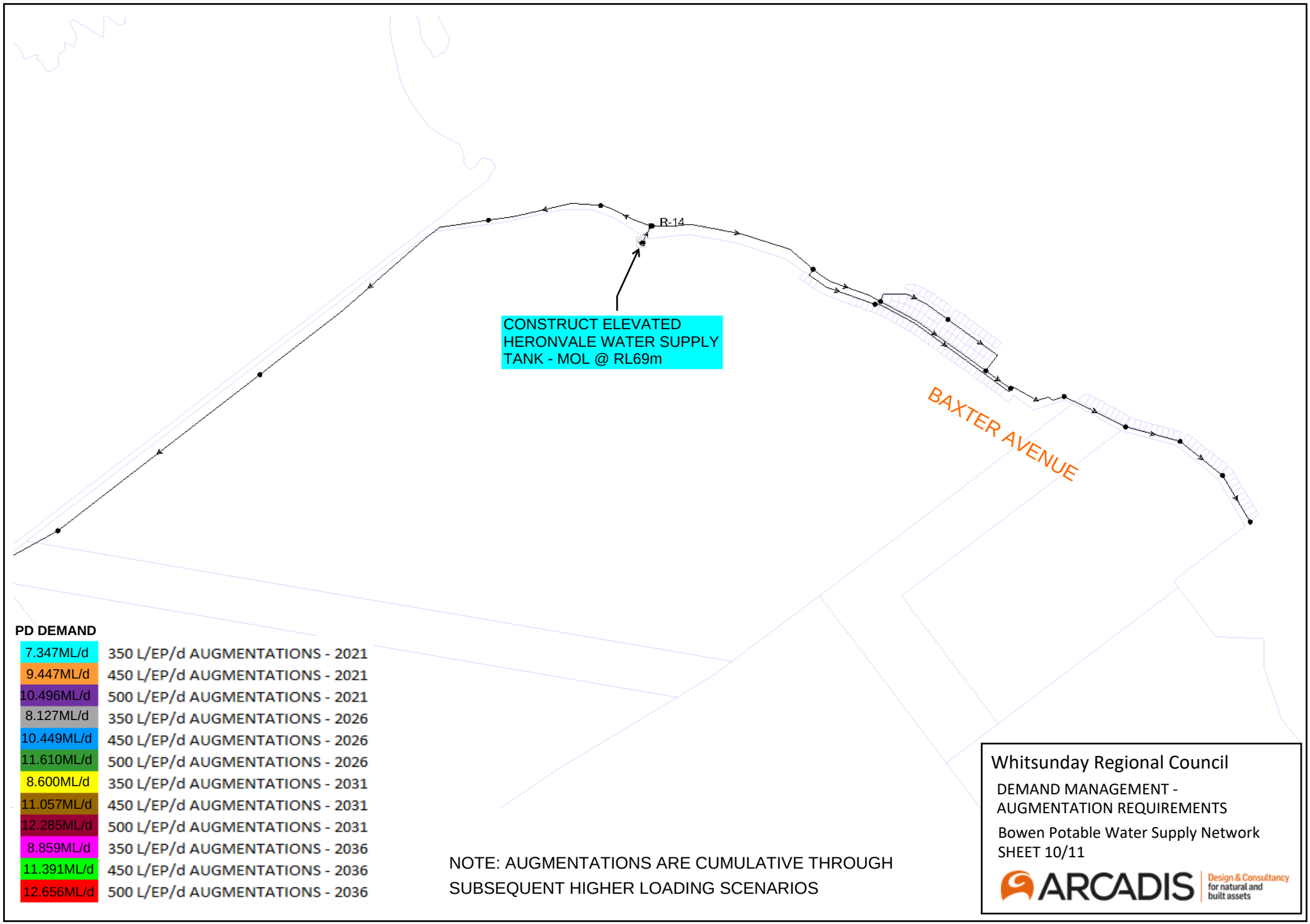
8.859ML/d 350 L/EP/d AUGMENTATIONS - 2036
11.391ML/d 450 L/EP/d AUGMENTATIONS - 2036
12.656ML/d 500 L/EP/d AUGMENTATIONS - 2036
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS
Whitsunday Regional Council
DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS
Bowen Potable Water Supply Network
SHEET 9/10
ARCADIS Design & Consultancy for natural and built assets



PD DEMAND

7.347ML/d	350 L/EP/d AUGMENTATIONS - 2021
9.447ML/d	450 L/EP/d AUGMENTATIONS - 2021
10.496ML/d	500 L/EP/d AUGMENTATIONS - 2021
8.127ML/d	350 L/EP/d AUGMENTATIONS - 2026
10.449ML/d	450 L/EP/d AUGMENTATIONS - 2026
11.610ML/d	500 L/EP/d AUGMENTATIONS - 2026
8.600ML/d	350 L/EP/d AUGMENTATIONS - 2031
11.057ML/d	450 L/EP/d AUGMENTATIONS - 2031
12.285ML/d	500 L/EP/d AUGMENTATIONS - 2031
8.859ML/d	350 L/EP/d AUGMENTATIONS - 2036
11.391ML/d	450 L/EP/d AUGMENTATIONS - 2036
12.656ML/d	500 L/EP/d AUGMENTATIONS - 2036

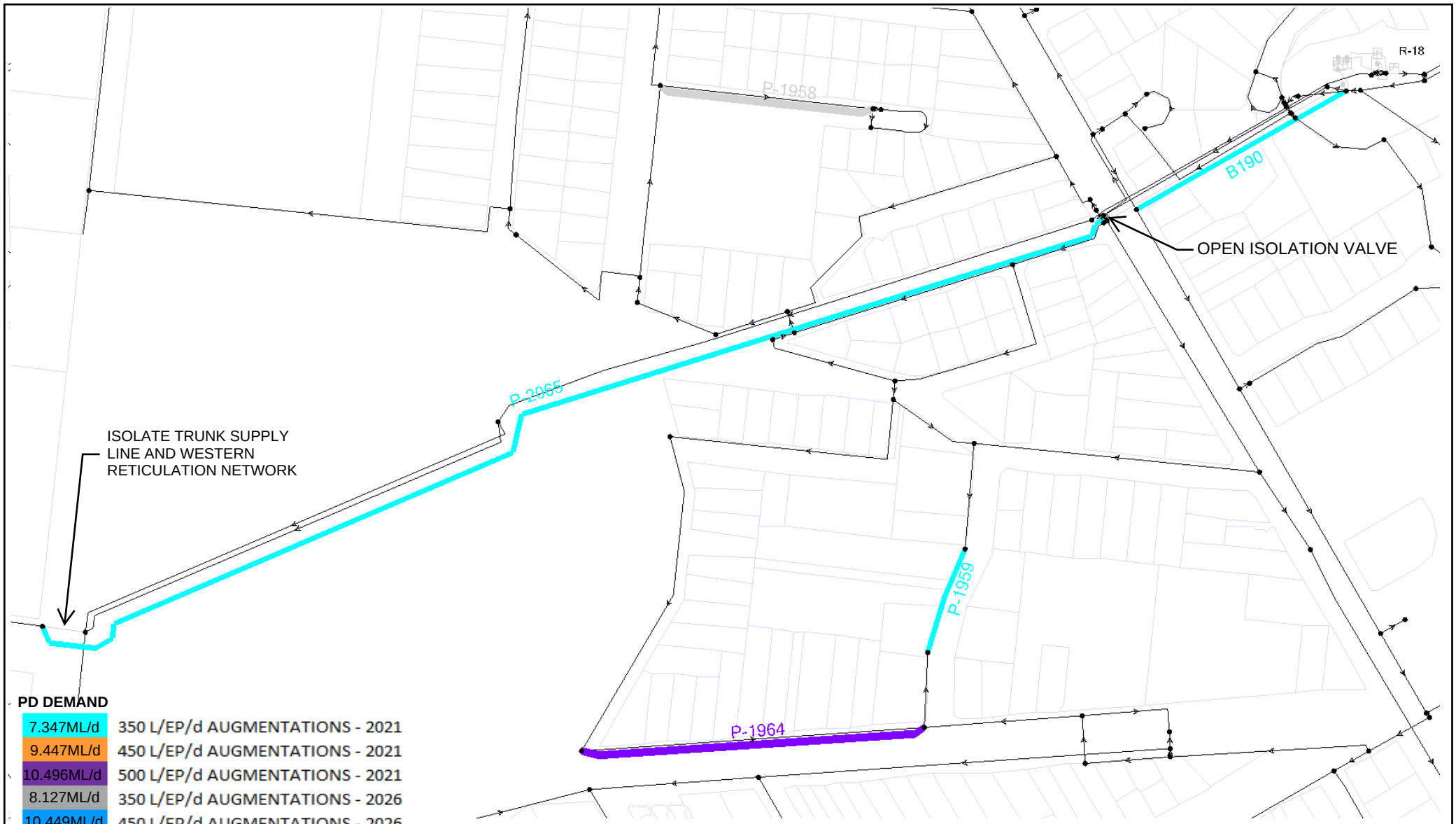
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Bowen Potable Water Supply Network
SHEET 10/11

ARCADIS Design & Consultancy for natural and built assets



PD DEMAND

7.347ML/d	350 L/EP/d AUGMENTATIONS - 2021
9.447ML/d	450 L/EP/d AUGMENTATIONS - 2021
10.496ML/d	500 L/EP/d AUGMENTATIONS - 2021
8.127ML/d	350 L/EP/d AUGMENTATIONS - 2026
10.449ML/d	450 L/EP/d AUGMENTATIONS - 2026
11.610ML/d	500 L/EP/d AUGMENTATIONS - 2026
8.600ML/d	350 L/EP/d AUGMENTATIONS - 2031
11.057ML/d	450 L/EP/d AUGMENTATIONS - 2031
12.285ML/d	500 L/EP/d AUGMENTATIONS - 2031
8.859ML/d	350 L/EP/d AUGMENTATIONS - 2036
11.391ML/d	450 L/EP/d AUGMENTATIONS - 2036
12.656ML/d	500 L/EP/d AUGMENTATIONS - 2036

NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Bowen Potable Water Supply Network
SHEET 11/11

ARCADIS Design & Consultancy for natural and built assets

PROJECT: Whitsundays Potable Water Network Modelling

Project Engineer: M.C

DOCUMENT NUMBER:

Software: WaterCad v8i

DATE: 12.12.2019

WHITSUNDAYS BOWEN POTABLE WATER NETWORK
DEMAND MANAGEMENT ASSESSMENT - AUGMENTATION REQUIREMENT SUMMARY

AUGMENTATION ID	LENGTH (m)	EXISTING PIPE SEGMENT		DUPLICATION DN	NEW PIPE DN	COST - $/m	ADJUSTMENT FACTOR FOR SOIL	10% ADDITIONAL REGIONAL COSTS	30% CONTINGENCY	COST OF NEW/DUPLICATION	AC PIPE							
		START NODE	END NODE								YEAR INSTALLED	AC DN	REPLACEMENT DN	COST - $/m	CAP & GROUT @ $20/M	TOTAL COST OF DECOMMISSIONING AND REPLACEMENT	COST INCREASE COMPARED TO DULPICATION	% OF INCREASE COMPARED TO DUPLICATION
2014_Aug_BNA160_BNA303	191	625: BNA160	1157: BNA303	150		$ 262.00	1.26	10%	30%	$ 88,274.09	1983	96.5	200	$ 310.00	$ 3,820.00	$ 115,726.90	$ 27,452.81	24%
2014_Aug_BNA225_J-1257	58	1364: BNA285	6913: J-1257		100	$ 205.00	1.26	10%	30%	$ 20,973.96								
2014_Aug_BNA581_BNA582	477	1098: BNA581	1322: BNA582	150		$ 262.00	1.26	10%	30%	$ 220,454.14	1950	96.5	200	$ 310.00	$ 9,540.00	$ 289,014.30	$ 68,560.16	24%
2014_Aug_BNA669_BNA466	160	628: BNA668	1310: BNA466		100	$ 205.00	1.26	10%	30%	$ 57,859.20								
2014_Aug_BNA87_BNA581	8	1233: BNA87	1098: BNA581	150		$ 262.00	1.26	10%	30%	$ 3,697.34	1962	96.5	200	$ 310.00	$ 160.00	$ 4,847.20	$ 1,149.86	24%
2014_Aug_BNB074_J-1260	10	6923: J-1260	3595: BNB074		100	$ 205.00	1.26	10%	30%	$ 3,616.20								
2014_Aug_J-1253_BNB092	150	6900: J-1253	3838: BNB092	100		$ 205.00	1.26	10%	30%	$ 54,243.00								
2016_Aug_BNA708_BNA710	438	1056: BNA708	622: BNA710	150		$ 272.00	1.26	10%	30%	$ 210,155.90								
B190	180	1089: BN90	1246:01:00	EXISTING - 297				10%	30%									
P-1373	812	915: BNA326	1220: BNA788	200		$ 310.00	1.26	10%	30%	$ 444,034.08								
P-1940	145	682: BNA63	667: BNA62	150		$ 262.00	1.26	10%	30%	$ 67,014.36	1964	96.5	200	$ 310.00	$ 2,900.00	$ 87,855.50	$ 20,841.14	24%
P-1941	169	960: BNA59	1069: BNA58	100		$ 205.00	1.26	10%	30%	$ 61,113.78	1979	96.5	150	$ 262.00	$ 3,380.00	$ 87,065.42	$ 25,951.64	30%
P-1942	181	500: BNA55	1275: BNA54	100		$ 205.00	1.26	10%	30%	$ 65,453.22	1964	96.5	150	$ 262.00	$ 3,620.00	$ 93,247.58	$ 27,794.36	30%
P-1943	124	410: BNA51	1153: BNA50	150		$ 262.00	1.26	10%	30%	$ 57,308.83	1964	96.5	200	$ 310.00	$ 2,480.00	$ 75,131.60	$ 17,822.77	24%
P-1944	209	3116: BNA529	3118: BNA525	150		$ 262.00	1.26	10%	30%	$ 96,593.11								
P-1945	97	943: BNA73	407: BNA715	150		$ 262.00	1.26	10%	30%	$ 44,830.30								
P-1946	250	407: BNA715	3132: BNA521	100		$ 205.00	1.26	10%	30%	$ 90,405.00								
P-1947	941	1336: BNA942	1309: BNA943	100		$ 205.00	1.26	10%	30%	$ 340,284.42								
P-1948	89	548: BNA519	643: BNA520		100	$ 205.00	1.26	10%	30%	$ 32,184.18								
P-1950	81	1112: BNA136	3718: BNB151		150	$ 262.00	1.26	10%	30%	$ 37,435.61								
P-1956	322	1157: BNA303	389: BNA936	150		$ 262.00	1.26	10%	30%	$ 148,818.10	1975	96.5	200	$ 310.00	$ 6,440.00	$ 195,099.80	$ 46,281.70	24%
P-1957	381	3676: BNA131	626: BNA935	150		$ 262.00	1.26	10%	30%	$ 176,086.01	1982	96.5	200	$ 310.00	$ 7,620.00	$ 230,847.90	$ 54,761.89	24%
P-1959	82	983: BNA276	521: BNA274		150	$ 262.00	1.26	10%	30%	$ 37,897.78								
P-1964	258	398: BNA273	962: BNA270	150		$ 262.00	1.26	10%	30%	$ 119,239.34	1960	96.5	200	$ 310.00	$ 5,160.00	$ 156,322.20	$ 37,082.86	24%
P-1965	115	3686: BNA482	3688: BNA484	150		$ 262.00	1.26	10%	30%	$ 53,149.32								
P-1970	182	3600: BNB079	3607: BNB167		100	$ 205.00	1.26	10%	30%	$ 65,814.84								
P-1971	288	3607: BNB167	3608: BNB168		100	$ 205.00	1.26	10%	30%	$ 104,146.56								
P-1973	256	3758: BNA530	3759: BNA531	100		$ 205.00	1.26	10%	30%	$ 92,574.72								
P-1979	721	1254: BNA784	1460: BNA350		150	$ 262.00	1.26	10%	30%	$ 333,223.13								
P-1981	58	559: BNA249	1287: BNA248	100		$ 205.00	1.26	10%	30%	$ 20,973.96								
P-1982	30	732: BNA404	1253: BNA416		150	$ 262.00	1.26	10%	30%	$ 13,865.04								
P-1983	26	1253: BNA416	1269: BNA405		150	$ 262.00	1.26	10%	30%	$ 12,016.37								
P-1986	261	569: BNA800	7069: J-1268		200	$ 310.00	1.26	10%	30%	$ 142,725.24								
P-1987	158	7069: J-1268	1266: BNA410		200	$ 310.00	1.26	10%	30%	$ 86,400.72								
P-1988	64	7069: J-1268	1281: BNA422		100	$ 205.00	1.26	10%	30%	$ 23,143.68								
P-1989	199	1220: BNA788	1405: BNA938	200		$ 310.00	1.26	10%	30%	$ 108,821.16								
P-1990	58	986: BNA812	1193: BNA816	150		$ 262.00	1.26	10%	30%	$ 26,805.74								
P-1991	36	1076: BNA801	986: BNA812	150		$ 262.00	1.26	10%	30%	$ 16,638.05								
P-1993	148	1193: BNA816	972: BNA817	150		$ 262.00	1.26	10%	30%	$ 68,400.86								
P-1994	136	972: BNA817	561: BNA818	150		$ 262.00	1.26	10%	30%	$ 62,854.85								
P-1995	76	561: BNA818	609: BNA819	150		$ 262.00	1.26	10%	30%	$ 35,124.77								
P-1998	150	3669: B155a	7082: J-1271	150		$ 262.00	1.26	10%	30%	$ 69,325.20								
P-2006	496	672: BNB005	1030: BNB006	150		$ 262.00	1.26	10%	30%	$ 229,235.33								
P-2007	400	1045: BNA941	791: BNA944	150		$ 262.00	1.26	10%	30%	$ 184,867.20								
P-2008	150	3656: BNB141	984: BNA734		150	$ 262.00	1.26	10%	30%	$ 69,325.20								
P-2009	158	3937: BNB142	6919: J-1259		150	$ 262.00	1.26	10%	30%	$ 73,022.54								
P-2013	55	1101: BN105	582: BNA723		150	$ 262.00	1.26	10%	30%	$ 25,419.24								
P-2016	32	921: BNA211	7104: J-1275		150	$ 262.00	1.26	10%	30%	$ 14,789.38								
P-2018	355	1157: BNA303	1141: BNA306	150		$ 262.00	1.26	10%	30%	$ 164,069.64								
P-2019	217	825: BNA311	640: BNA312	150		$ 262.00	1.26	10%	30%	$ 100,290.46								
P-2020	220	640: BNA312	1227: BNA313	150		$ 262.00	1.26	10%	30%	$ 101,676.96								
P-2021	191	1227: BNA313	1288: BNA314	150		$ 262.00	1.26	10%	30%	$ 88,274.09								
P-2022	1,424	1405: BNA938	704: BNA792	150		$ 262.00	1.26	10%	30%	$ 658,127.23								
P-2023	37	1024: BNA428	1149: BNA432	150		$ 262.00	1.26	10%	30%	$ 17,100.22								
P-2024	171	1391: BNA821	392: BNA822	150		$ 262.00	1.26	10%	30%	$ 79,030.73								
P-2030	200	1212: BNA323	7122: J-1279	200	200	$ 310.00	1.26	10%	30%	$ 109,368.00								
P-2032	263	7122: J-1279	7118: J-1277	150		$ 262.00	1.26	10%	30%	$ 121,550.18								
P-2039	81	1473: BNA356	1474: BNA357	150		$ 262.00	1.26	10%	30%	$ 37,435.61								
P-2042	450	514: BNA341	896: BNA664	150		$ 262.00	1.26	10%	30%	$ 207,975.60								
P-2047	334	7224: R-15	1443: BNA443		375	$ 878.00	1.26	10%	30%	$ 517,296.53								
P-2050	841	7224: R-15	7228: J-1286		250	$ 384.00	1.26	10%	30%	$ 569,673.22								
P-2052	342	1361: BNA339	1171: BNA605		100	$ 205.00	1.26	10%	30%	$ 123,674.04								
P-2057	218	1067: BNA225	7243: J-1287		150	$ 262.00	1.26	10%	30%	$ 100,752.62								
P-2061	216	3554: BNB100	3497: J-1168		200	$ 310.00	1.26	10%	30%	$ 118,117.44								
P-2062	403	3497: J-1168	1361: BNA339	150		$ 262.00	1.26	10%	30%	$ 186,253.70								
P-2065	891	1156: BN108	445: BNA583		375	$ 878.00	1.26	10%	30%	$ 1,379,973.67								
P-2069	170	7269: J-1288	3595: BNB074		200	$ 310.00	1.26	10%	30%	$ 92,962.80								
	17090.00						**TOTAL**			**$ 9,184,237.78**						**$ 1,335,158.40**	**$ 327,699.19**	**24.54%**

PROJECT:	Whitsundays Potable Water Network Modelling	**Project Engineer:**	M.C
DOCUMENT NUMBER:		**Software:**	WaterCad v8i
DATE:	12.12.2019		

ARCADIS Design & Consultancy for natural and built assets

WHITSUNDAYS BOWEN POTABLE WATER NETWORK
DEMAND MANAGEMENT ASSESSMENT - AUGMENTATION REQUIREMENT SUMMARY

AUGMENTATION ID	350 L/EP/d DEMAND - 2021	450 L/EP/d DEMAND - 2021	BASELINE 500 L/EP/d DEMAND - 2021	350 L/EP/d DEMAND - 2026	450 L/EP/d DEMAND - 2026	BASELINE 500 L/EP/d DEMAND - 2026	350 L/EP/d DEMAND - 2031	450 L/EP/d DEMAND - 2031	BASELINE 500 L/EP/d DEMAND - 2031	350 L/EP/d DEMAND - 2036	450 L/EP/d DEMAND - 2036	BASELINE 500 L/EP/d DEMAND - 2036
2014_Aug_BNA160_BNA303												
2014_Aug_BNA225_J-1257												
2014_Aug_BNA581_BNA582												
2014_Aug_BNA669_BNA466												
2014_Aug_BNA87_BNA581												
2014_Aug_BNB074_J-1260												
2014_Aug_J-1253_BNB092												
2016_Aug_BNA708_BNA710												
B190												
P-1373												
P-1940												
P-1941												
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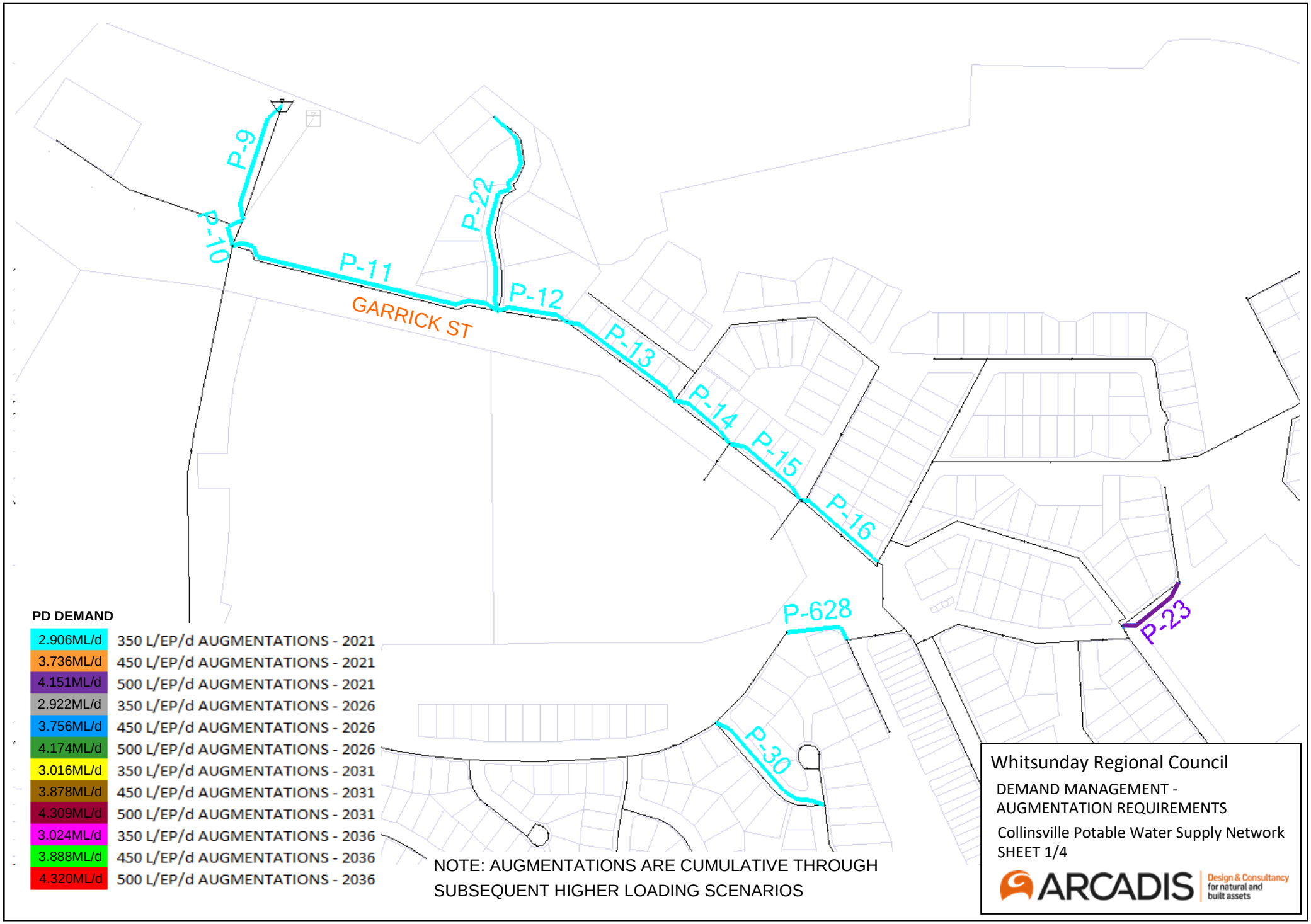
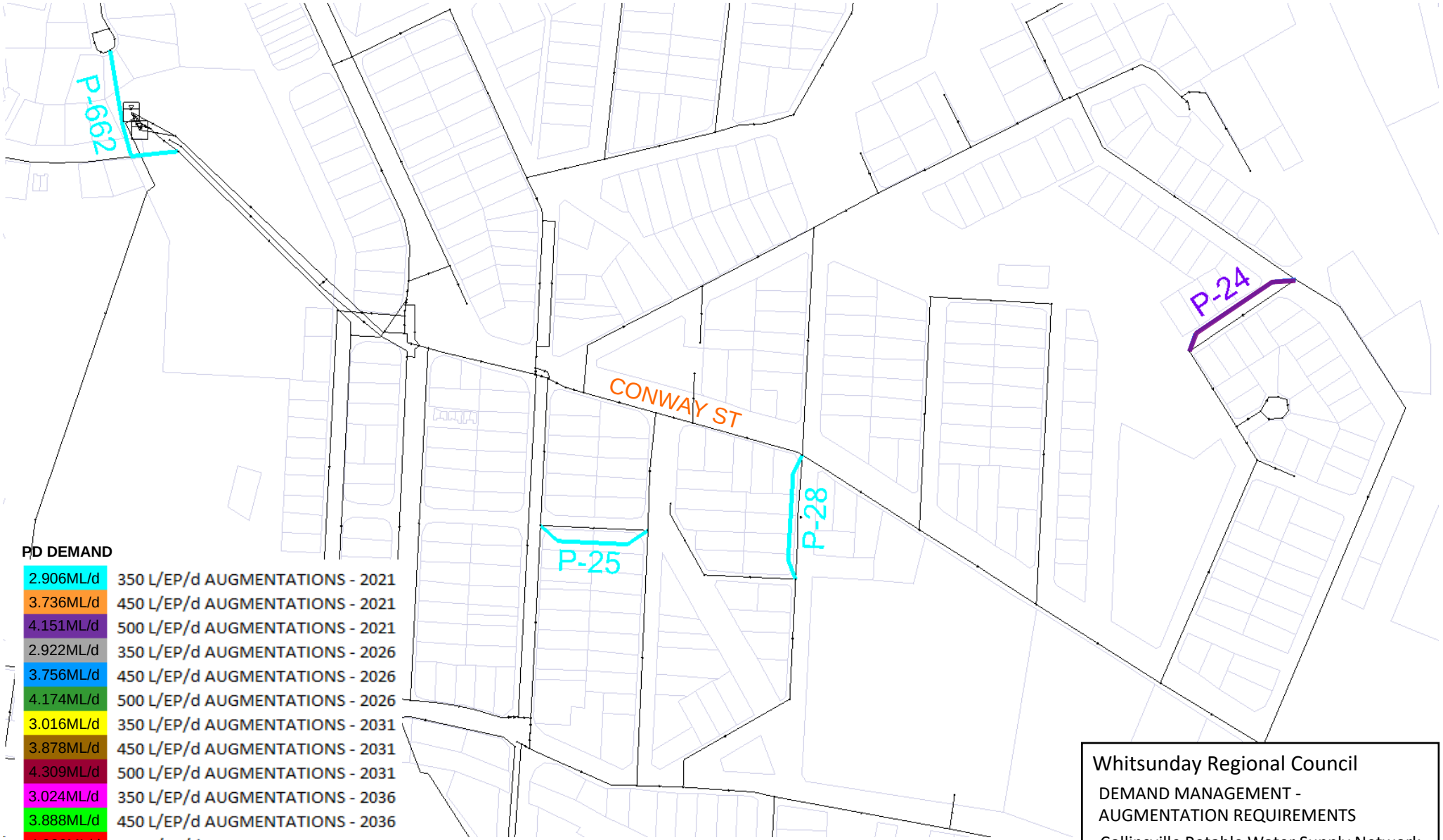


16/12/2019

SK001-10027536-01



PD DEMAND	
2.906ML/d	350 L/EP/d AUGMENTATIONS - 2021
3.736ML/d	450 L/EP/d AUGMENTATIONS - 2021
4.151ML/d	500 L/EP/d AUGMENTATIONS - 2021
2.922ML/d	350 L/EP/d AUGMENTATIONS - 2026
3.756ML/d	450 L/EP/d AUGMENTATIONS - 2026
4.174ML/d	500 L/EP/d AUGMENTATIONS - 2026
3.016ML/d	350 L/EP/d AUGMENTATIONS - 2031
3.878ML/d	450 L/EP/d AUGMENTATIONS - 2031
4.309ML/d	500 L/EP/d AUGMENTATIONS - 2031
3.024ML/d	350 L/EP/d AUGMENTATIONS - 2036
3.888ML/d	450 L/EP/d AUGMENTATIONS - 2036
4.320ML/d	500 L/EP/d AUGMENTATIONS - 2036

NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

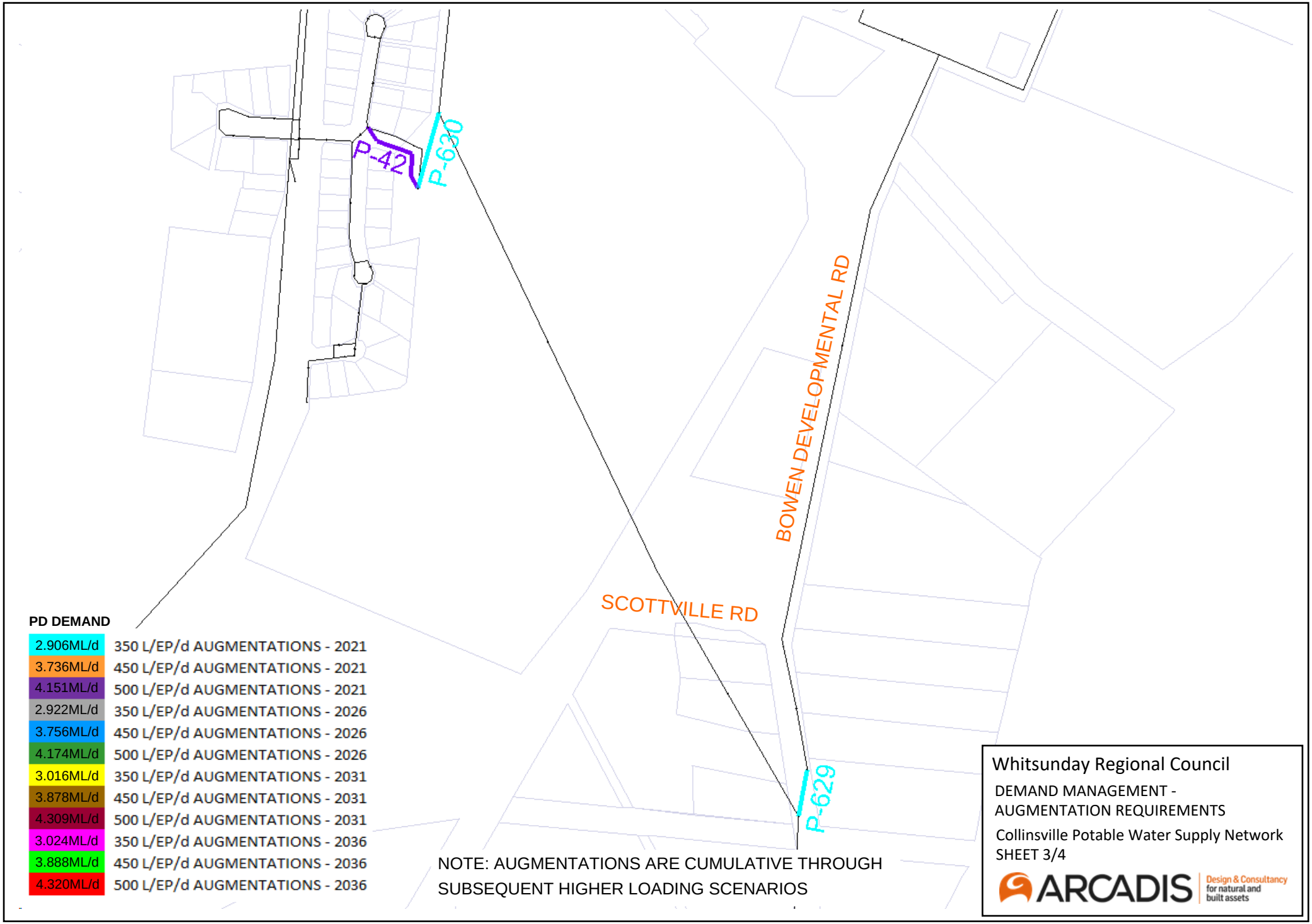
Collinsville Potable Water Supply Network

SHEET 2/4

ARCADIS Design & Consultancy for natural and built assets

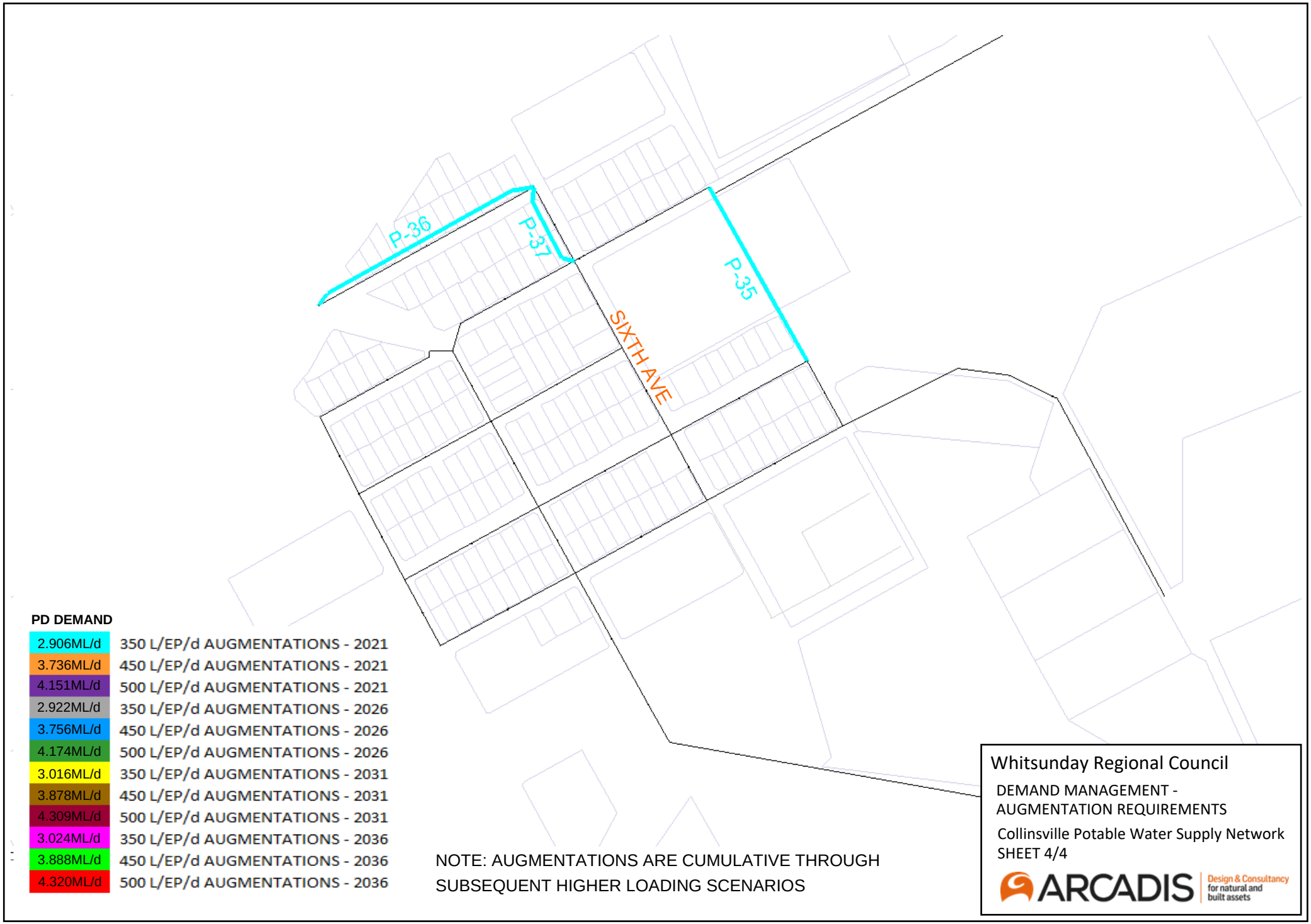
16/12/2019

SK001-10027536-01



16/12/2019

SK001-10027536-01



PD DEMAND

2.906ML/d	350 L/EP/d AUGMENTATIONS - 2021
3.736ML/d	450 L/EP/d AUGMENTATIONS - 2021
4.151ML/d	500 L/EP/d AUGMENTATIONS - 2021
2.922ML/d	350 L/EP/d AUGMENTATIONS - 2026
3.756ML/d	450 L/EP/d AUGMENTATIONS - 2026
4.174ML/d	500 L/EP/d AUGMENTATIONS - 2026
3.016ML/d	350 L/EP/d AUGMENTATIONS - 2031
3.878ML/d	450 L/EP/d AUGMENTATIONS - 2031
4.309ML/d	500 L/EP/d AUGMENTATIONS - 2031
3.024ML/d	350 L/EP/d AUGMENTATIONS - 2036
3.888ML/d	450 L/EP/d AUGMENTATIONS - 2036
4.320ML/d	500 L/EP/d AUGMENTATIONS - 2036

NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Collinsville Potable Water Supply Network
SHEET 4/4

ARCADIS Design & Consultancy for natural and built assets

16/12/2019

SK001-10027536-01

PROJECT: WRC Potable Water Network Modelling **Project Engineer:** M.C

DOCUMENT NUMBER: **Software:** WaterCad v8i

DATE: 16.12.2019

WHITSUNDAYS COLLINSVILLE POTABLE WATER NETWORK
DEMAND MANAGEMENT ASSESSMENT - AUGMENTATION REQUIREMENT SUMMARY

AUGMENTATION ID	LENGTH (m)	EXISTING PIPE SEGMENT		DUPLICATION DN	NEW PIPE DN	COST - $/m	ADJUSTMENT FACTOR FOR SOIL	10% ADDITIONAL REGIONAL COSTS	30% CONTINGENCY	COST OF NEW/DUPLICATION	AC PIPE							
		START NODE	END NODE								YEAR INSTALLED	AC DN	REPLACEMENT DN	COST - $/m	CAP & GROUT @ $20/M	TOTAL COST OF DECOMISSIONING AND REPLACEMENT	COST INCREASE COMPARED TO DULPICATION	% OF INCREASE COMPARED TO DUPLICATION
P-9	145	R-1	CLC258	250		$ 384.00	1.26	10%	30%	$ 98,219.52								
P-10	43	CLC258	CLC151	250		$ 384.00	1.26	10%	30%	$ 29,127.17								
P-11	328	CLC151	CLC2	200		$ 310.00	1.26	10%	30%	$ 179,363.52								
P-12	84	CLC2	CLC263	200		$ 310.00	1.26	10%	30%	$ 45,934.56								
P-13	158	CLC263	CLC3	200		$ 310.00	1.26	10%	30%	$ 86,400.72								
P-14	84	CLC3	CLC4	200		$ 310.00	1.26	10%	30%	$ 45,934.56								
P-15	108	CLC4	CLC5	200		$ 310.00	1.26	10%	30%	$ 59,058.72								
P-16	118	CLC5	CLC6	200		$ 310.00	1.26	10%	30%	$ 64,527.12								
P-22	257	CLC2	CLC9	100		$ 205.00	1.26	10%	30%	$ 92,936.34		100	150	$ 262.00	$ 5,140.00	$ 132,401.26	$ 39,464.92	30%
P-23	89	CLC20	CLC24	100		$ 205.00	1.26	10%	30%	$ 32,184.18		100	150	$ 262.00	$ 1,780.00	$ 45,851.02	$ 13,666.84	30%
P-24	135	CLC72	CLC73	100		$ 205.00	1.26	10%	30%	$ 48,818.70		100	150	$ 262.00	$ 2,700.00	$ 69,549.30	$ 20,730.60	30%
P-25	118	CLC97	CLC98	100		$ 205.00	1.26	10%	30%	$ 42,671.16		100	150	$ 262.00	$ 2,360.00	$ 60,791.24	$ 18,120.08	30%
P-28	128	CLC67	CLC212	100		$ 205.00	1.26	10%	30%	$ 46,287.36		100	150	$ 262.00	$ 2,560.00	$ 65,943.04	$ 19,655.68	30%
P-30	165	CLC164	CLC166	100		$ 205.00	1.26	10%	30%	$ 59,667.30		100	150	$ 262.00	$ 3,300.00	$ 85,004.70	$ 25,337.40	30%
P-35	287	CLC195	CLC179		150	$ 262.00	1.26	10%	30%	$ 132,642.22								
P-36	357	CLC182	CLC183	100		$ 205.00	1.26	10%	30%	$ 129,098.34		100	150	262	$ 7,140.00	$ 183,919.26	$ 54,820.92	30%
P-37	131	CLC181	CLC182	100		$ 205.00	1.26	10%	30%	$ 47,372.22		100	150	262	$ 2,620.00	$ 67,488.58	$ 20,116.36	30%
P-42	105	CLC120	CLC121		150	$ 205.00	1.26	10%	30%	$ 37,970.10		100	150	262	$ 2,100.00	$ 54,093.90	$ 16,123.80	30%
P-628	80	CLC165	CLC54		150	$ 262.00	1.26	10%	30%	$ 36,973.44								
P-629	55	CLC205	CLC267		150	$ 262.00	1.26	10%	30%	$ 25,419.24								
P-630	91	CLC172	CLC121		150	$ 262.00	1.26	10%	30%	$ 42,057.29								
P-662	155	CLC170	CLC147		100	$ 205.00	1.26	10%	30%	$ 56,051.10								
	3221.00						**TOTAL**			**$ 1,438,714.87**						**$ 765,042.30**	**$ 228,036.60**	**29.81%**

PROJECT:	WRC Potable Water Network Modelling	**Project Engineer:**	M.C
DOCUMENT NUMBER:		**Software:**	WaterCad v8i
DATE:	16.12.2019		

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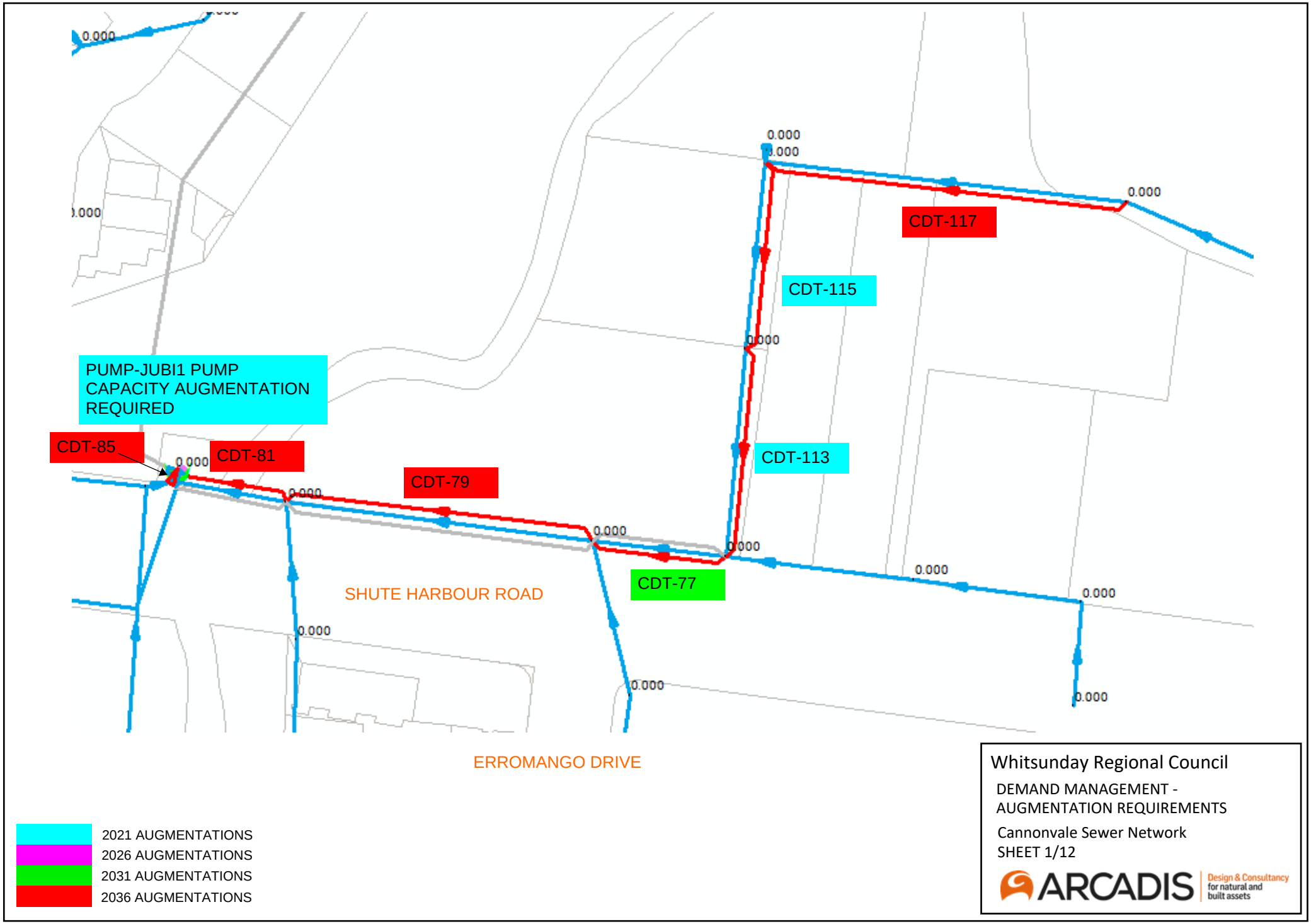
WHITSUNDAYS COLLINSVILLE POTABLE WATER NETWORK
DEMAND MANAGEMENT ASSESSMENT - AUGMENTATION REQUIREMENT SUMMARY

AUGMENTATION ID	350 L/EP/d DEMAND - 2021	450 L/EP/d DEMAND - 2021	BASELINE 500 L/EP/d DEMAND - 2021	350 L/EP/d DEMAND - 2026	450 L/EP/d DEMAND - 2026	BASELINE 500 L/EP/d DEMAND - 2026	350 L/EP/d DEMAND - 2031	450 L/EP/d DEMAND - 2031	BASELINE 500 L/EP/d DEMAND - 2031	350 L/EP/d DEMAND - 2036	450 L/EP/d DEMAND - 2036	BASELINE 500 L/EP/d DEMAND - 2036
P-9												
P-10												
P-11												
P-12												
P-13												
P-14												
P-15												
P-16												
P-22												
P-23												
P-24												
P-25												
P-28												
P-30												
P-35												
P-36												
P-37												
P-42												
P-628												
P-629												
P-630												
P-662												

APPENDIX G

INITIAL SEWER NETWORK AUGMENTATION OUTPUTS PRE-WORKSHOP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CDT-117
CDT-115
PUMP-JUBI1 PUMP CAPACITY AUGMENTATION REQUIRED
CDT-85
CDT-81
CDT-79
CDT-113
CDT-77
SHUTE HARBOUR ROAD
ERROMANGO DRIVE
2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS
Whitsunday Regional Council
DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS
Cannonvale Sewer Network
SHEET 1/12
ARCADIS
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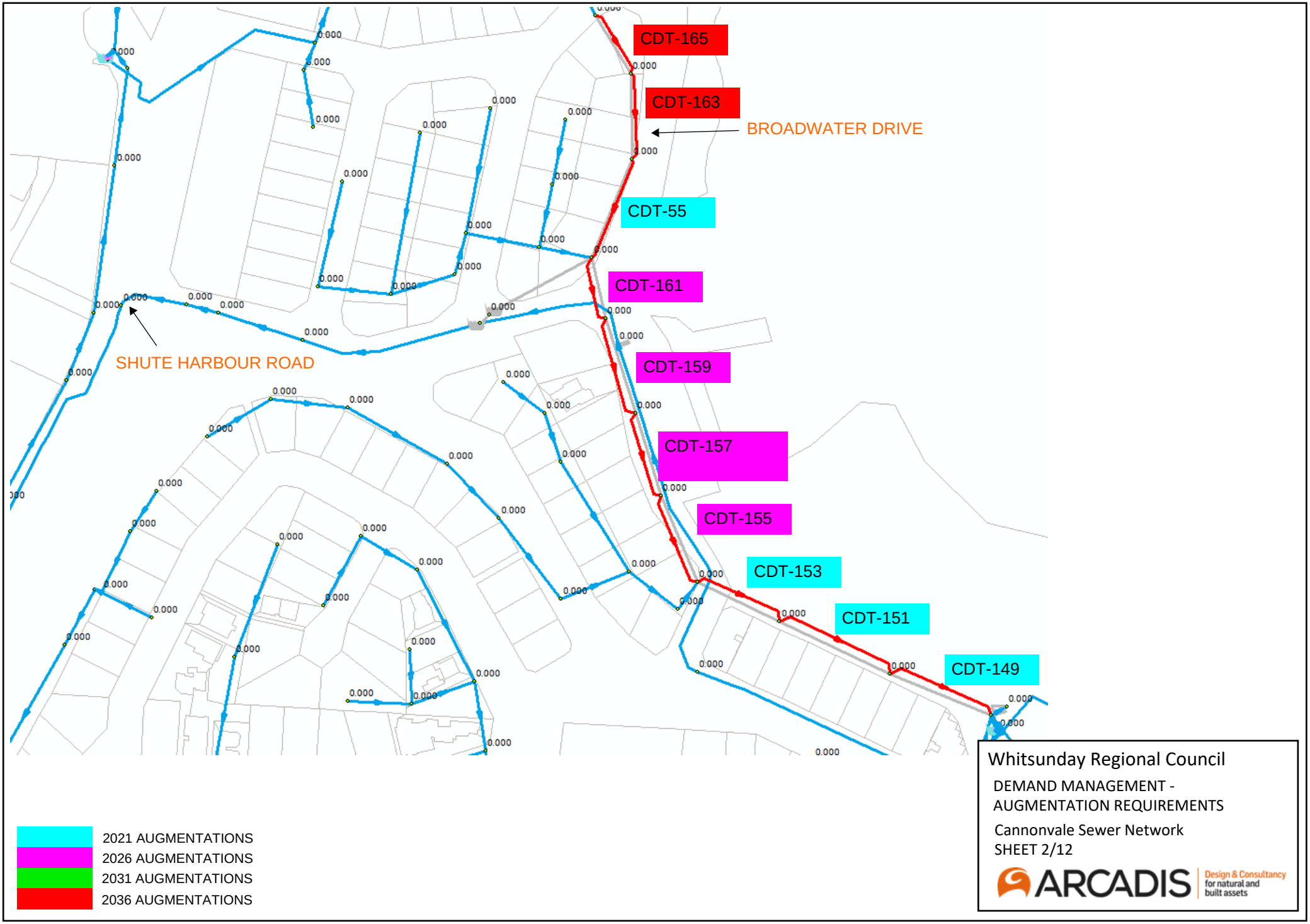
CDT-165
CDT-163
BROADWATER DRIVE
CDT-55
CDT-161
CDT-159
CDT-157
CDT-155
CDT-153
CDT-151
CDT-149
SHUTE HARBOUR ROAD
2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS
Whitsunday Regional Council
DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS
Cannonvale Sewer Network
SHEET 2/12
ARCADIS
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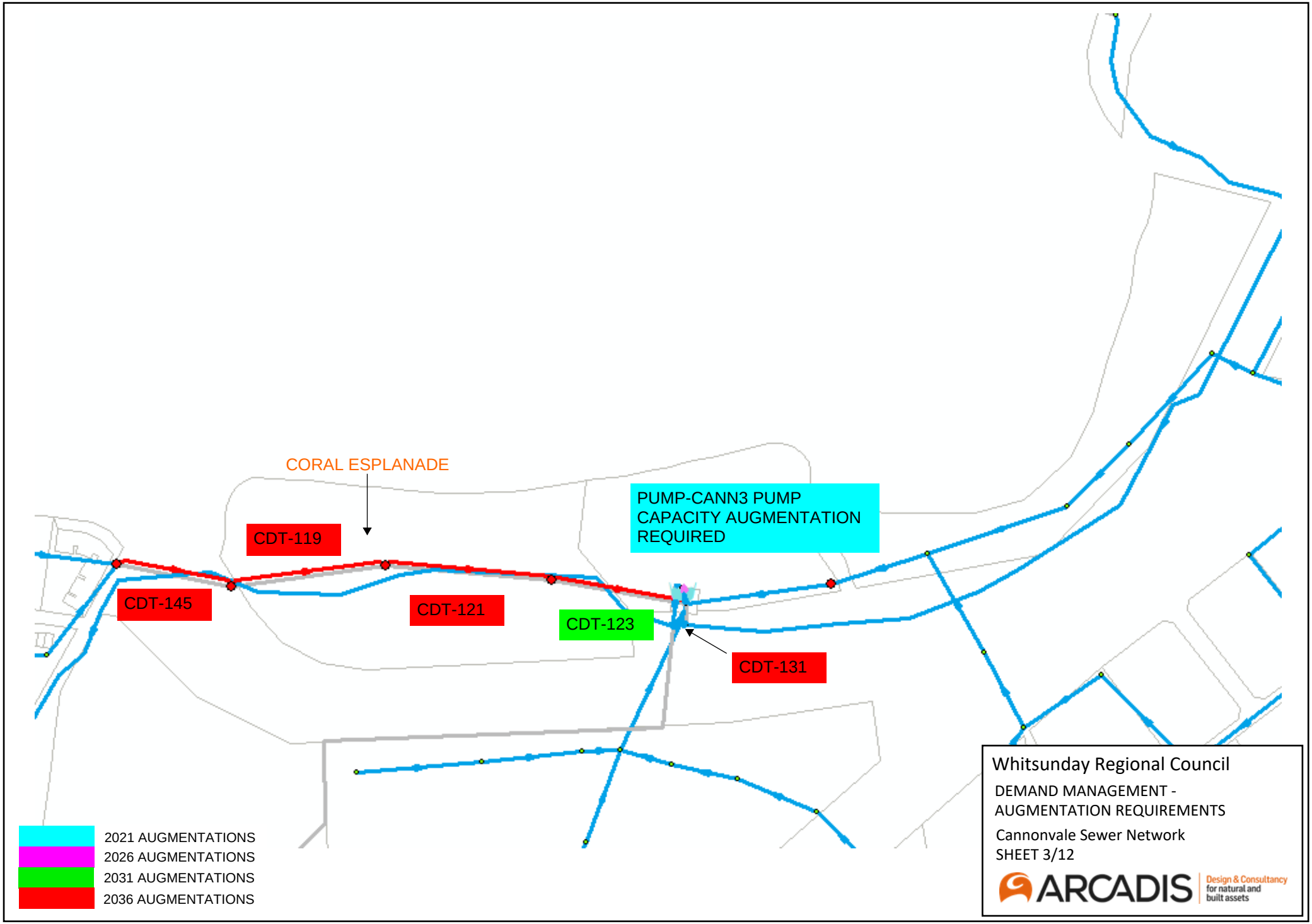
CORAL ESPLANADE
PUMP-CANN3 PUMP CAPACITY AUGMENTATION REQUIRED
CDT-119
CDT-145
CDT-121
CDT-123
CDT-131
2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS
Whitsunday Regional Council
DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS
Cannonvale Sewer Network
SHEET 3/12
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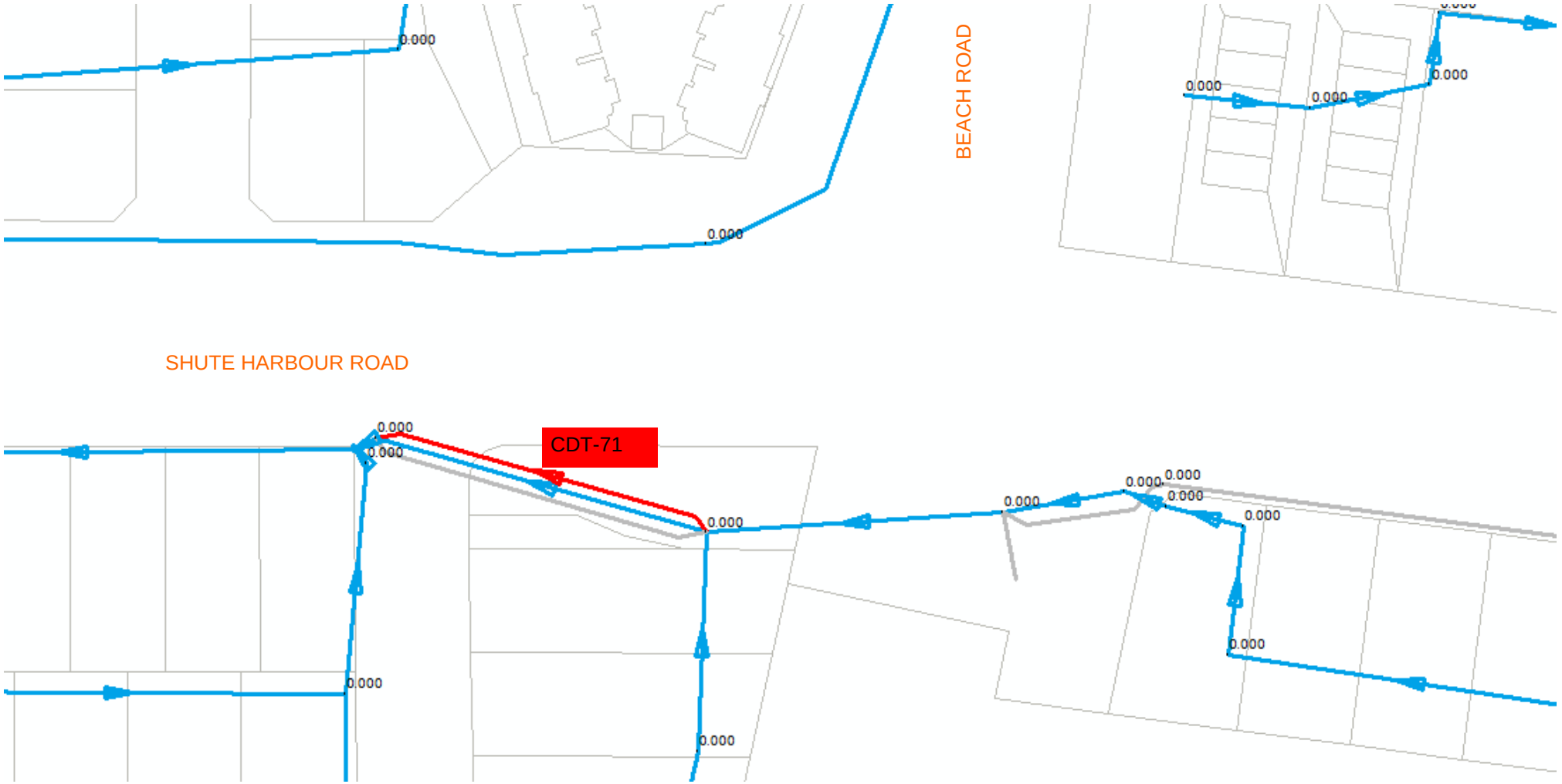


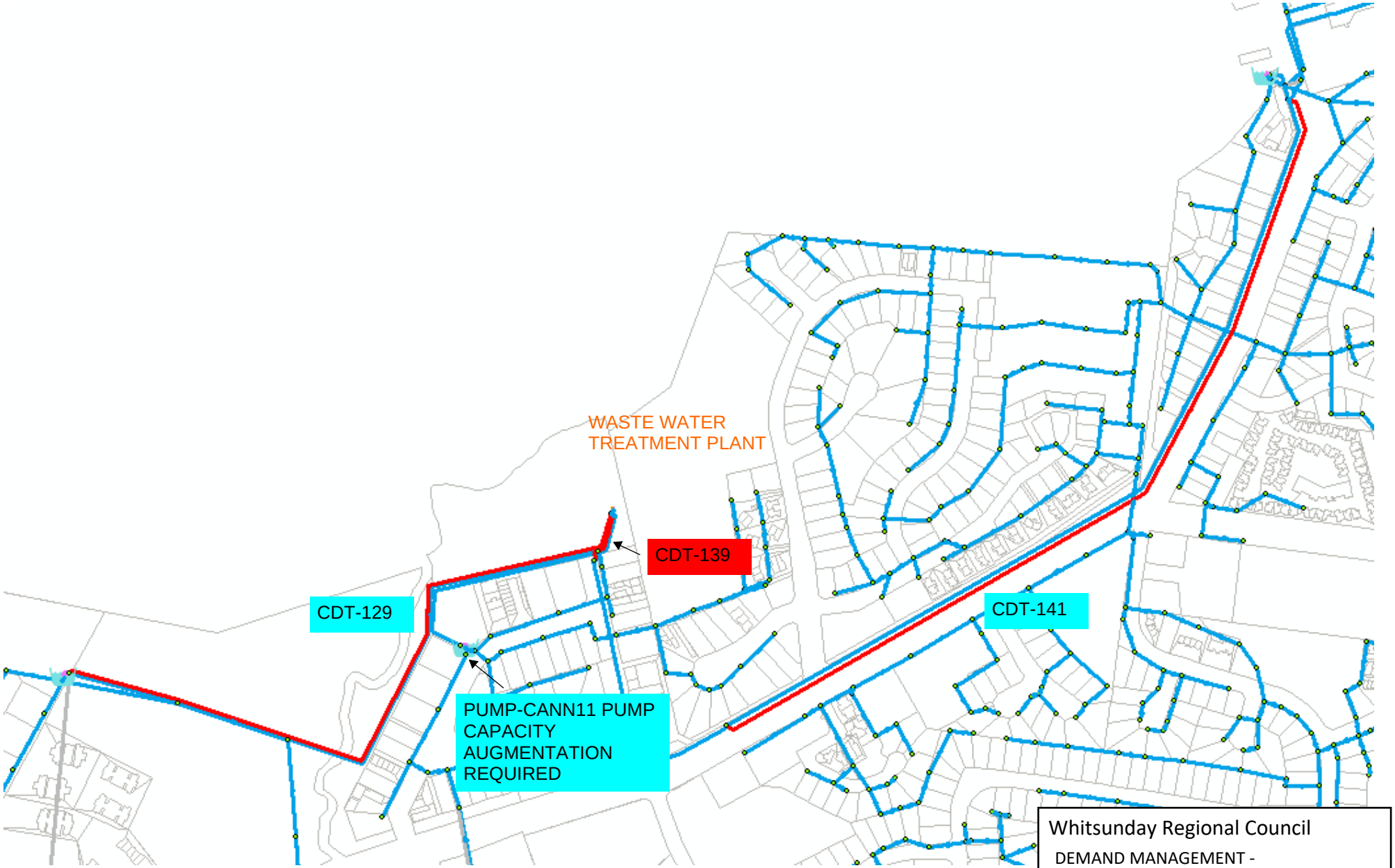
2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS

Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Cannonvale Sewer Network
SHEET 4/12

ARCADIS Design & Consultancy for natural and built assets



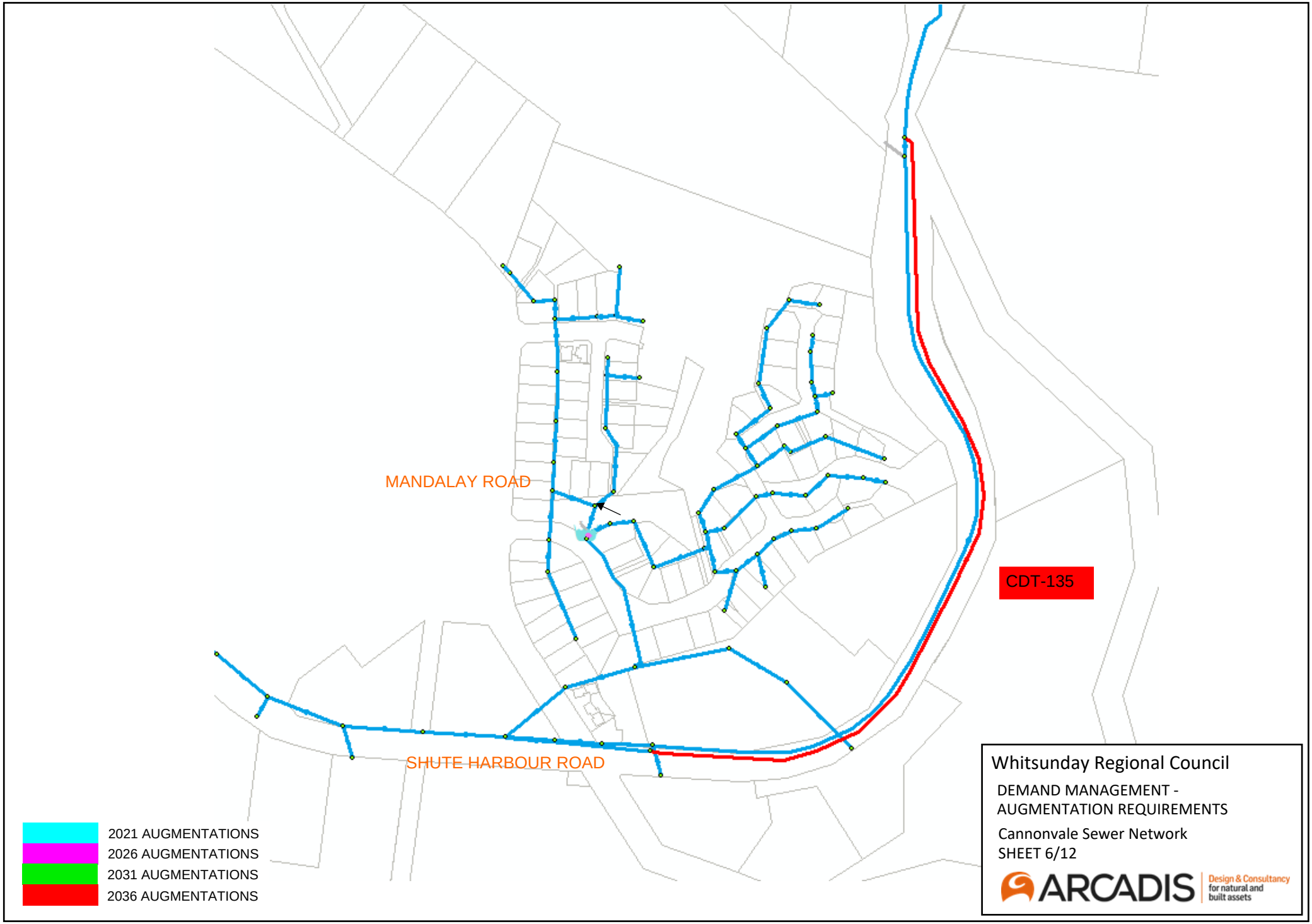
2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS

Whitsunday Regional Council

DEMAND MANAGEMENT -
AUGMENTATION REQUIREMENTS

Cannonvale Sewer Network
SHEET 5/12

ARCADIS Design & Consultancy for natural and built assets


MANDALAY ROAD
SHUTE HARBOUR ROAD
CDT-135
2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS
Whitsunday Regional Council
DEMAND MANAGEMENT -
AUGMENTATION REQUIREMENTS
Cannonvale Sewer Network
SHEET 6/12
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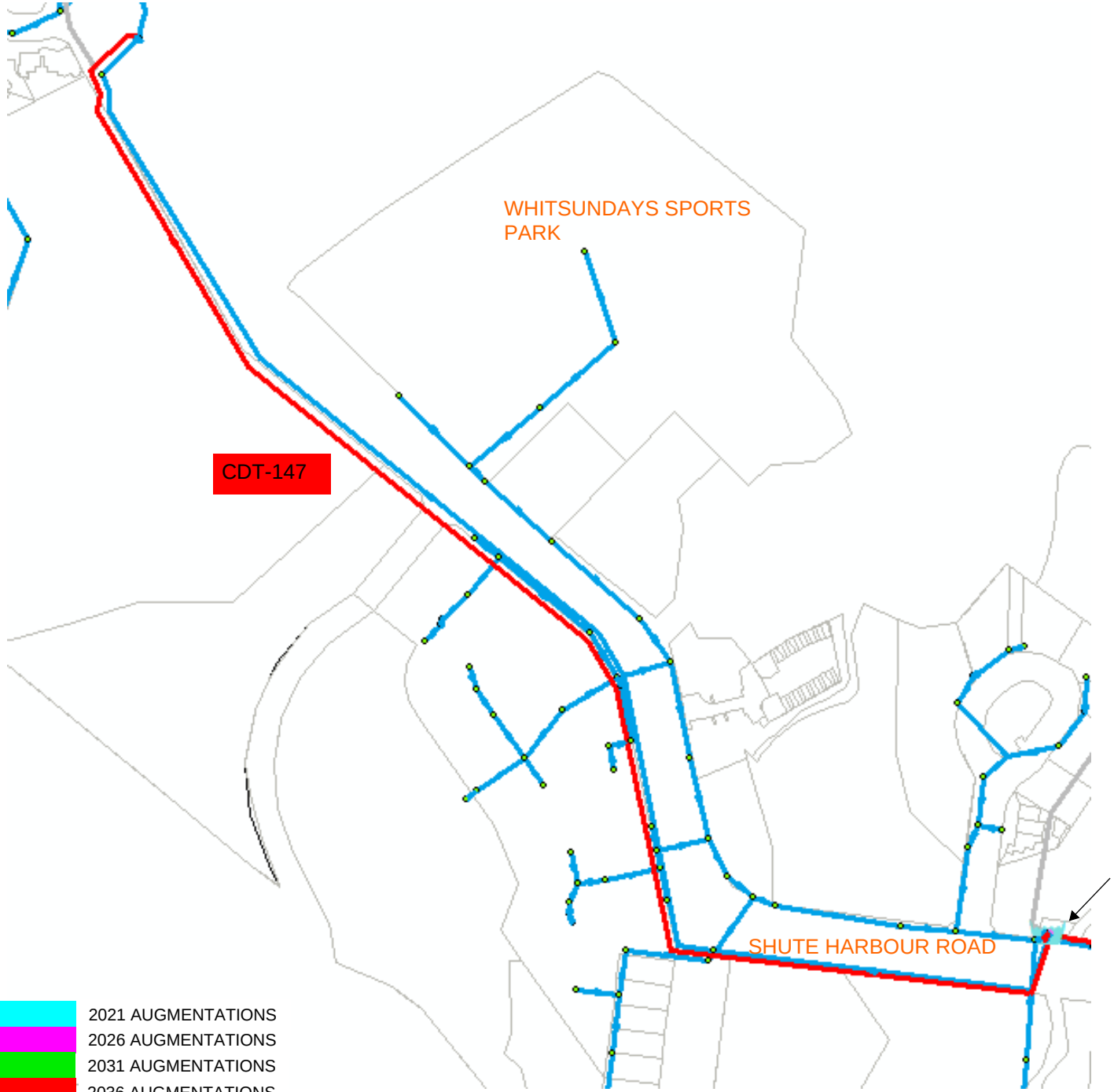
built assets



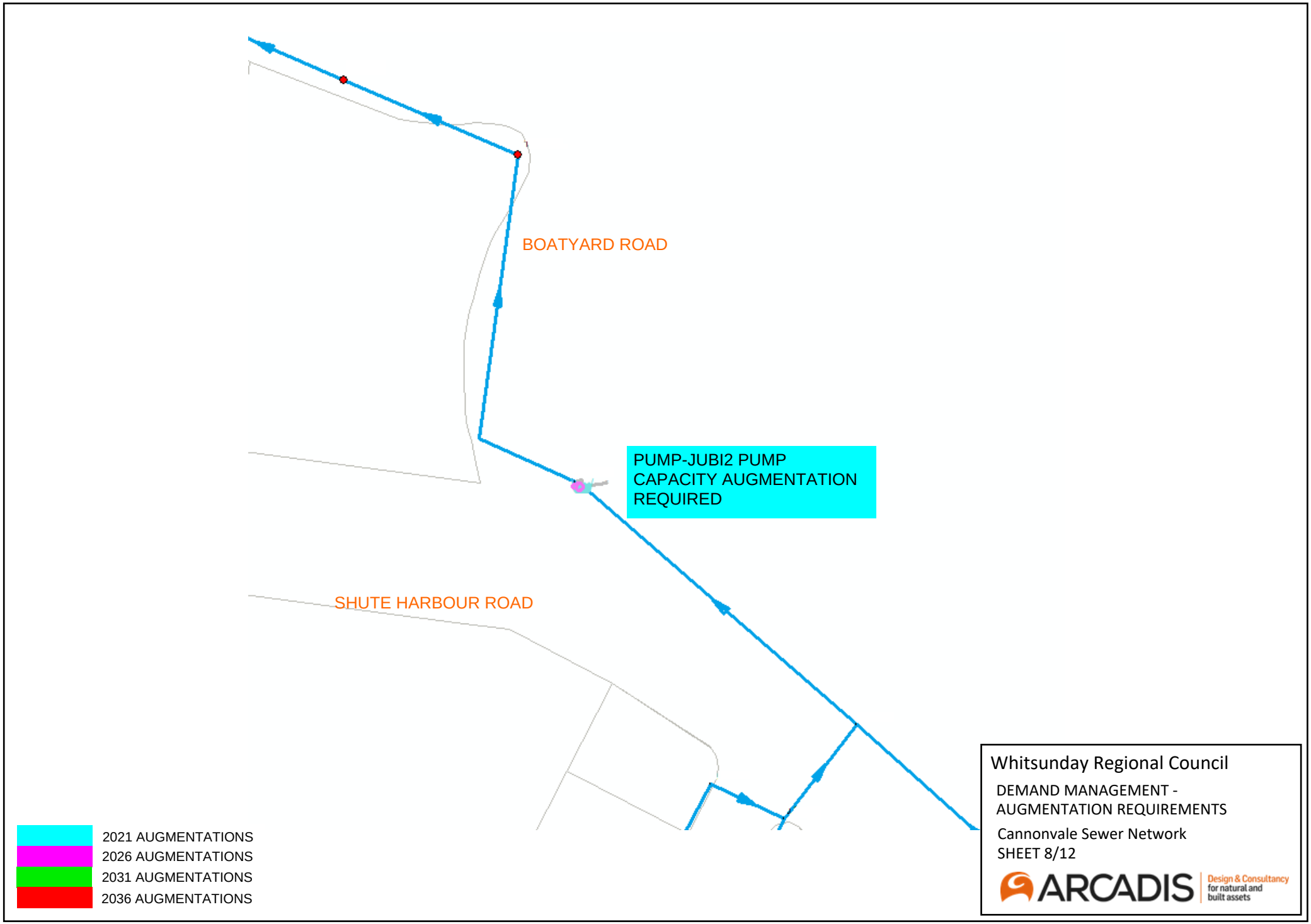
Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Cannonvale Sewer Network

SHEET 7/12

ARCADIS Design & Consultancy for natural and built assets


BOATYARD ROAD
PUMP-JUBI2 PUMP CAPACITY AUGMENTATION REQUIRED
SHUTE HARBOUR ROAD
2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS
Whitsunday Regional Council
DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS
Cannonvale Sewer Network
SHEET 8/12
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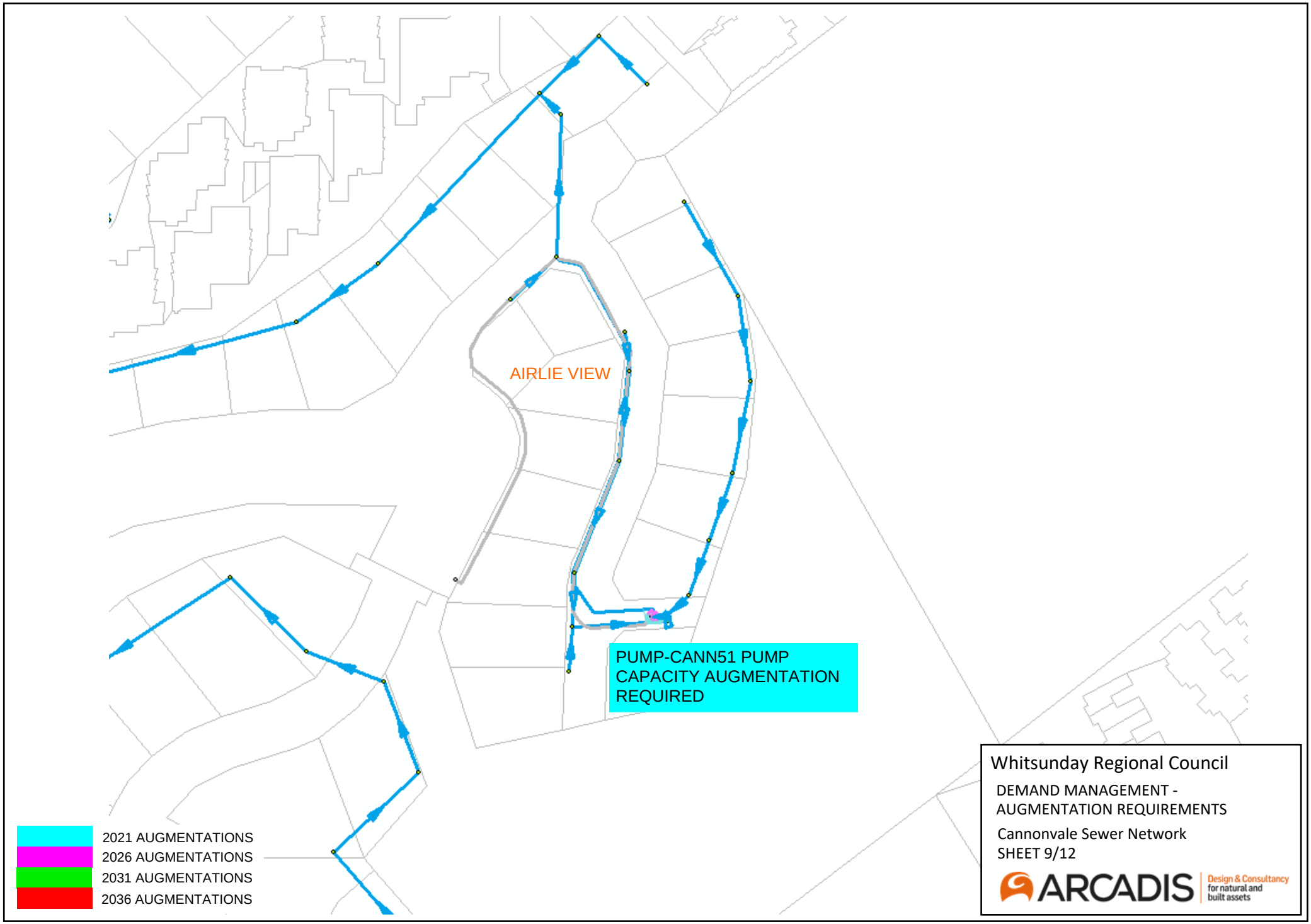
AIRLIE VIEW
PUMP-CANN51 PUMP CAPACITY AUGMENTATION REQUIRED
2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS
Whitsunday Regional Council
DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS
Cannonvale Sewer Network
SHEET 9/12
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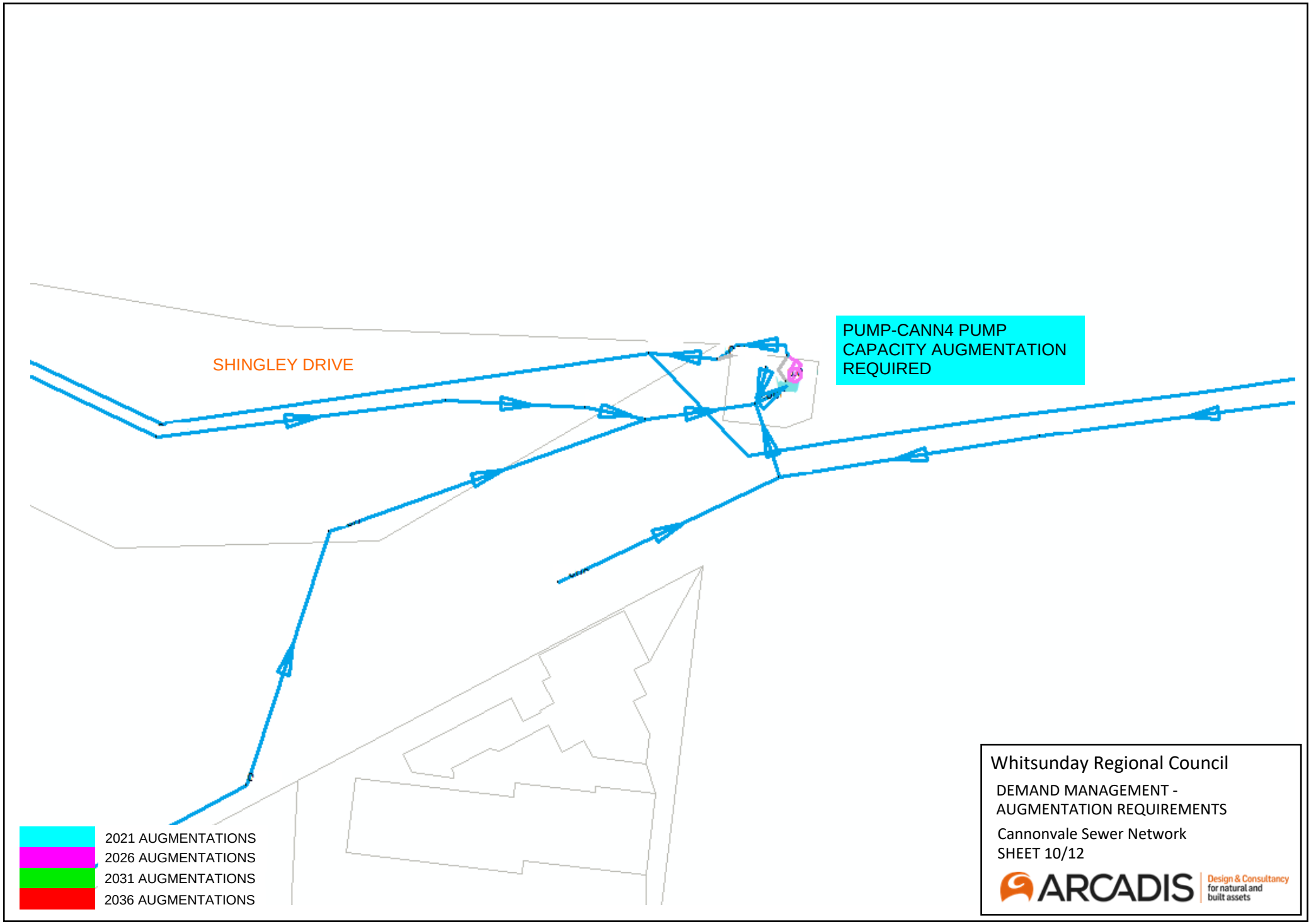
SHINGLEY DRIVE
PUMP-CANN4 PUMP CAPACITY AUGMENTATION REQUIRED
2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS
Whitsunday Regional Council
DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS
Cannonvale Sewer Network
SHEET 10/12
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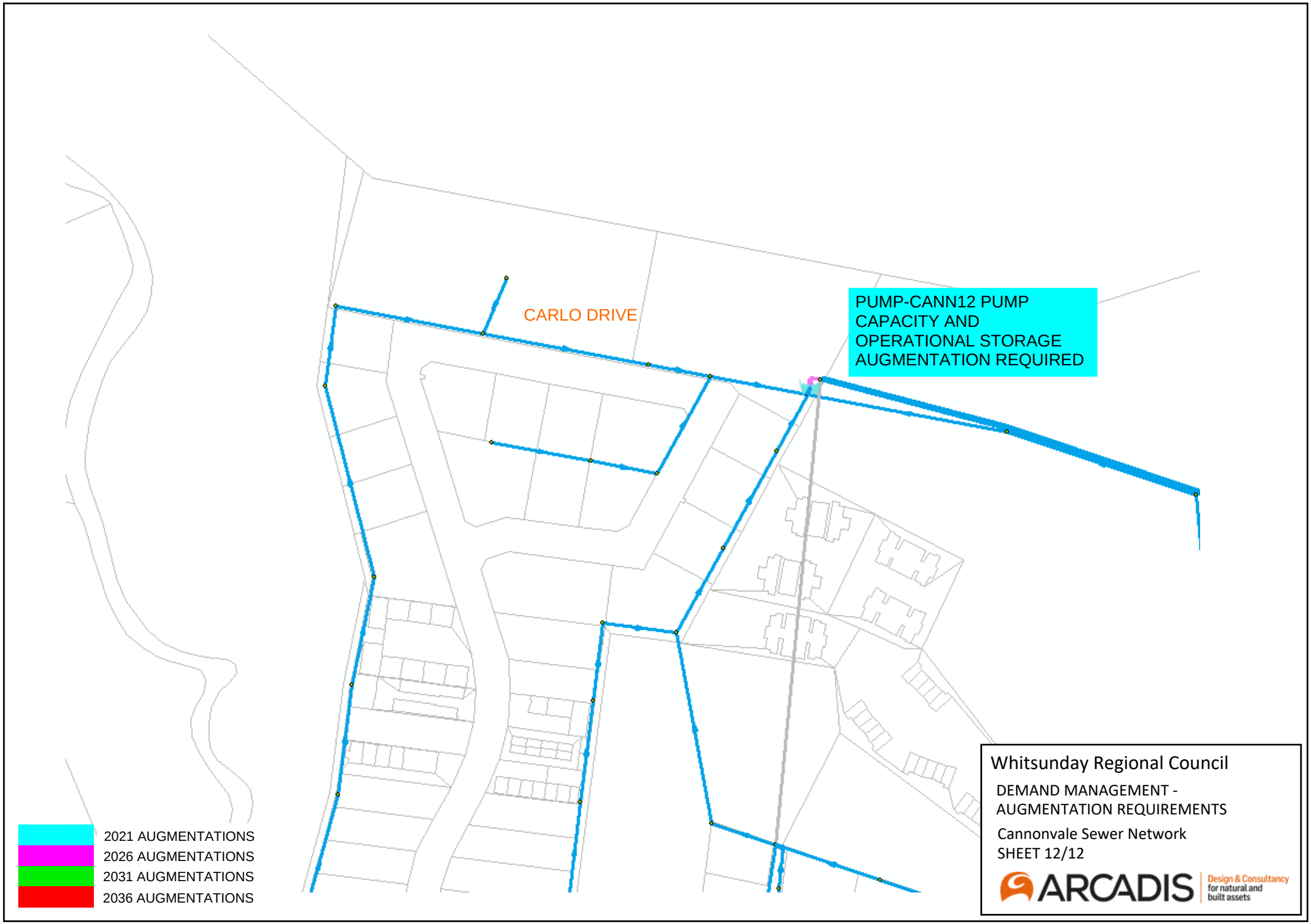
20/12/2019

SK006-10027536-01


CARLO DRIVE
PUMP-CANN12 PUMP CAPACITY AND OPERATIONAL STORAGE AUGMENTATION REQUIRED
2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS
Whitsunday Regional Council
DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS
Cannonvale Sewer Network
SHEET 12/12
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PROJECT: Whitsundays Sewer Network Modelling
Project Engineer: M.C
DOCUMENT NUMBER: 0006-10027536-01
Software: InfoSWMM SA
DATE:

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WHITSUNDAYS CANNONVALE SEWER NETWORK
DEMAND MANAGEMENT ASSESSMENT - AUGMENTATION REQUIREMENT SUMMARY

AUGMENTATION ID	LENGTH (m)	EXISTING PIPE SEGMENT		DUPLICATION DN	DEPTH RANGE (m)	COST - $/m	ADJUSTMENT FACTOR FOR SOIL	SCALE FACTOR	10% ADDITIONAL REGIONAL COSTS	30% CONTINGENCY	COST OF NEW /DUPLICATION	PIPE REPLACEMENT							2021	2026	2031	2036
		START NODE	END NODE									NOTES	ORIGINAL DN	REPLACEMENT DN	COST - $/m	CAP & GROUT @ $30/M	TOTAL COST	COST INCREASE COMPARED TO DUPLICATION				
CDT-55	60.19	MH-P-871	MH-P-870	150	0 - 1.5	$ 148.00	0.97	2.24	10%	30%	$ 27,098.83	AC	150									
CDT-71	60.35	MH-P-3181	MH-P-3182	250	> 4	$ 835.00	0.96	2.24	10%	30%	$ 151,279.75	PVC	225	300	$ 1,046.00	$ 1,335.00	$ 194,468.46	$ 43,083.71				
CDT-77	38.38	MH-P-1883	MH-P-1882	225	0 - 1.5	$ 215.00	1.04	2.45	10%	30%	$ 29,635.46	AC	200	300	$ 266.00	$ 767.60	$ 17,185.43	$ 2,749.97				
CDT-79	91.46	MH-P-1882	MH-P-1881	225	0 - 1.5	$ 215.00	1.04	1.51	10%	30%	$ 43,228.33	AC	275	375	$ 393.00	$ 1,909.20	$ 84,582.38	$ 39,354.05				
CDT-81	34.55	MH-P-1881	MH-P-1728	150	0 - 1.5	$ 148.00	1.04	2.45	10%	30%	$ 18,240.52		400									
CDT-85	2	MH-P-1728	JUB1-P51	200	0 - 1.5	$ 200.00	1.04	3.48	10%	30%	$ 2,002.76	Pump Inlet	275	500	$ 586.00	$ 40.00	$ 1,508.08	$ 1,305.32				
CDT-113	63.76	MH-P-1887	MH-P-1883	250	1.5 - 3	$ 328.00	0.95	2.17	10%	30%	$ 60,254.24	AC	150	300	$ 387.00	$ 1,276.80	$ 72,967.46	$ 12,713.22				
CDT-115	54.34	MH-P-1888	MH-P-1887	250	1.5 - 3	$ 328.00	0.95	2.36	10%	30%	$ 55,958.59	AC	150	300	$ 387.00	$ 1,086.80	$ 67,111.12	$ 11,152.52				
CDT-117	102.13	MH-P-1889	MH-P-1888	250	1.5 - 3	$ 328.00	0.95	1.41	10%	30%	$ 63,066.58	AC	200	300	$ 387.00	$ 2,050.60	$ 76,492.83	$ 13,394.80				
CDT-119	81.82	MH-P-651	MH-P-650	225	0 - 1.5	$ 215.00	1.04	1.79	10%	30%	$ 45,962.61	AC	150									
CDT-131	90.47	MH-P-650	MH-P-649	300	0 - 1.5	$ 266.00	1.04	1.62	10%	30%	$ 56,833.62	AC	150									
CDT-133	69.93	MH-P-649	MH-P-3188	300	0 - 1.5	$ 266.00	1.04	2.04	10%	30%	$ 55,235.45	AC	150									
CDT-145	64.858	MH-P-652	MH-P-651	225	0 - 1.5	$ 215.00	1.04	2.14	10%	30%	$ 43,528.43	AC	150									
CDT-181	2.344	MH-JDN-0175	MH-JDN-0176	200		$ 240.00	1.35	2.45	10%	30%	$ 2,604.92	RM DUPLICATION	250									
CDT-139	6.563	JCT-70	JCT-72	375		$ 821.00	1.07	2.45	10%	30%	$ 19,775.12	RM DUPLICATION	150									
CDT-129	904.105	CANN_12_PS-12	JCT-72	150		$ 305.00	1.35	0.94	10%	30%	$ 329,277.75	RM DUPLICATION	150									
CDT-141	1165.912	MH-JDN-0182	MH-JDN-0202	300		$ 362.00	1.35	0.91	10%	30%	$ 726,523.85	RM DUPLICATION	350									
CDT-147	1151.018	JCT-26	MH_JDN-0183	150		$ 305.00	1.35	0.91	10%	30%	$ 407,235.67	RM DUPLICATION	225									
CDT-135	914.384	MH-JDN-0193	MH-JDN-0202	150		$ 265.00	1.35	0.94	10%	30%	$ 313,021.40	RM DUPLICATION	160									
CDT-149	66.16	MH-P-864	MH-P-3569	250	3 - 4.5	$ 432.00	0.97	2.12	10%	30%	$ 82,169.73	AC	150									
CDT-151	74.37	MH-P-865	MH-P-864	250	1.5 - 3	$ 328.00	0.95	1.95	10%	30%	$ 63,199.12	AC	150									
CDT-153	56.19	MH-P-866	MH-P-865	225	1.5 - 3	$ 327.00	0.95	2.32	10%	30%	$ 56,757.99	AC	150									
CDT-155	57.67	MH-P-867	MH-P-866	200	1.5 - 3	$ 296.00	0.95	2.39	10%	30%	$ 52,037.78	AC	150									
CDT-157	52.66	MH-P-868	MH-P-867	200	0 - 1.5	$ 200.00	1.04	2.40	10%	30%	$ 36,720.62	AC	150									
CDT-159	59.96	MH-P-869	MH-P-868	200	0 - 1.5	$ 200.00	1.04	2.24	10%	30%	$ 39,194.54	AC	150									
CDT-161	39.15	MH-P-870	MH-P-869	200	0 - 1.5	$ 200.00	1.04	2.45	10%	30%	$ 27,912.65	AC	150									
CDT-163	50.29	MH-P-872	MH-P-871	200	0 - 1.5	$ 200.00	1.04	2.44	10%	30%	$ 35,791.41	AC	150									
CDT-165	40.55	MH-P-3365	MH-P-872	200	0 - 1.5	$ 200.00	1.04	2.45	10%	30%	$ 29,019.17	AC	150									
							TOTAL				$ 2,895,205.89							$ 130,753.58				

PUMP AUGMENTATIONS REQUIRED

PUMP STATION LABEL	AUGMENTATION TYPE	VALUE	COST - $/x	TOTAL COST	2021	2026	2031	2036
PUMP-JUB1	PUMP CAPACITY	2 x 78.5 kW*	$2181/kW	$342,628.68				
PUMP-CANN31	PUMP CAPACITY	2 x 0.3 kW*	$78083/kW	$46,384.67				
PUMP-CANN4	PUMP CAPACITY	2 x 1.5 kW*	$16811/kW	$49,480.66				
PUMP-CANN3	PUMP CAPACITY	2 x 17.2 kW*	$4318/kW	$148,863.67				
PUMP-CANN1	PUMP CAPACITY	2 x 18.8 kW*	$4305/kW	$151,448.64				
PUMP-CANN12	PUMP CAPACITY	2 x 27.4 kW*	$3486/kW	$190,815.81				
PUMP-CANN11	PUMP CAPACITY	3 x 7.1 kW*	$7564/kW	$107,276.11				
PUMP-JUB2	PUMP CAPACITY	2 x 2.1 kW*	$5881/kW	$91,002.87				
PUMP-CANN12	OPERATIONAL STORAGE	2.71 kL	$5303/kL	$14,371.13				

*Assumes 70% efficiency at duty

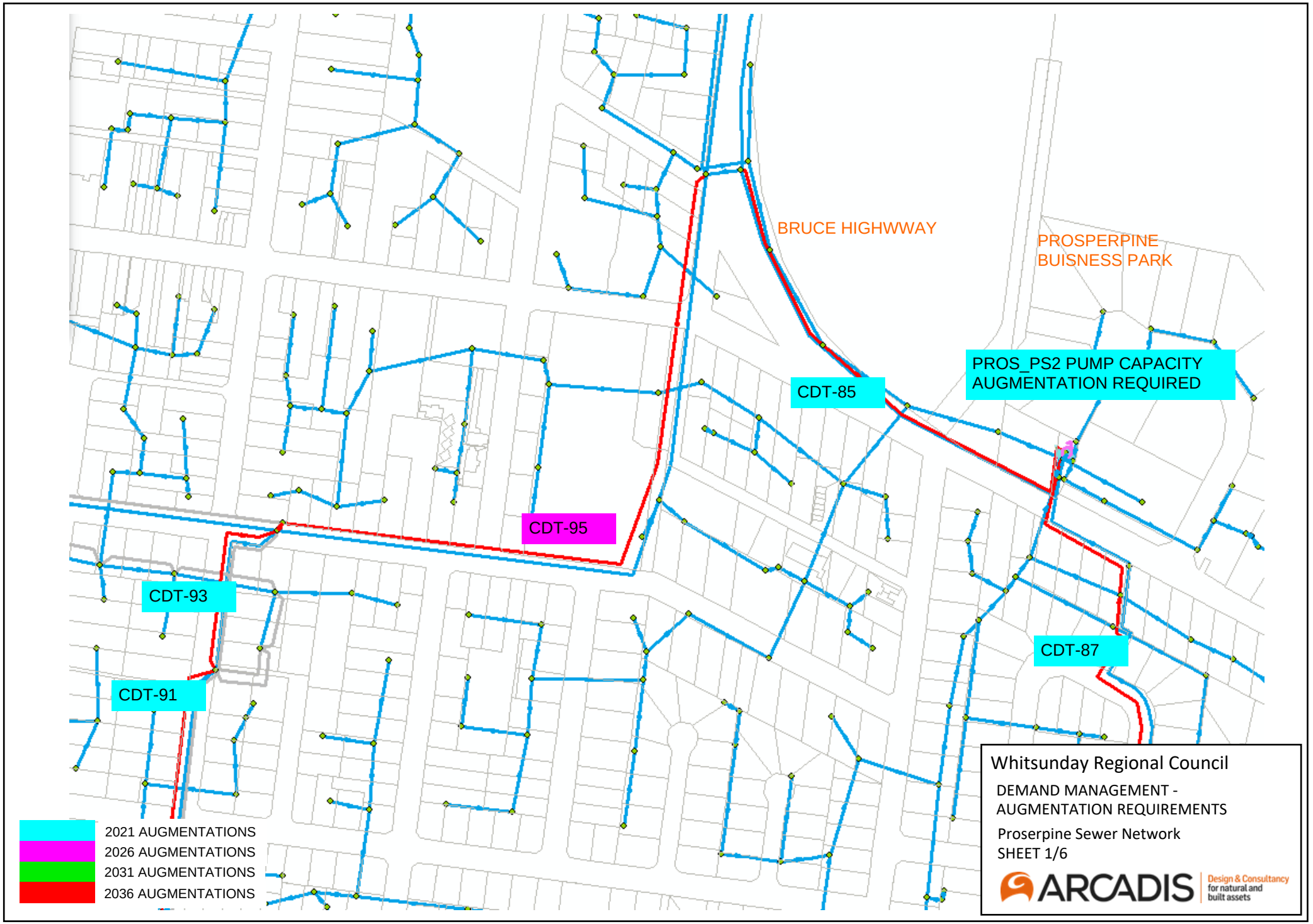
ADDITIONAL EMERGENCY STORAGE REQUIREMENTS HAVE NOT BEEN COSTED - TO BE VERIFIED AGAINST EXISTING UPSTREAM NETWORK CAPACITY (PIPEWORK + MANHOLES)

PROJECT: Whitsundays Sewer Network Modelling
Project Engineer: M.C
DOCUMENT N D006-10027536-01
Software: InfoSWMM SA
DATE:

ARCADIS Design & Consultancy for natural and built assets

WHITSUNDAYS CANNONVALE SEWER NETWORK
DEMAND MANAGEMENT ASSESSMENT - SEWER PUMP STATION ASSESSMENT SUMMARY

PUMP					CURRENT		PWWF FACTORS			0.680		0.789			0.890			PWWF			2036	
Pump ID (Char)	Startup Depth (m)	Shutoff Depth (m)	Max Depth	Area	Op. Storage	Em. Storage	Op. Storage	Emer. Storage	2021 (L/s)	Op. Storage	Emer. Storage	2026	Op. Storage	Emer. Storage	2031	Op. Storage	Emer. Storage	2036	HEAD GAIN	STORAGE UPGRADES REQUIRED	Op. Storage Upgrade Required	NOTES
PUMP-CANN1.2	2.6	1.1	6.6	10	15.00	37.00	2.82	108.16	37.55	3.26	125.36	43.53	3.68	141.49	49.13	4.14	158.98	55.20	24	Emergency storage beyond volume within wet well required		Pump capacity augmentation required
PUMP-CANN11.1	0.87	0.27	4.37	4.34	2.60	13.89	1.14	43.65	15.15	1.32	50.59	17.56	1.49	57.09	19.82	1.67	64.15	22.28	22	Emergency storage beyond volume within wet well required		Pump capacity augmentation required
PUMP-CANN12.1	1.7	1.2	5.95	3.6	1.80	14.22	3.07	117.89	40.93	3.56	136.64	47.44	4.02	154.21	53.55	4.51	173.28	60.17	32	Emergency storage beyond volume within wet well required	2.71	Pump capacity augmentation required
PUMP-CANN14.2	0.86	0.36	3.66	2.46	1.23	6.15	0.12	4.79	1.66	0.14	5.55	1.93	0.16	6.27	2.18	0.18	7.04	2.45	22.5	Emergency storage beyond volume within wet well required		
PUMP-CANN15.2	0.47	0.17	5.8	1.43	0.43	7.19												0	0	OK		
PUMP-CANN17.1	2.6	1	5	10	16.00	21.00	0.02	0.62	0.21	0.02	0.72	0.25	0.02	0.81	0.28	0.02	0.91	0.32	0	OK		Depth in the wet well is not great enough to trigger the pump
PUMP-CANN18.1	2.6	1	5	10	16.00	21.00	0.17	6.57	2.28	0.20	7.62	2.65	0.22	8.60	2.99	0.25	9.66	3.36	53	OK		
PUMP-CANN2.2	2.82	1.82	5.22	2.04	2.04	4.28	0.37	14.12	4.90	0.43	16.36	5.68	0.48	18.47	6.41	0.54	20.75	7.21	3.9	Emergency storage beyond volume within wet well required		
PUMP-CANN3.1	4.25	2.75	6.85	10	15.00	23.00	2.08	79.85	27.72	2.41	92.54	32.13	2.72	104.45	36.27	3.06	117.36	40.75	30	Emergency storage beyond volume within wet well required		Pump capacity augmentation required
PUMP-CANN4.1	3.04	1.04	5.04	4.34	8.68	7.38	0.14	5.24	1.82	0.16	6.07	2.11	0.18	6.86	2.38	0.20	7.70	2.68	35	Emergency storage beyond volume within wet well required		Pump capacity augmentation required
PUMP-CANN5.2	2.8	1.3	6.3	4.34	6.51	13.89	2.55	97.97	34.02	2.96	113.55	39.43	3.34	128.16	44.50	3.75	144.00	50.00	51	Emergency storage beyond volume within wet well required		
PUMP-CANN51.1	2.5	1.5	5	2	2.00	4.40	0.03	1.02	0.35	0.03	1.18	0.41	0.03	1.33	0.46	0.04	1.50	0.52	19	OK		Pump capacity augmentation required
PUMP-CANN6.2	2.65	1.35	4.97	30	39.00	60.60	0.80	30.62	10.63	0.92	35.48	12.32	1.04	40.05	13.91	1.17	45.00	15.63	0	OK		Depth in the wet well is not great enough to trigger the pump
PUMP-JUBI1.1	3.85	1.85	8.1	4.34	8.68	17.14	4.54	174.21	60.49	5.26	201.92	70.11	5.93	227.89	79.13	6.67	256.06	88.91	63	Emergency storage beyond volume within wet well required		Pump capacity augmentation required
PUMP-JUBI2.2	2.6	0.6	6.05	2.49	4.98	7.84	1.80	69.17	24.02	2.09	80.17	27.84	2.36	90.48	31.42	2.65	101.66	35.30	5.6	Emergency storage beyond volume within wet well required		Pump capacity augmentation required
PUMP-JUBI3.2	2.07	0.57	3.67	10	15.00	13.00	0.38	14.53	5.04	0.44	16.84	5.85	0.49	19.01	6.60	0.56	21.36	7.42	0	Emergency storage beyond volume within wet well required		Depth in the wet well is not great enough to trigger the pump
PUMP-JUBI4.2	1.61	1.11	6.06	2.66	1.33	11.04	0.47	17.89	6.21	0.54	20.73	7.20	0.61	23.40	8.13	0.68	26.29	9.13	6.7	Emergency storage beyond volume within wet well required		
PUMP-SHUT1.2	3	2	5	2.54	2.54	4.32	0.36	13.97	4.85	0.42	16.19	5.62	0.48	18.28	6.35	0.53	20.53	7.13	90	Emergency storage beyond volume within wet well required		
PUMP-SHUT2.1	2.6	1	5	2.54	4.06	5.33	0.17	6.64	2.31	0.20	7.70	2.67	0.23	8.69	3.02	0.25	9.76	3.39	28	Emergency storage beyond volume within wet well required		
PUMP-SHUT3.1	2.6	1	3	10	16.00	1.00	0.10	3.85	1.34	0.12	4.46	1.55	0.13	5.04	1.75	0.15	5.66	1.97	108	Emergency storage beyond volume within wet well required		



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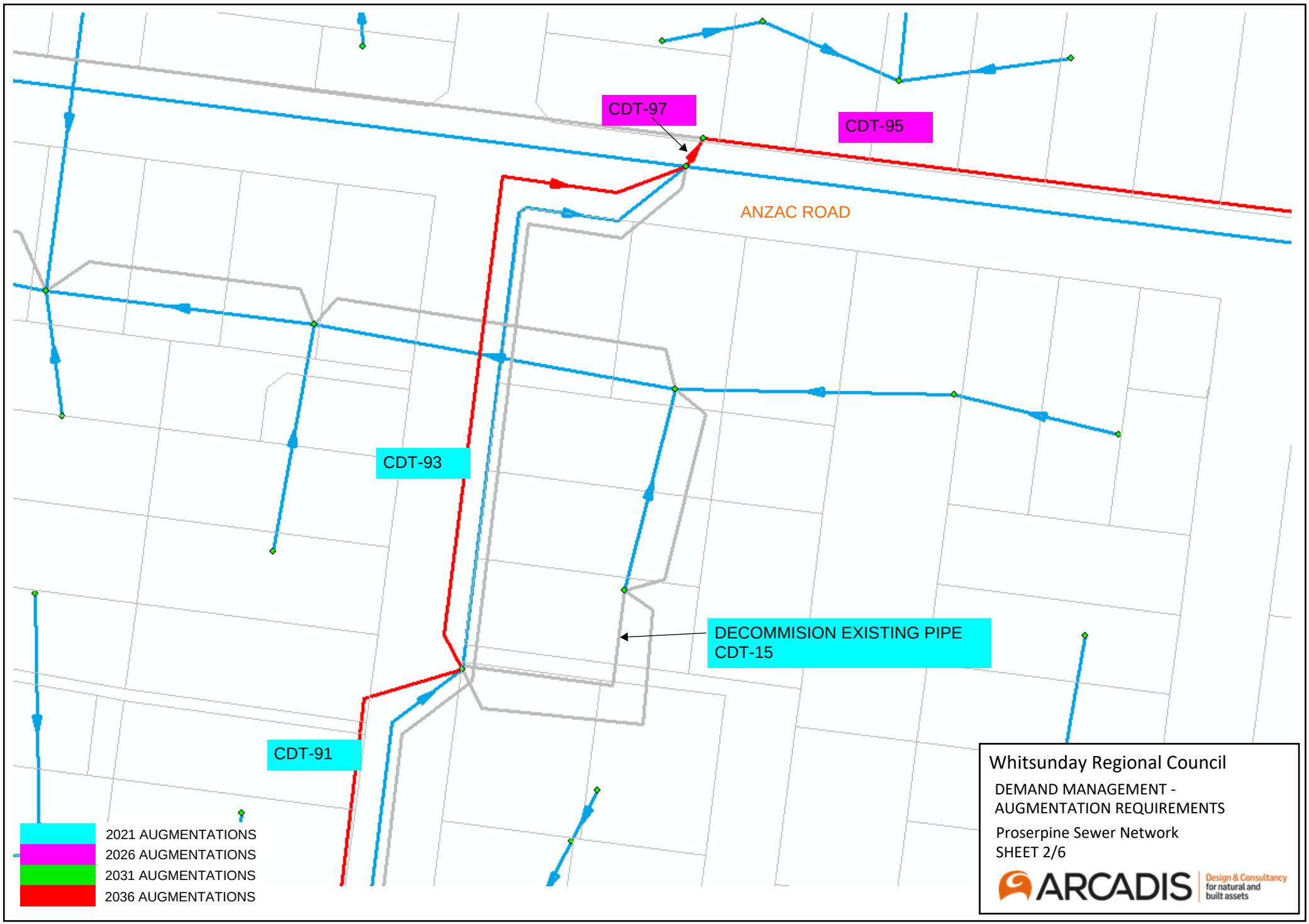

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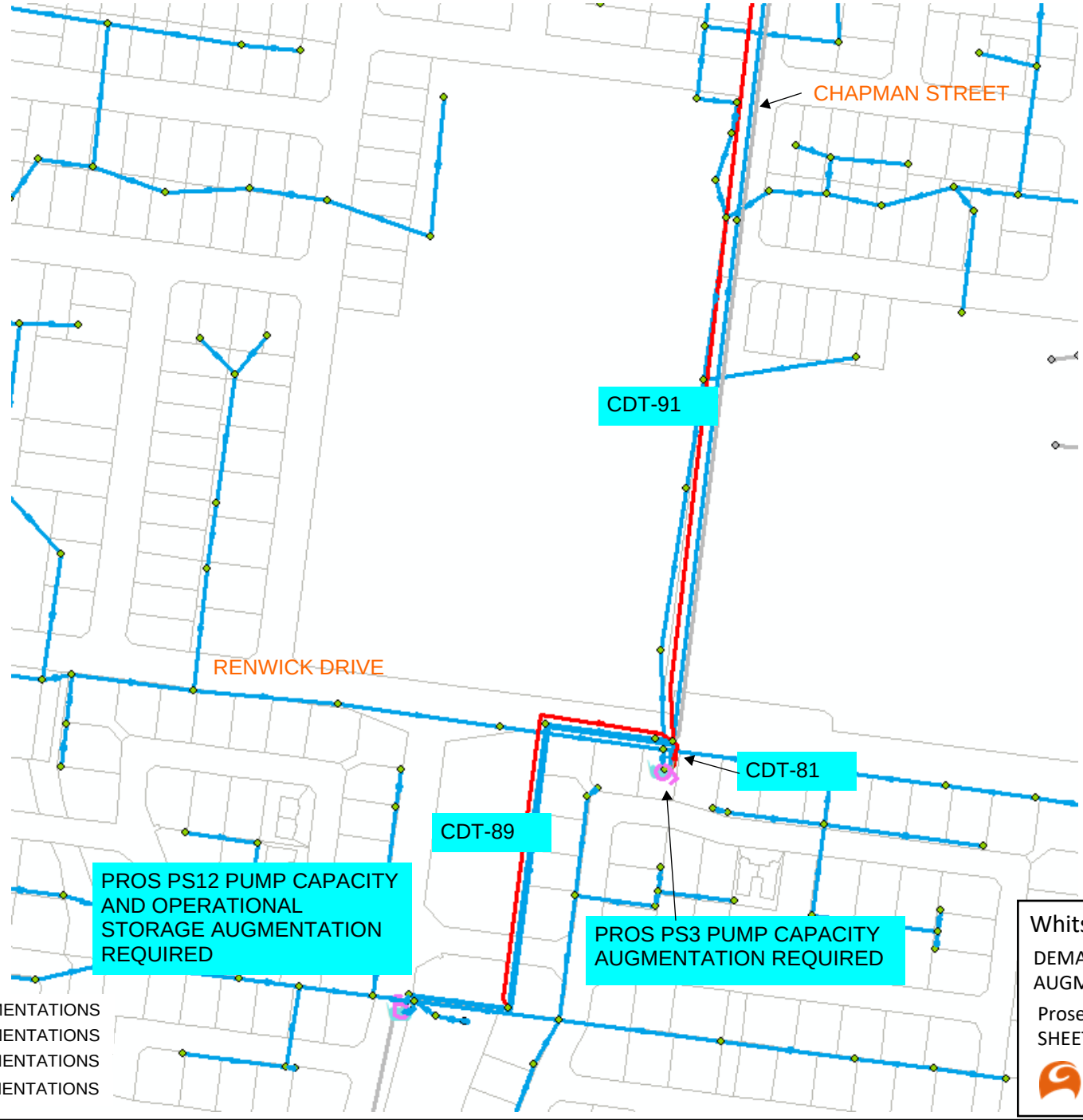


Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

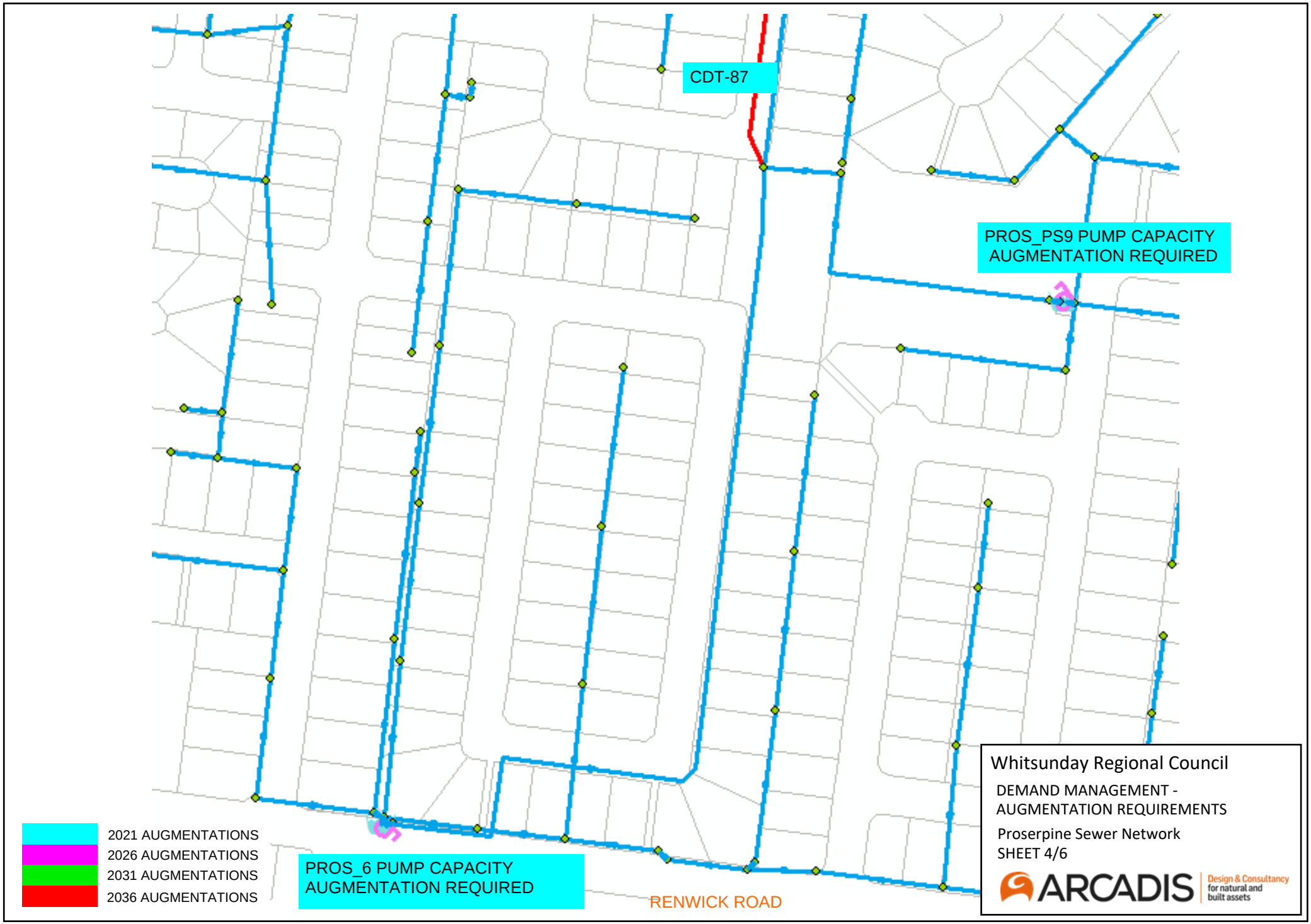
Proserpine Sewer Network

SHEET 3/6

ARCADIS Design & Consultancy for natural and built assets

20/12/2019

SK007-10027536-01



20/12/2019

SK007-10027536-01

2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS

Whitsunday Regional Council

DEMAND MANAGEMENT -
AUGMENTATION REQUIREMENTS

Proserpine Sewer Network
SHEET 5/6

ARCADIS Design & Consultancy for natural and built assets

20/12/2019

SK007-10027536-01

20/12/2019

SK007-10027536-01

PROJECT:	Whitsundays Sewer Network Modelling	**Project Engineer:**	M.C
DOCUMENT NUMBER:	D007-10027536-AAC-01	**Software:**	InfoSWMM SA
DATE:			

WHITSUNDAYS PROSERPINE SEWER NETWORK
DEMAND MANAGEMENT ASSESSMENT - AUGMENTATION REQUIREMENT SUMMARY

AUGMENTATION ID	LENGTH (m)	EXISTING PIPE SEGMENT		DUPLICATION DN (mm)	DEPTH RANGE (m)	COST - $/m	ADJUSTMENT FACTOR FOR SOIL	SCALE FACTOR	10% ADDITIONAL REGIONAL COSTS	30% CONTINGENCY	COST OF NEW /DUPLICATION
		START NODE	END NODE								
CDT-79	1651.49	PROS_PS1_SURROGATE	PJ-21	225		$ 271.00	1.35	0.89	10%	30%	$ 752,830.23
CDT-81	20.11	PROS_PS3_SURROGATE	PJ-27	100		$ 156.00	1.35	2.45	10%	30%	$ 14,526.62
CDT-83	80.577	JCT-12	MH-P-2423	200		$ 240.00	1.35	1.82	10%	30%	$ 66,524.66
CDT-85	454.77	PROS_PS2_SURROGATE	PJ-21	150		$ 205.00	1.35	1.03	10%	30%	$ 181,486.66
CDT-87	468.216	PJ-26	MH-P-2560	100		$ 156.00	1.35	1.02	10%	30%	$ 140,809.78
CDT-91	507.029	PJ-27	JCT-12	150		$ 205.00	1.35	1	10%	30%	$ 196,448.39
CDT-93	157.076	JCT-12	JCT-14	150		$ 205.00	1.35	1.28	10%	30%	$ 77,899.64
CDT-81	20.11	PROS_PS3_SURROGATE	PJ-27	100		$ 156.00	1.35	2.45	10%	30%	$ 14,526.62
CDT-85	454.77	PROS_PS2_SURROGATE	PJ-20	150		$ 205.00	1.35	1.03	10%	30%	$ 181,486.66
CDT-87	468.216	PJ-26	MH-P-2560	100		$ 156.00	1.35	1.02	10%	30%	$ 140,809.78
CDT-91	507.029	PJ-27	JCT-12	150		$ 205.00	1.35	1	10%	30%	$ 196,448.39
CDT-93	157.076	JCT-12	JCT-14	150		$ 240.00	1.35	1.28	10%	30%	$ 91,199.58
CDT-95	610.47	JCT-20	PJ-21	150		$ 240.00	1.35	0.98	10%	30%	$ 271,371.01
CDT-97	7.622	JCT-14	JCT-20	150		$ 240.00	1.35	2.45	10%	30%	$ 8,470.48
DEACTIVATE CDT-15											
							TOTAL				$ 2,334,838.49

AUGMENTATION ID	PIPE REPLACEMENT							2021	2026	2031	2036	NOTES
	NOTES	ORIGINAL DN (mm)	REPLACEMENT DN	COST - $/m	CAP & GROUT @ $20/M	TOTAL COST	COST INCREASE COMPARED TO DULPICATION					
CDT-79	RM DULPICATION	225										
CDT-81	RM DULPICATION	100										
CDT-83	RM DULPICATION	100										
CDT-85	RM DULPICATION	150										
CDT-87	RM DULPICATION	100										
CDT-91	RM DULPICATION	100										
CDT-93	RM DULPICATION	100										
CDT-81	RM DULPICATION	100										
CDT-85	RM DULPICATION	150										
CDT-87	RM DULPICATION	100										
CDT-91	RM DULPICATION	100										
CDT-93	NEW RM											
CDT-95	NEW RM											
CDT-97	NEW RM											
DEACTIVATE CDT-15												
TOTAL							$ -					

PUMP AUGMENTATIONS REQUIRED

PUMP STATION LABEL	AUGMENTATION TYPE	VALUE	COST - $/x	TOTAL COST	2021	2026	2031	2036
PROS_PS1	PUMP CAPACITY	2 x 24 kW*	$3654/kW	$128,473.30				
PROS_PS12	PUMP CAPACITY	2 x 9.0 kW*	$6217/kW	$90,310.30				
PROS_PS3	PUMP CAPACITY	2 x 14 kW*	$4762/kW	$105,898.05				
PROS_6	PUMP CAPACITY	2 x 6.5 kW*	$7564/kW	$65,192.75				
PROS_PS9	PUMP CAPACITY	2 x 2.3 kW*	$16813/kW	$65,509.92				
PROS_PS2	PUMP CAPACITY	2 x 16.6 kW*	$4318/kW	$103,506.66				
PROS_PS12	OPERATIONAL STORAGE	0.31 kL	$5303/kL	$1,643.93				
PUMP-11	OPERATIONAL STORAGE	0.02 kL	$5303/kL	$106.06				

**Assumes 70% efficiency at duty*

ADDITIONAL EMERGENCY STORAGE REQUIREMENTS HAVE NOT BEEN COSTED - TO BE VERIFIED AGAINST EXISTING UPSTREAM NETWORK CAPACITY (PIPEWORK + MANHOLES)

PROJECT: Whitsundays Sewer Network Modelling

Project Engineer: M.C

DOCUMENT NUMBER: 0007-10027536-AAC-01

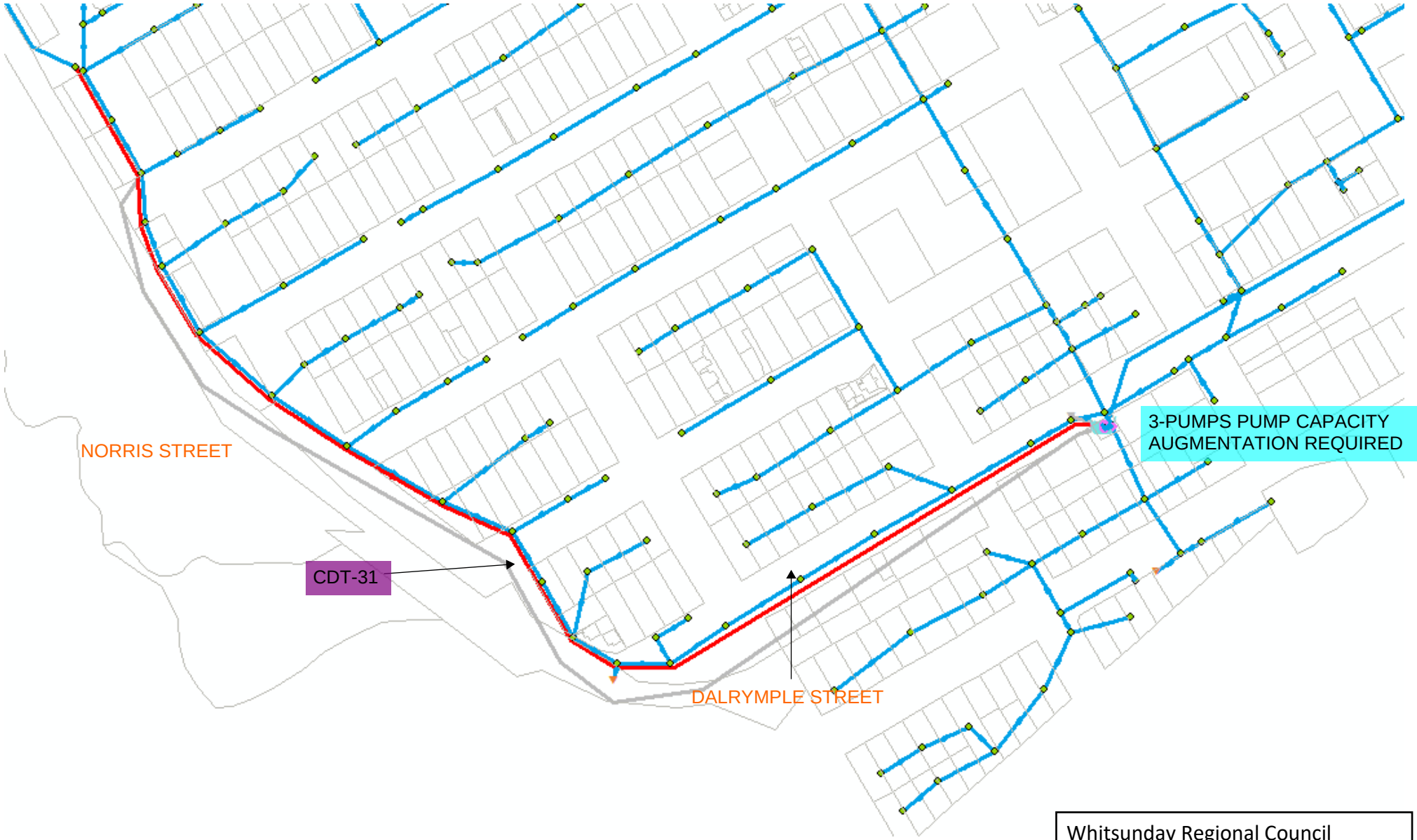
Software: InfoSWMM SA

DATE:

ARCADIS Design & Consultancy for natural and built assets

WHITSUNDAYS COLLINSVILLE SEWER NETWORK
DEMAND MANAGEMENT ASSESSMENT - SEWER PUMP STATION ASSESSMENT SUMMARY

PUMP			WET WELL		CURRENT		PWWF FACTORS		0.930041152		0.9547325		0.979423868		PWWF	With ideal pump curves	2036	
Pump ID (Char)	Startup Depth (m)	Shutoff Depth (m)	Max Depth	Area	Op. Storage	Em. Storage	Op. Storage	Emer. Storage	2021 (L/s)	Op. Storage	Emer. Storage	2026	Op. Storage	Emer. Storage	2031	Op. Storage	Emer. Storage	2036	HEAD GAIN	UPGRADES REQUIRED	Op. Storage Upgrade Required	NOTES
PROS_S.1	0.7	0.3	5.2	3.98	1.592	16.716	0.92	35.21	12.23	0.94	36.14	12.55	0.97	37.08	12.87	0.99	37.86	13.145	33			
PROS_PS1.1	2.6	1.1	8.1	7.31	10.965	38.012	3.94	151.40	52.57	4.05	155.42	53.97	4.15	159.44	55.36	4.24	162.79	56.525	32	Emergency storage beyond volume within wet well required		PWWF reduced with pipe augmentations (98.02 to 56.525)
PROS_PS10.1	0.78	0.38	3	2	0.8	3.84	0.10	3.95	1.37	0.11	4.06	1.41	0.11	4.16	1.44	0.11	4.25	1.475	2			
PROS_PS11.1	0.61	0.21	3	2	0.8	4.18	0.10	3.94	1.37	0.11	4.04	1.40	0.11	4.15	1.44	0.11	4.23	1.47	1.5			
PROS_PS12.1	0.8	0.4	6.3	2	0.8	10.4	1.03	39.66	13.77	1.06	40.71	14.13	1.09	41.76	14.50	1.11	42.64	14.805	40	Emergency storage beyond volume within wet well required	0.31	
PROS_PS2.1	1.1	0.3	7.35	7.31	5.848	43.4945	3.72	142.67	49.54	3.81	146.46	50.85	3.91	150.25	52.17	3.99	153.40	53.265	22			
PROS_PS3.1	0.8	0.4	7.65	7.31	2.924	47.8805	1.84	70.57	24.50	1.89	72.44	25.15	1.94	74.31	25.80	1.98	75.87	26.345	37			
PROS_PS4A.1	1.8	0.8	6	1.33	1.33	5.187												0				
PROS_PS5.1	1.4	0.5	5.77	1.33	1.197	5.4131	0.56	21.51	7.47	0.57	22.08	7.67	0.59	22.65	7.86	0.60	23.13	8.03	4.6	Emergency storage beyond volume within wet well required		
PROS_PS9.1	0.7	0.3	7	2.32	0.928	13.92	0.55	21.17	7.35	0.57	21.74	7.55	0.58	22.30	7.74	0.59	22.77	7.905	18.2			
PUMP-11	0.8	0.4	3	2	0.8	3.8	0.76	29.25	10.16	0.78	30.03	10.43	0.80	30.80	10.70	0.82	31.45	10.92	16	Emergency storage beyond volume within wet well required	0.02	



2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS

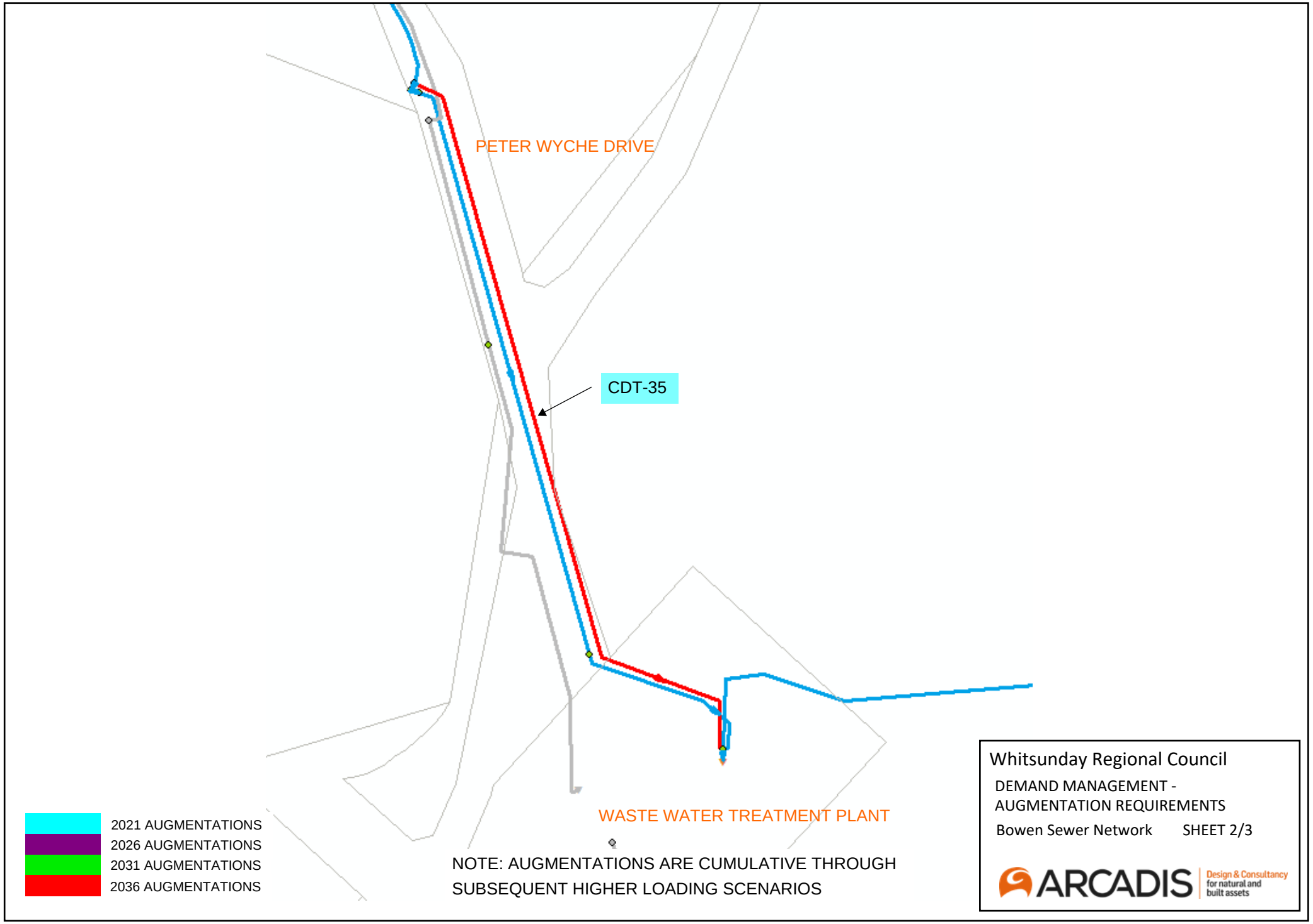
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS

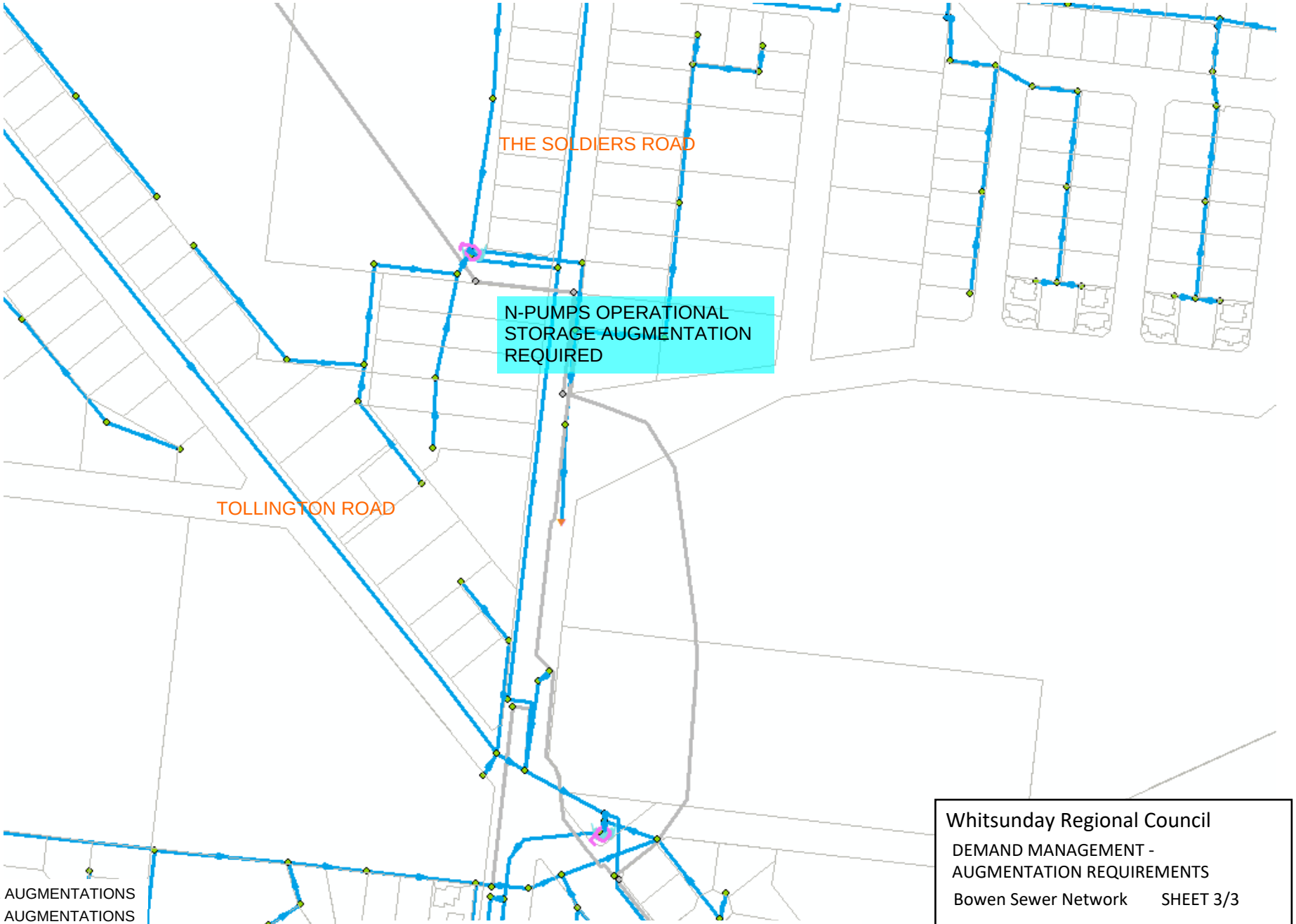
Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Bowen Sewer Network
SHEET 1/3

ARCADIS Design & Consultancy for natural and built assets


PETER WYCHE DRIVE
CDT-35
WASTE WATER TREATMENT PLANT
2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS
NOTE: AUGMENTATIONS ARE CUMULATIVE THROUGH SUBSEQUENT HIGHER LOADING SCENARIOS
Whitsunday Regional Council
DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS
Bowen Sewer Network
SHEET 2/3
ARCADIS
Design & Consultancy for natural and built assets



Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Bowen Sewer Network SHEET 3/3

ARCADIS Design & Consultancy for natural and built assets

PROJECT: Whitsundays Sewer Network Modelling
Project Engineer: M.C
DOCUMENT NUMBER: D004-10027536-AAC-01
Software: InfoSWMM SA
DATE:

ARCADIS Design & Consultancy for natural and built assets

WHITSUNDAYS BOWEN SEWER NETWORK
DEMAND MANAGEMENT ASSESSMENT - AUGMENTATION REQUIREMENT SUMMARY

AUGMENTATION ID	LENGTH (m)	EXISTING PIPE SEGMENT		DUPLICATION DN (mm)	DEPTH RANGE (m)	COST - $/m	ADJUSTMENT FACTOR FOR SOIL	SCALE FACTOR	10% ADDITIONAL REGIONAL COSTS	30% CONTINGENCY	COST OF NEW /DUPLICATION	PIPE REPLACEMENT							2021	2026	2031	2036
		START NODE	END NODE									NOTES	ORIGINAL DN	REPLACEMENT DN	COST - $/m	CAP & GROUT @ $20/M	TOTAL COST	COST INCREASE COMPARED TO DUPICATION				
COT-31	1263.96	JCT-102	3-WELL	150		$ 205.00	1.35	0.907	10%	30%	$ 444,177.22	NEW RISING MAIN	200 - GRAVITY									
COT-35	425.96	PJ-39	PJ-44	300		$ 362.00	1.35	1.04	10%	30%	$ 303,090.65	DUPLICATION RM	300									
							TOTAL				$ 747,267.87							$ -				

NOTES
No flooding in 2021 but nearing top of manhole and causing backup in upstream line

PUMP AUGMENTATIONS REQUIRED

PUMP STATION LABEL	AUGMENTATION TYPE	VALUE	COST - $/x	TOTAL COST	2021	2026	2031	2036
3-PUMPS	PUMP CAPACITY	2 x 27.5 kW*	$484/kW	$191,620.00				

**Assumes 70% efficiency at duty*

ADDITIONAL EMERGENCY STORAGE REQUIREMENTS HAVE NOT BEEN COSTED - TO BE VERIFIED AGAINST EXISTING UPSTREAM NETWORK CAPACITY (PIPEWORK + MANHOLES)

PROJECT: Whitsundays Sewer Network Modelling
Project Engineer: M.C
DOCUMENT NU D004-10027536-01
Software: InfoSWMM SA
DATE:

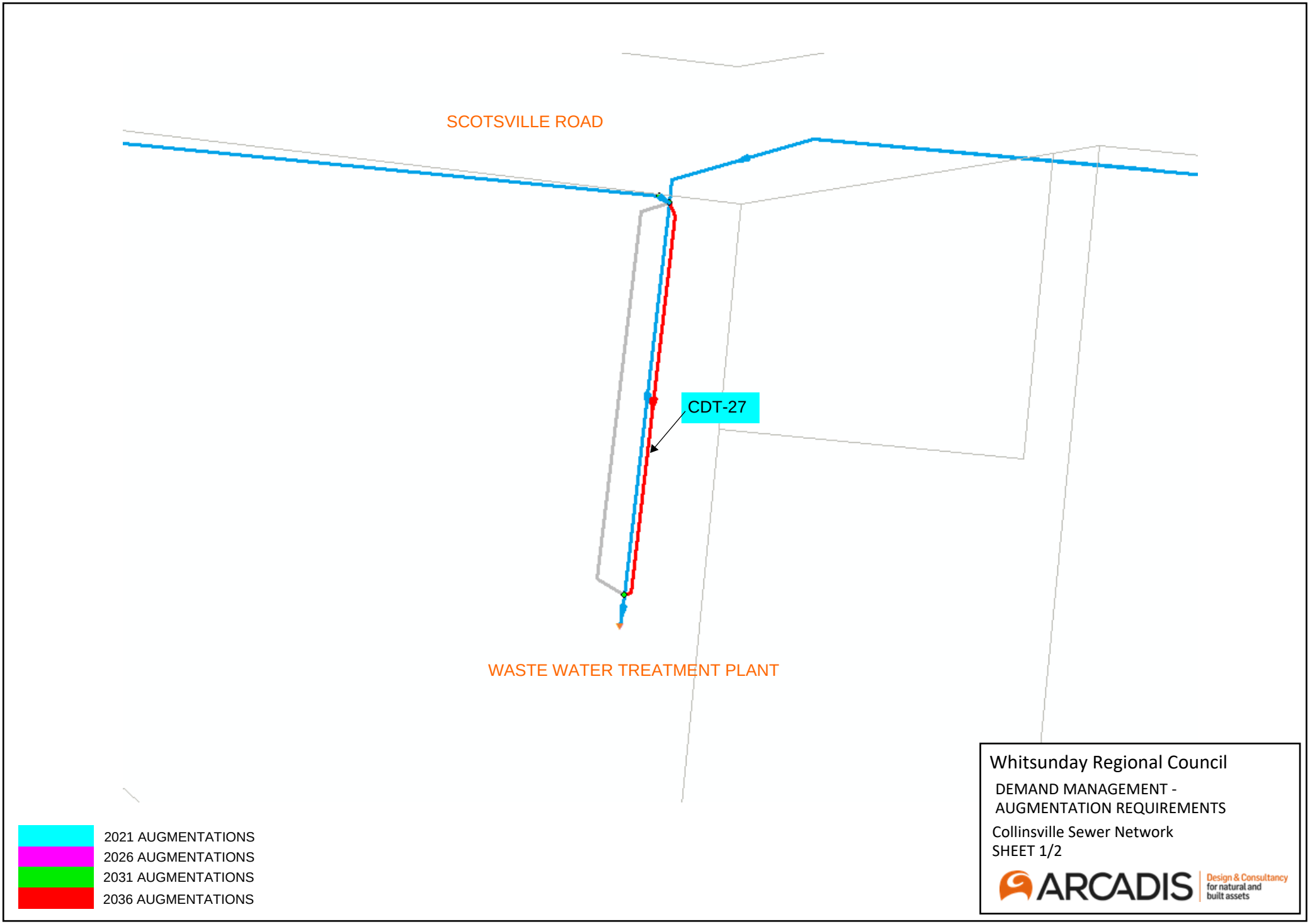
ARCADIS Design & Consultancy for natural and built assets

WHITSUNDAYS BOWEN SEWER NETWORK
DEMAND MANAGEMENT ASSESSMENT - SEWER PUMP STATION ASSESSMENT SUMMARY

PUMP			WET WELL		CURRENT		PWWF FACTORS		0.829333333			0.917333333			0.970666667			PWWF		2036	
Pump ID (Char)	Startup Depth (m)	Shutoff Depth (m)	Max Depth	Area	Op. Storage	Em. Storage	Op. Storage	Emer. Storage	2021 (L/s)	Op. Storage	Emer. Storage	2026	Op. Storage	Emer. Storage	2031	Op. Storage	Emer. Storage	2036	HEAD GAIN	STORAGE UPGRADES REQUIRED	Op. Storage Upgrade Required	NOTES
1-PUMPS.1	2	0.4	5.562																			
1-PUMPS.2	2.51	0.4	5.562	29.22	61.6542	80.41344	7.64	293.25	101.82	8.45	324.36	112.63	8.94	343.22	119.17	9.21	353.59	122.78	26	Emergency storage beyond volume within wet well required		
10-PUMPS.1	0.8	0.4	6.08																			
10-PUMPS.2	1	0.4	6.08	2.54	1.524	12.1412	0.08	3.00	1.04	0.09	3.32	1.15	0.09	3.51	1.22	0.09	3.61	1.26	7.9	OK		
13-PUMPS.1	0.8	0.4	5.685																			
13-PUMPS.2	1	0.4	5.685	2.54	1.524	11.1379	0.20	7.80	2.71	0.22	8.63	3.00	0.24	9.13	3.17	0.24	9.40	3.27	4.4	OK		
15-PUMPS.1	0.8	0.4	5.17																			
15-PUMPS.2	1	0.4	5.17	2.54	1.524	9.8298	0.06	2.39	0.83	0.07	2.64	0.92	0.07	2.80	0.97	0.08	2.88	1.00	5	OK		
1A-PUMPS.1	0.8	0.4	4.035																			
1A-PUMPS.2	1	0.4	4.035	2.54	1.524	6.9469	0.01	0.25	0.09	0.01	0.28	0.10	0.01	0.29	0.10	0.01	0.30	0.11	2.7	OK		
1C-PUMPS.1	0.8	0.4	5																			
1C-PUMPS.2	1	0.4	5	2.54	1.524	9.398																
2-PUMPS.1	0.8	0.4	5.75																			
2-PUMPS.2	1	0.4	5.75	20.43	12.258	90.9135	1.68	64.35	22.34	1.85	71.17	24.71	1.96	75.31	26.15	2.02	77.59	26.94	16	OK		
2A-PUMPS.1	0.8	0.4	3.21																			
2A-PUMPS.2	1	0.4	3.21	2.54	1.524	4.8514	0.13	4.91	1.70	0.14	5.43	1.89	0.15	5.74	1.99	0.15	5.92	2.06	9	OK		
2B-PUMPS.1	0.8	0.4	3.91																			
2B-PUMPS.2	1	0.4	3.91	2.54	1.524	6.6294	0.25	9.60	3.33	0.28	10.62	3.69	0.29	11.24	3.90	0.30	11.58	4.02	5.4	OK		
2D-PUMPS.1	0.8	0.4	5																			
2D-PUMPS.2	1	0.4	5	2.54	1.524	9.398																
2E-PUMPS.1	0.8	0.4	5																			
2E-PUMPS.2	1	0.4	5	2.54	1.524	9.398																
2F-PUMPS.1	0.8	0.4	5																			
2F-PUMPS.2	1	0.4	5	2.54	1.524	9.398																
2G-PUMPS.1	0.8	0.4	5																			
2G-PUMPS.2	1	0.4	5	2.54	1.524	9.398																
3-PUMPS.1	0.8	0.4	7.5																			
3-PUMPS.2	1	0.4	7.5	29.22	17.532	181.164	3.26	125.31	43.51	3.61	138.61	48.13	3.82	146.67	50.93	3.93	151.10	52.47	37	OK		Pump Augmented
4-PUMPS.1	0.8	0.4	7.34																			
4-PUMPS.2	1	0.4	7.34	20.43	12.258	123.3972	1.56	60.01	20.84	1.73	66.38	23.05	1.83	70.24	24.39	1.88	72.36	25.13	28.5	OK		
4A-PUMPS.1	0.8	0.4	4.55																			
4A-PUMPS.2	1	0.4	4.55	2.54	1.524	8.255	0.09	3.31	1.15	0.10	3.66	1.27	0.10	3.87	1.34	0.10	3.99	1.39	3.5	OK		
A-PUMPS.1	0.736	0.44	5.18																			
A-PUMPS.2	0.936	0.44	5.18	3.56	1.76576	14.04064	0.29	11.18	3.88	0.32	12.36	4.29	0.34	13.08	4.54	0.35	13.48	4.68	14	OK		
B-PUMPS.1	0.84	0.44	6.76																			
B-PUMPS.2	1.04	0.44	6.76	3.56	2.136	19.2952	0.36	13.73	4.77	0.40	15.19	5.27	0.42	16.07	5.58	0.43	16.56	5.75	11.8	OK		
C-PUMPS.1	0.84	0.44	6.67																			
C-PUMPS.2	1.04	0.44	6.67	3.56	2.136	18.9748	0.41	15.80	5.49	0.46	17.48	6.07	0.48	18.49	6.42	0.50	19.05	6.62	9.8	OK		
D-PUMPS.1	0.74	0.44	5.18																			
D-PUMPS.2	0.94	0.44	5.18	3.56	1.78	14.0264	0.20	7.66	2.66	0.22	8.47	2.94	0.23	8.96	3.11	0.24	9.23	3.21	12.2	OK		
E-PUMPS.1	0.8	0.4	5.5																			
E-PUMPS.2	1	0.4	5.5	11.34	6.804	47.628	1.48	56.68	19.68	1.63	62.69	21.77	1.73	66.34	23.03	1.78	68.34	23.73	6.7	OK		
F-PUMPS.1	0.56	0.36	5.195																			
F-PUMPS.2	0.755	0.36	5.195	3.56	1.4062	14.7384	0.03	1.34	0.46	0.04	1.48	0.51	0.04	1.57	0.54	0.04	1.61	0.56	4.1	OK		
G-PUMPS.1	0.655	0.455	3.83																			
G-PUMPS.2	0.855	0.455	3.83	3.56	1.424	9.523	0.23	8.74	3.04	0.25	9.67	3.36	0.27	10.23	3.55	0.27	10.54	3.66	4.4	OK		
H-PUMPS.1	0.8	0.4	5.9																			
H-PUMPS.2	1	0.4	5.9	11.34	6.804	52.164	2.59	99.65	34.60	2.87	110.22	38.27	3.04	116.63	40.50	3.13	120.15	41.72	37	Emergency storage beyond volume within wet well required		
J-PUMPS.1	0.765	0.265	6.665																			
J-PUMPS.2	0.965	0.265	6.665	3.56	2.492	19.224	1.29	49.35	17.13	1.42	54.58	18.95	1.50	57.76	20.05	1.55	59.50	20.66	13.5	Emergency storage beyond volume within wet well required		
KING_ST	3	2	5.14	29.22	29.22	53.7648	0.03	1.03	0.36	0.03	1.14	0.39	0.03	1.20	0.42	0.03	1.24	0.43	6.1	OK		
L-PUMPS.1	0.9	0.5	4.73																			
L-PUMPS.2	1	0.5	4.73	3.46	1.73	11.8678	0.74	28.48	9.89	0.82	31.50	10.94	0.87	33.34	11.58	0.89	34.34	11.93	7	Emergency storage beyond volume within wet well required		
M-PUMPS.1	0.8	0.4	3.8																			
M-PUMPS.2	1	0.4	3.8	4.52	2.712	11.3	0.05	1.74	0.61	0.05	1.93	0.67	0.05	2.04	0.71	0.05	2.10	0.73	5.9	OK		
N-PUMPS.1	0.617	0.267	5.767																			
N-PUMPS.2	0.817	0.267	5.767	2.22	1.221	10.323	18.33	293.25	101.82	18.33	324.36	112.63	18.33	343.22	119.17	18.33	11.65	4.05	8.5	Emergency storage beyond volume within wet well required / Operational Storage Augment Required	17.11	
O-PUMPS.1	0.569	0.219	4.819																			
O-PUMPS.2	0.769	0.219	4.819	2.22	1.221	8.325	0.10	3.86	1.34	0.11	4.27	1.48	0.12	4.51	1.57	0.12	4.65	1.62	5.2	OK		
P-PUMPS.1	0.8	0.4	4.7																			
P-PUMPS.2	1	0.4	4.7	1.54	0.924	5.236	0.31	11.92	4.14	0.34	13.18	4.58	0.36	13.95	4.84	0.37	14.37	4.99	7	Emergency storage beyond volume within wet well required		
Q1-PUMPS.1	0.8	0.4	2.64																			
Q1-PUMPS.2	1	0.4	2.64	2.54	1.524	3.4036	0.13	4.92	1.71	0.14	5.44	1.89	0.15	5.76	2.00	0.15	5.93	2.06	7.3	Emergency storage beyond volume within wet well required		
Q3-PUMPS.1	0.8	0.4	5																			
Q3-PUMPS.2	1	0.4	5	2.54	1.524	9.398																
Q4-PUMPS.1	0.8	0.4	5																			
Q4-PUMPS.2	1	0.4	5	2.54	1.524	9.398																
R-PUMPS.1	0.734	0.234	6.034																			
R-PUMPS.2	0.934	0.234	6.034	3.56	2.492	17.088	0.42	16.30	5.66	0.47	18.03	6.26	0.50	19.08	6.62	0.51	19.66	6.83	3.9	Emergency storage beyond volume within wet well required		
S-PUMPS.1	0.8	0.4	5																			
S-PUMPS.2	1	0.4	5	2.54	1.524	9.398																
T-PUMPS.1	0.8	0.4	2.1																			
T-PUMPS.2	1	0.4	2.1	2.54	1.524	2.032	0.02	0.60	0.21	0.02	0.66	0.23	0.02	0.70	0.24	0.02	0.72	0.25	5.8	Emergency storage beyond volume within wet well required		
WS-PUMPS.1	0.8	0.4	5																			
WS-PUMPS.2	1	0.4	5	2.54	1.524	9.398																
Z-PUMPS.1	2	0.5	7.65																			
Z-PUMPS.2	2.5	0.5	7.65	11.34	22.68	54.999	4.83	185.53	64.42	5.34	205.21	71.25	5.65	217.14	75.40	5.83	223.70	77.68	25	Emergency storage beyond volume within wet well required		

WHITSUNDAY SHORES PUMPS

PUMP			WET WELL		CURRENT		PWWF FACTORS		0.829333333			0.917333333			0.970666667			PWWF			
Pump ID (Char)	Startup Depth (m)	Shutoff Depth (m)	Max Depth	Area	Op. Storage	Em. Storage	Op. Storage	Emer. Storage	2021 (L/s)	Op. Storage	Emer. Storage	2026	Op. Storage	Emer. Storage	2031	Op. Storage	Emer. Storage	2036	HEAD GAIN	STORAGE UPGRADES REQUIRED	Op. Storage Upgrade Required
PS_7_PUMPS	0.8	0.4	5.5	7.1	2.84	31.24	1.77	67.89	23.57	1.96	75.10	26.08	2.07	79.46	27.59	2.13	81.86	28.425	32	Emergency storage beyond volume within wet well required	
PS_9_PUMPS	0.8	0.4	5.5	7.1	2.84	31.24	0.90	34.48	11.97	0.99	38.14	13.24	1.05	40.35	14.01	1.08	41.57	14.435	4.7	Emergency storage beyond volume within wet well required	
PS_5_PUMPS	0.8	0.4	4.5	7.1	2.84	24.14	0.40	15.18	5.27	0.44	16.79	5.83	0.46	17.77	6.17	0.48	18.30	6.355	37		
PS_6_PUMPS	0.8	0.4	5.3	7.1	2.84	29.82	0.16	6.11	2.12	0.18	6.76	2.35	0.19	7.16	2.48	0.19	7.37	2.56	4.5		
PS_8_PUMPS	0.8	0.4	7.3	7.1	2.84	44.02	0.51	19.63	6.82	0.57	21.72	7.54	0.60	22.98	7.98	0.62	23.67	8.22	29		



Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Collinsville Sewer Network
SHEET 1/2

ARCADIS Design & Consultancy for natural and built assets

2021 AUGMENTATIONS
2026 AUGMENTATIONS
2031 AUGMENTATIONS
2036 AUGMENTATIONS

Whitsunday Regional Council

DEMAND MANAGEMENT - AUGMENTATION REQUIREMENTS

Collinsville Sewer Network
SHEET 2/2

ARCADIS Design & Consultancy for natural and built assets

20/12/2019

SK002-10027536-01

PROJECT:	Whitsundays Sewer Network Modelling	**Project Engineer:**	M.C
DOCUMENT NUMBER:	D002-10027536-AAC-01	**Software:**	InfoSWMM SA
DATE:			

ARCADIS Design & Consultancy for natural and built assets

WHITSUNDAYS COLLINSVILLE SEWER NETWORK
DEMAND MANAGEMENT ASSESSMENT - AUGMENTATION REQUIREMENT SUMMARY

AUGMENTATION ID	LENGTH (m)	EXISTING PIPE SEGMENT		DUPLICATION DN (mm)	DEPTH RANGE (m)	COST - $/m	ADJUSTMENT FACTOR FOR SOIL	SCALE FACTOR	10% ADDITIONAL REGIONAL COSTS	30% CONTINGENCY	COST OF NEW /DUPLICATION	PIPE REPLACEMENT							2021	2026	2031	2036	NOTES
		START NODE	END NODE									NOTES	ORIGINAL DN	REPLACEMENT DN	COST - $/m	CAP & GROUT @ $20/M	TOTAL COST	COST INCREASE COMPARED TO DUPLICATION					
CDT-27	174.774	PJ-2	JCT-12	200		$ 240.00	1.35	1.23	10%	30%	$ 97,511.31	RISING MAIN	225	375	$ 821.00	$ 3,495.48	$ 337,065.41	$ 239,554.11					This augment is solely to resolve velocity issues
							TOTAL				$ 97,511.31							$ 239,554.11					

PUMP AUGMENTATIONS REQUIRED

PUMP STATION LABEL	AUGMENTATION TYPE	VALUE	COST - $/x	TOTAL COST	2021	2026	2031	2036
D.C. PUMPS	PUMP CAPACITY	2 x 7.7 kW*	$7564/kW	$116,604.46				

**Assumes 70% efficiency at duty*

ADDITIONAL EMERGENCY STORAGE REQUIREMENTS HAVE NOT BEEN COSTED - TO BE VERIFIED AGAINST EXISTING UPSTREAM NETWORK CAPACITY (PIPEWORK + MANHOLES)

PROJECT: Whitsundays Sewer Network Modelling

Project Engineer: M.C

DOCUMENT NUMBER: D002-10027536-AAC-01

Software: InfoSWMM SA

DATE:

ARCADIS Design & Consultancy for natural and built assets

WHITSUNDAYS COLLINSVILLE SEWER NETWORK
DEMAND MANAGEMENT ASSESSMENT - SEWER PUMP STATION ASSESSMENT SUMMARY

PUMP			WET WELL		CURRENT		0.9609375				0.966145S			0.9973958			PWWF	With ideal pump curves	2036	
Pump ID (Char)	Startup Depth (m)	Shutoff Depth (m)	Max Depth	Area	Op. Storage	Em. Storage	Op. Storage	Emer. Storage	2021 (L/s)	Op. Storage	Emer. Storage	2026	Op. Storage	Emer. Storage	2031	Op. Storage	Emer. Storage	2036	HEAD GAIN	STORAGE UPGRADES REQUIRED	Op. Storage Upgrade Required	NOTES
1-C_PUMPS.1	1.15	0.61	5.11	15.8	8.532	57.828	3.33	127.93	44.42	3.35	128.62	44.66	3.46	132.78	46.10	3.47	133.13	46.225	28	Emergency storage beyond volume within wet well required		
1-C_PUMPS.2	1.75	0.61	5.11	15.8	18.012	48.348	3.33	127.93	44.42	3.35	128.62	44.66	3.46	132.78	46.10	3.47	133.13	46.225				
2-C_PUMPS.1	1.21	0.71	4.63	3.66	1.83	11.4192	0.68	26.22	9.10	0.69	26.36	9.15	0.71	27.22	9.45	0.71	27.29	9.475	55	Emergency storage beyond volume within wet well required		Pump augmentation required
2-C_PUMPS.2	2.27	0.71	4.63	3.66	5.7096	7.5396	0.68	26.22	9.10	0.69	26.36	9.15	0.71	27.22	9.45	0.71	27.29	9.475				
B-C_PUMP.1	0.7	0.3	6.5	2.54	1.016	13.97	0.02	0.84	0.29	0.02	0.85	0.29	0.02	0.88	0.30	0.02	0.88	0.305	0	OK		Not enough depth to trigger pump
B-C_PUMP.2	0.9	0.3	6.5	2.54	1.524	13.462	0.02	0.84	0.29	0.02	0.85	0.29	0.02	0.88	0.30	0.02	0.88	0.305				
A-C_PUMPS.1	0.7	0.3	2.7	2.54	1.016	4.318	0.07	2.71	0.94	0.07	2.73	0.95	0.07	2.82	0.98	0.07	2.82	0.98	4.8	OK		
A-C_PUMPS.2	0.9	0.3	2.7	2.54	1.524	3.81	0.07	2.71	0.94	0.07	2.73	0.95	0.07	2.82	0.98	0.07	2.82	0.98				

APPENDIX B

POTABLE WATER NETWORK RESERVOIR ASSESSMENT SUMMARY

APPENDIX C

SEWER NETWORK AUGMENTATION MAPPING AND SUMMARY

APPENDIX D

SEWER NETWORK PUMP STATION ASSESSMENT SUMMARY

APPENDIX E

POTABLE WATER & SEWER NETWORK MCA ASSESSMENTS

APPENDIX F

INITIAL WATER NETWORK AUGMENTATION OUTPUTS PRE-WORKSHOP

APPENDIX G

INITIAL SEWER NETWORK AUGMENTATION OUTPUTS PRE-WORKSHOP