1. INTRODUCTION

Byron Shire Council is responsible for the management of ~190km of gravity sewer mains throughout the shire. This report provides a summary of the findings relating to the gravity sewer infrastructure that has been visually condition assessed as part of the ongoing gravity sewer asset management program over the past four years as well as the remediation works that have resulted from these assessments.

2. BACKGROUND

From Council Resolution 18-054, this project was initiated in FY19/20 after the flow on effects of poor asset management practices were experienced with sewer pump stations exceeding the allowable peaking factors. Following a review of the 30 year capital program in 2019, it was identified that 40 gravity sewer mains within the Mullumbimby catchment were proposed for renewal within the 2022-2031 horizon. This prompted some flow monitoring of the network to identify if I&I was an issue which is a high level indication of the networks condition. It was identified that I&I was evident, hence visual condition assessments were undertaken to determine each individual pipe and maintenance holes overall condition and consequence of failure scores to establish the subsequent overall risk rating. This assessment enabled the appropriate remediation measures to be proposed for assets that were a high risk.

3. RISK

Good asset management can assist with reducing the risk associated with managing asset bases such as gravity sewer networks. Desirable outcomes that this project aims to achieve through the ongoing program of condition assessments followed by prioritised rectification works are as follows:

- A reduction in expensive emergency rectification works due to timely preventative intervention.
- Reduced on-going sewerage operational costs due to limiting the capture, transfer, and treatment of both groundwater and stormwater that can infiltrate into poorly managed sewer networks.
- A reduction of infiltration into the sewer network that often results in the migration of supportive material beneath road pavements which can cause their collapse (sink hole).
- Increased public health due to reduced sewage spills into private property and public spaces.
- Increased asset lifespan due to well-timed remediation.
- Data driven decision making.
- Improved serviceability and infrastructure resilience.
- Improved customer satisfaction.

If council fail to implement the ongoing program of asset management works, the contrary to the above desirable outcomes will be realised especially during system failures or extreme weather events consuming councils' budget, damaging the reputation, and compromising the health of the

community and the environment. Data driven rectification works fed by proactive and targeted condition assessments are the best way forward to ensure the resilience and integrity of the sewer network is maintained.

4. CONDITION ASSESSMENTS

4.1. Risk Analysis

To ensure that the highest risk sewer catchments were assessed in order of priority, a sewer catchment risk analysis was established based on various factors such as average age, depth, material type, peaking factors, and depth below water table.

4.2. Assessments

Over the past four years, eighteen catchments have been condition assessed with another sixteen smaller sewer catchments to be assessed in FY23/24. Across the five towns on average almost 50% of the sewer network has been visually assessed to date, the following graph identifies the length of the sewer network in each town and the length that has been assessed to date.

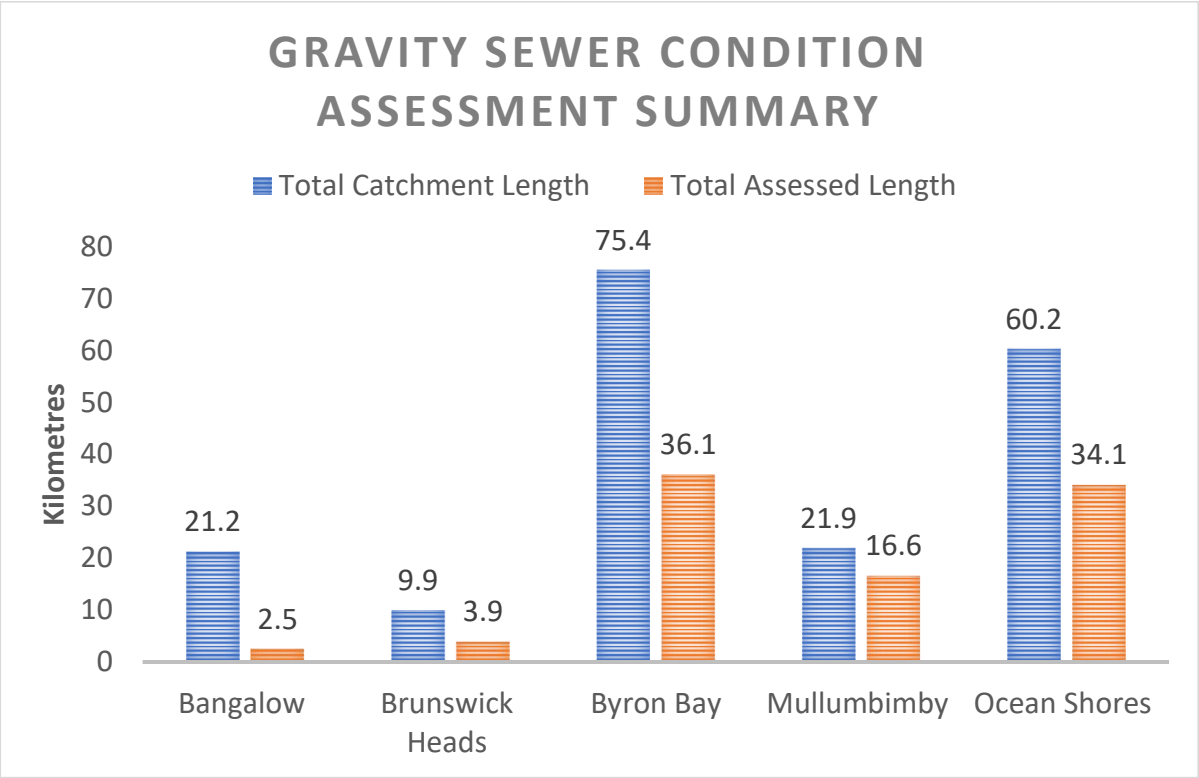

Figure 1 – Condition Assessment Summary

4.3. Findings

The findings from the assessments to date have resulted in a large array of rectification works that are identified in Section 5 of this report, however an average risk score for the sewer network that has been assessed to date in each town within Byron Shire is identified in the below graph. It is necessary to consider the length of each of the below catchments that have been assessed when comparing average overall scores for each towns sewer system whilst noting that the higher risk catchments are completed first. It would be expected that the average risk score for each town will reduce as the program continues as lower risk portions of the network yet to be assessed will reduce the average.

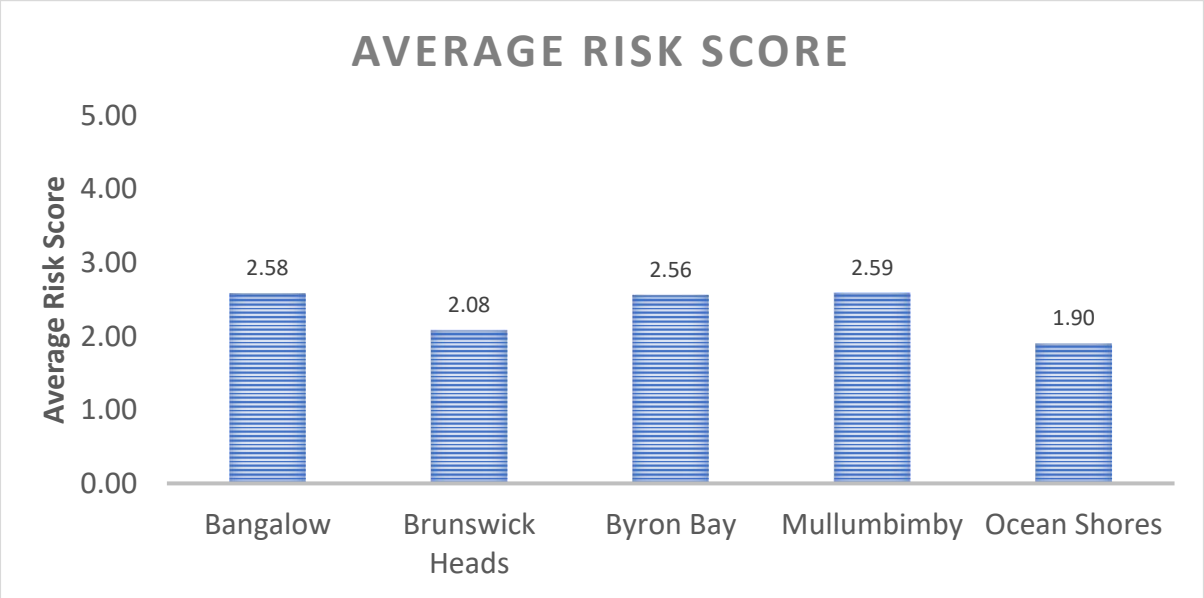

Figure 2 – Average Overall Risk Score

It should be noted that a risk score of 1 indicates a low risk and a risk score of 5 represents a high risk.

4.4. Re-assessments

During the assessment of gravity sewer networks, each asset is assigned an overall risk score that assists with the proposed outcome. Outcomes can be either a re-assessment in a future date (4 year intervals) depending on the assigned risk, or to undertake rectification works specific to the defects of the particular asset.

As the program has been ongoing for 4 years to date, the first of the proposed re-assessments are due this FY23/24 from the original Mullumbimby catchment 4001. There are 18 mains from this catchment that are due for re-assessment that will be included in the CCTV program for FY23/24. In FY24/25 there will be a further 38 mains from catchments 3002 and 5012 that will be included in the CCTV package.

4.5. Unassessed Mains

There were 14 mains from the original Mullumbimby 4001 catchment that were unable to be assessed due to access issues. It should be noted that where mains have not been able to be assessed due to access issues associated with buried maintenance holes or other limitations, these mains have not yet

been assessed throughout the network. These works are often complicated and have a heavy resource load often requiring community / private landowner consultation. The focus has been on the majority of the network that does not have access limitations to begin with whilst documenting access limitations for future rectification packages. This project will likely require the assistance of a dedicated project manager.

5. RENEWALS

5.1. Works Completed

Stemming from the condition assessment works, there have been 430 sewer mains recommended for some form of rectification of which 244 have been completed. Rectification works range from root removal, isolated pipe patching, full structural relines, and isolated repairs requiring excavation. A summary of the total number of mains proposed for rectification and the sewer mains that have had rectification works completed are detailed below in Figure 3.

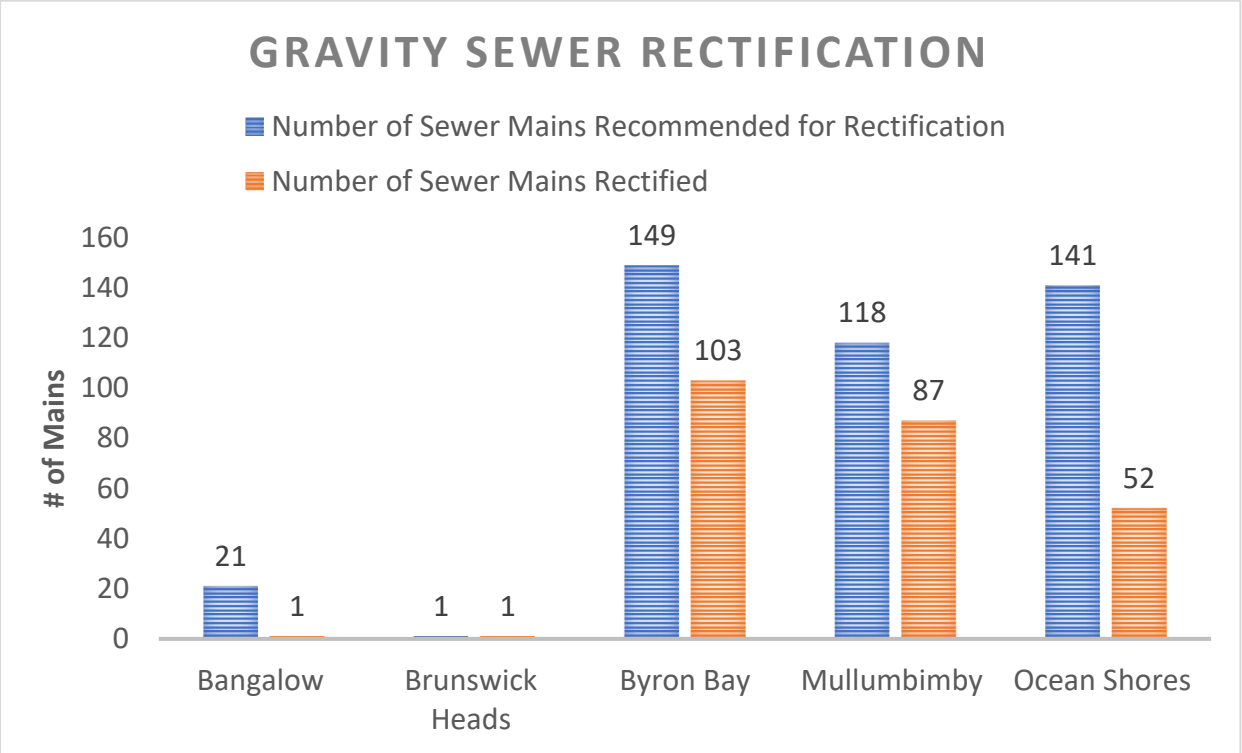

Figure 3 – Summary of Sewer Main Rectifications

It should be noted that approximately 185 sewer maintenance holes have also been rectified as part of this program of works over the past four years.

6. CONCLUSION

It is evident that the asset management program involving ongoing condition assessments and rectification works has proven valuable. Hundreds of assets in poor condition identifying high risk to Byron Shire Council have been rectified because of this program. In addition to this, the Utilities department have detailed information of the condition of the network which enables data driven decisions to be made to ensure that capital expenditure is prudent and economical. It is recommended that beyond the initial five year inflow and infiltration project that the program of works should continue into perpetuity. The sewer network should not depend on a project but should be managed into perpetuity as ongoing asset management that all government bodies responsible for large asset bases should undertake.

However, it is clearly evident that the performance of the I&I program is dependent on the stormwater infrastructure and associated hydraulic capacity of the stormwater network. To achieve the desired outcome, asset management across both sewer and stormwater infrastructure should be aligned and strategic in nature. The poor condition and/or inadequate sizing of stormwater infrastructure in an area where sewer infrastructure is also below the hydraulic grade line of the stormwater system caused significant infiltration and inflow into the sewer reticulation system via the gravity sewer mains, junctions, inspections points and pump stations. The ingress of this stormwater is then pumped to associated sewage treatment plants and processed through the system. This has significant cost impacts including environmental and social impacts. The Ocean Shores STP is currently deemed high risk under EPA's risk assessment tool. This is due to wet weather events causing additional inflow into the STP that cannot be processed to EPA licence requitements. In addition, these events can cause uncontrolled discharge to the Brunswick River which is an EPA notifiable incident.

7. QUESTIONS FROM CR. HUNTER

Please see below consolidated response to Cr. Hunter's questions.

Please find the answers to each question below in blue.

1. **How many of the sewer drains, of the 22 identified and recommenced for replacement in the Willow Sparrow (2019) report have been replaced?**

Of catchment 4001, twenty-seven mains had relining which also includes twenty one of the twenty-two mains that required remediation works.

Each of these mains has been relined except for line 81 ID32702. This main was removed from scope due to major difficulties/costs associated with remediation.

The table below details the pipes that have undergone remediation work.

In FY23/24 we will be assessing catchments 4005 and 4012 within Mullumbimby.

Pipe ID	Report Line #	W+S Recommendation	Renewal Works
32305	13	**Replace**	Relined
33027	1	**Replace**	Relined
33044	9	**Replace**	Relined
33629	11	**Replace**	Relined
33650	22	**Replace**	Relined
32901	24	**Replace**	Relined
33627	25	**Replace**	Relined
36101	45	**Replace**	Relined
35838	49	**Replace**	Relined
33033	50	**Replace**	Relined
33034	51	**Replace**	Relined
32733	52	**Replace**	Relined
32691	69	**Replace**	Relined
32720	70	**Replace**	Relined
32728	72	**Replace**	Relined
32726	74	**Replace**	Relined
32729	75	**Replace**	Relined
32712	76	**Replace**	Relined
32717	77	**Replace**	Relined
32702	81	**Replace**	*Removed from scope*
32742	83	**Replace**	Relined
32716	85	**Replace**	Relined
32691	95	**Replace**	Relined
32883	98	**Replace**	Relined

33634	99	**Replace**	Relined
32847	100	**Replace**	Relined
33635	109	**Replace**	Relined

2. **Of the remaining 22 assessed; how many have been attended to with rectification work as recommended?**

Please refer to the above.

3. **How many mains recommended for re-assessment in or by the end of 2023 are yet to be completed?**

The assessment of mains in other Byron Shire catchments has been prioritised over the reassessment of previously surveyed areas. Mains recommended for reassessment will become a priority once Council has developed a clear representation of the entire sewer network.

Further elaboration as requested by Cr. Alan Hunter:
Regarding Q3, I've consulted with Councils Asset Engineer and believe Cr. Hunter is relying on the Condition assessment reports (that have now been superseded) and not the latest remediation work information. See screen shot below.

- Of the 5237 gravity sewer mains we have in total, 2267 have been physically inspected leaving 2970 to complete. These will hold priority over recently inspected assets.
- We now do not rely on contractors to supply us with a capital works program as we have developed a complex and comprehensive predictor model on this asset class which assigns capital works based upon condition, risk, priorities and optimises capital funding each year.

Table 115 | Capital Works Program - Follow up Assessment

#	Pipe Section	Decision Outcome	Capital Works Delivery Period					Pipe Age at Next Assessment (yrs.)	30yr Capital Program – Replacement Year
			2019	2023	2027	2031	2035		
1	EA04-EA05	Replace	Immediate					37	
2	EA03-EA04	Monitor (Cat 1)		Assess				41	
3	EA02-EA03	Monitor (Cat 2)			Assess			45	
4	EA01-EA02	Monitor (Cat 2)			Assess			45	
5	EA01-EA01/End	Monitor (Cat 2)			Assess			45	
6	E18-EA01	Monitor (Cat 2)	Patch liner		Assess			45	
7	E14-E16	Leave (Cat 3)				Assess		67	
8	E13-E14	Monitor (Cat 2)			Assess			63	
9	E17-E18	Replace	Immediate					59	
10	K01 -E08	Leave (Cat 3)				Assess		67	
11	K01-K02	Replace	Immediate					55	
12	E08-E09	Monitor (Cat 2)			Assess			59	
13	E09-E10	Replace	Immediate					55	2035
14	K02-K03	Monitor (Cat 2)			Assess			63	
15	E10-L01	Monitor (Cat 2)	Patch liner		Assess			63	
16	L01-DE	Leave (Cat 3)				Assess		67	
17	E10-E11	Monitor (Cat 2)			Assess			63	2035
18	E07-E08	Monitor (Cat 1)	Re-assess	Assess				59	2028
19	E06-E07	Monitor (Cat 2)			Assess			67	2028
20	J01-J02	Monitor (Cat 2)			Assess			63	
21	E06-J01	Monitor (Cat 2)			Assess			63	
22	E05-E06	Replace	Immediate and clear line					63	
23	E05-DE	Leave (Cat 4)					Assess	71	2030
24	E04-E05	Replace	Immediate					59	2030
25	E03-E04	Replace	Immediate					55	2029
26	N04-N05	Monitor (Cat 1)		Assess				59	2032

4. How many of the 14 mains that were not assessed at all in this W/S report are yet to be assessed?

These mains were not assessed due to access limitations. This could be that the maintenance holes are buried/built over or that landowners did not grant access. Unassessed mains have not been revisited to date.

Further elaboration as requested by Cr. Alan Hunter:
Q4: Of the mains that could not have assessment work completed, a register will be developed to arrange for the inspection of assets. While Council has the powers of entry to a Council asset, this will need to be completed in a respectful approach with the community. The approach elected will impact the time frame of these works.
This is an item I would like to discuss further given it can become sensitive in nature.

5. Could staff also provide a short list of the risks of a system failure that could impact any social, environmental or financial responsibilities of council and any comment about the amelioration of such?
Further elaboration as requested by Cr. Alan Hunter:

Utilities have a Business Contingency Plan that is executed when any of the below risks to operational system failure occurs.

Risks associated with system failure include but are not limited to;

- Possible increased frequency and severity of blockages

- Slow running drains or back flowing
- General Maintenance issues
- Stormwater inflow and pump station load burdening
- Inadequate stormwater condition and capacity
- Reputation damage for Council

In any sewer reticulated system. Rain events are allowed for in design through capacity requirements to Industry standards. However, sometimes the rain events exceed these standards. Council staff are currently in the process of building resilience into the sewer system (from the recent natural disaster data) And working closely with Public works to look at high risk areas subject to social, environmental health and impacts to service delivery. This includes increasing invert heights of key pump stations.

Regarding your comments relating to social, environmental, and financial responsibilities.
The overall asset management of the sewer system program has been driven by a risk approach. This means not only condition assessment gives a priority of works. The use
Of multicriteria analysis using condition rating and risk (around financial, social, and environmental factors) have been used to drive prioritisation through financial social and environmental multi-criteria assessment. This follows best practice asset management principles to ISO 55000 series Assessment Management Standards.