Government of JERSEY

Bridging Liquid Waste Strategy 2023-26

Infrastructure and Environment

R.71/2023

blank

Infrastructure and Environment

Bridging Liquid Waste Strategy 2023-26

Version Control

Revision	Date	Comment
0_0	3/8/21	For discussion
0_1	5/8/21	With notes/updates from meeting 4/8/21
0_2	31/3/22	Issued for Review/Discussion SS
0_3	29/4/22	Issued for comment
0_4		Final for review
0_5	26/8/22	Final review comments incorporated
1_0	14/09/22	Edited for Final Issue
1_1	27/04/23	Department name updated (Infrastructure & Environment)

Infrastructure and Environment
Operations & Transport
Engineering & Development – Capital Delivery
P O Box 412, Beresford House,
Bellozanne Road
St Helier,
Jersey,
Channel Islands,
JE4 8UY

Table of Contents

Table of Contents ..... **i**

1. Executive Summary **1**

2. Introduction **4**

2.1. Why do we need an update to the Liquid Waste Strategy? 4

2.2. Historical and geographical context 4

2.2.1 1950's to 1970's 5

2.2.2 1980's to 2000 5

2.2.3 2000 to 2020's 5

2.3. Approach to updating the Liquid Waste Strategy 5

2.4. Aims of the Strategy 6

2.4.1 Meeting the demands of the Island Plan 7

3. Benchmarking against the 2013 Liquid Waste Strategy **8**

3.1. Introduction and Summary of 2013 LWS 8

3.2. Additional Treatment Capacity - Replace Bellozanne STW 8

3.3. Environmental Impact - St Aubin's Bay study 10

3.4. Foul Network improvements 11

3.4.1 Addressing Infiltration 11

3.4.2 Additional capacity – Surface Water Separation 12

3.4.3 New connections and Sewer extensions 12

3.4.4 Pumping Station Upgrades – rolling programme 13

3.4.5 Pumping Station Upgrades – key schemes 14

3.5. Surface Water Network improvements 16

3.5.1 Adoption/Promotion of SUDS for new developments 16

3.5.2 Baudrette Brook Pumping Station 17

3.5.3 Surface Water Management Plan (SWMP) and Inland Pluvial Climate Change (IPCC) Study 17

3.6. Asset Management 17

3.6.1 Telemetry upgrades 18

4. Strategic Drivers **19**

4.1. Introduction 19

4.1.1 Surface Water separation 19

4.1.2 Climatic changes due to global warming 19

4.1.3 Population growth 19

4.1.4 Rainfall and Ground Water in small sewage pumping stations 19
4.1.5 Efficiency, Automation, Safety and Maintainability 19
4.1.6 Environmental Standards and Policies 20
4.1.7 Changes to GoJ Legislation 20
4.2. Island Plan 20
4.2.1 Bridging Island Plan principles and influences 20
4.2.2 Economic Outlook 22
4.3. GoJ Strategic Proposals 23
4.3.1 Strategic Proposal 1 - Development of a long-term planning assumption 23
4.3.2 Strategic Proposal 2 - Understanding the requirements of Jersey's energy market 23
4.3.3 Strategic Proposal 3 – Creating a marine spatial plan for Jersey 24
4.3.4 Strategic Proposal 4 – A west of island planning framework 25
4.3.5 Strategic Proposal 5 – An infrastructure roadmap for Jersey 25
4.4. GoJ Strategic Policy 26
4.4.1 Policy SP1 – Responding to climate change 26
4.4.2 Policy SP2 – Spatial strategy 26
4.4.3 Policy SP3 – Placemaking 28
4.4.4 Policy SP4 – Protecting and promoting island identity 28
4.4.5 Policy SP5 - Protecting and improving the natural environment 29
4.4.6 Policy SP6 – Sustainable island economy 29
4.4.7 Policy SP7 – Planning for community needs 29
4.4.8 Housing Policies 29
4.4.9 Liquid Waste Policies 32
4.4.10 Climate Emergency 33
4.5. Government Plan 33
4.6. Other legislation 34
4.6.1 UK Legislation 34
4.6.2 EU Directives 35
5. International Best Practice 38
5.1. Introduction 38
5.2. Sewerage catchment 38
5.2.1 Surface Water Systems 39
5.3. STW Treatment 40
5.4. Water Resources and Wastewater Recycling 41
5.4.1 Water re-use 41

5.4.2 Grey water recycling 42
5.4.3 Rainwater Harvesting 42
5.4.4 Summary 42
5.4.5 Community Awareness 42
5.5. The Approach of Other Islands 43
5.5.1 States of Guernsey 43
5.5.2 Isle of Man 44
5.5.3 Isle of Wight 45
5.5.4 Summary 45
6. Existing Sewerage Catchment 46
6.1. Introduction 46
6.2. General 46
6.3. Treatment 47
6.3.1 Bellozanne STW 47
6.3.2 Bonne Nuit STW 53
6.3.3 Sludge cake storage and disposal 53
6.4. Network Storage 55
6.5. Gravity Systems 55
6.6. Pumping Stations 56
6.6.1 Pumping Station design and construction 57
6.6.2 Pumping Stations and rising mains over 50 years old 57
6.6.3 Pumping Stations less than 50 years old with Ductile Iron rising mains (full or part) 60
6.6.4 Small Pumping Stations with rising mains less than or equal to 100mm diameter 60
6.6.5 Pumping Stations with rising mains greater than 100mm diameter 62
6.6.6 Pumping Station Asset Replacement 63
6.6.7 Water Ingress at Pumping Stations 64
6.6.8 Pumping Station Condition Survey 66
6.6.9 Pumping Station Control and monitoring 66
6.6.10 Pumping Station Recommendations 67
6.7. Rising Mains 68
6.7.1 Rising Main Condition Surveys 69
6.7.2 Ductile, Cast and Spun Iron Rising Mains 69
6.7.3 uPVC Rising Mains 71
6.7.4 Telemetry monitoring and control system 73
6.8. Meeting the demands of the Island Plan 74

6.8.1 Is there spare capacity in the network? 74
6.9. Identified Rising Main schemes 74
6.10. Emergency repair strategy 74
7. Existing Surface Water Catchment 75
7.1. Introduction 75
7.2. Surface Water Catchment Model 75
7.3. Surface Water Management Plan 76
7.4. Intergovernmental Panel on Climate Change 76
7.5. Developer connections/SUDS and IUDM 77
7.6. Meeting the demands of the Island Plan 78
7.6.1 Is there spare capacity? 78
8. Population and Development Forecasting 79
8.1. Introduction 79
8.2. 2021 Population vs 2013 Forecasts 80
8.3. 2021 growth models from the Statistics Jersey Team 82
8.4. Population growth vs Bellozanne STW capacity 83
8.4.1 2013 Connected Population Forecast 84
8.5. Island Plan Development strategy 88
8.5.1 Strategic Policies 88
8.5.2 Development locations – the Spatial Strategy 90
8.5.3 Property demand vs availability – the need for a planned sequence of development 92
9. Liquid Waste Programme of Works 94
9.1. Introduction 94
9.2. Short term – ongoing and starting before 2026 94
9.2.1 West Park Surface Water Outfall 95
9.2.2 Bonne Nuit STW 95
9.2.3 Emerging Projects – overall for the LWS 95
9.2.4 Emerging Projects – North and West 96
9.2.5 Drainage Capacity Upgrades – Island Wide 97
9.2.6 First Tower Rising Main replacement 98
9.2.7 Bellozanne STW 99
9.2.8 Telemetry Upgrades 103
9.2.9 Other Feasibility Studies 105
9.3. Medium term to 2025-2035 105
9.3.1 Confirmed Projects 105

9.3.2 Effluent Quality at Bellozanne ... 106
9.3.3 Emerging Schemes – South and East ... 106
9.3.4 Additional Treatment Capacity ... 107
9.3.5 Pumping Station Programme ... 112
9.4. Long term - 2035 and beyond ... 112
10. Operational Issues ... 113
10.1. Introduction ... 113
10.2. Adopting a Proactive Maintenance approach ... 113
10.2.1 Ice pigging ... 113
10.2.2 Dealing with Salinity and Septicity in Coastal Pumping Stations ... 114
10.2.3 Emergency repair strategy and stock ... 114
10.3. Staff challenges ... 115
10.3.1 Use of Consultants ... 115
11. Funding ... 117
11.1. Introduction ... 117
11.1.1 Funding network improvements to service new developments ... 117
11.2. Short term - 2022-2025 ... 118
11.2.1 Liquid Waste Strategy – Bellozanne STW ... 118
11.2.2 Liquid Waste Strategy – STW Projects ... 119
11.2.3 Liquid Waste Strategy – Infrastructure Projects ... 120
11.2.4 Replacement Assets and Minor Capital Works ... 121
11.2.5 Foul Sewer Extensions ... 122
11.2.6 Drainage Infrastructure (Infrastructure Rolling Vote) ... 122
11.3. Medium term - 2025-2035 ... 123
11.4. Long term for 2035 and beyond ... 123
12. Conclusions ... 124
12.1. Short Term 2023-26 ... 124
12.2. Medium Term 2025-2035 ... 124
12.3. Long Term beyond 2035 ... 125
Appendices ... 126

List of Appendices

Appendix A – Strategic Proposals, Policies and supporting Planning Policies

A1 Strategic Proposal 3 – Additional Notes on the ILSCA

A2 Strategic Proposal 5 – Additional Notes on the Infrastructure Road Map

A3 GoJ Strategic Policies

Appendix B – Pumping Stations and Rising Mains over 50 years old

B1 50 year old Large pumping stations with cast/spun iron mains

B2 50 year old Pumping stations with uPVC rising mains

Appendix C – Pumping stations with small rising mains

Appendix D – Pumping stations with saline intrusion

Appendix E – Summary of 2021 Condition Survey

Appendix F – Pumping stations with Surge suppression equipment

Appendix G – Pumping Station Mechanical Full Refit Scope

Appendix H – Ice Pigging Report

Appendix J – Miscellaneous Key Installations

J1 Bonne Nuit

J2 Weighbridge

J3 West of Albert

1. Executive Summary

Government of Jersey Infrastructure and Environment (I&E) have produced a draft Liquid Waste Strategy in various formats since 2009. The last issue of the Liquid Waste Strategy (LWS) was the Waste Water Strategy (WWS), issued in 2013, which expanded on the 2010 strategy and was approved by the States of Jersey on 04 June 2014 under P.39/2014. The approved WWS defined the requirements for a new Sewage Treatment Works (STW) at Bellozanne.

In the 2013 WWS, the key drivers behind the Replacement of Bellozanne STW were the fact that the plant was failing due to age of the main treatment facilities, climate change, treatment standards and population growth of over 70% since it was first built in the 1950's. The original design capacity was for a population of 57,000 compared with the 2011 Census result of 97,857. The subsequent population projections developed by Statistics Jersey were used to design the new STW for a population equivalent of 118,000 in 2035. This included allowances for population growth; seasonal workers and visiting friends and relatives; new connections of existing properties; and new developments.

The STW Replacement project is close to completion and the old treatment works will be decommissioned in its entirety this year. With this major component of the Island's infrastructure expected to be successfully delivered, it is essential that the LWS is revisited with a view to planning for the further demands of the 21st century, including population growth, climate change and the ever increasing demands on the aging sewerage and drainage network. This is all the more important in light of the fact that part of the funding from the Infrastructure Rolling Vote had to be diverted away from network projects to supplement the funding for the new STW, resulting in underinvestment in the network over the last few years.

Although the new Bellozanne STW is being built with provisions for additional capacity, the total flow it can accommodate will be limited by the network's capacity to deliver the flows to the STW and the future requirements for any enhanced effluent quality.

This updated LWS has been synchronised with the Island Plan so that it can be used to inform the new Government Plan 2023-26. Both the LWS and the Island Plan have been formulated during a period of significant uncertainty due to the impact of the Coronavirus pandemic and Brexit. To reflect this uncertainty, the Island Plan has been developed to cover the shorter than normal period of three years from 2022-25 and has been identified as the *Bridging Island Plan 2022-25*. This Bridging Island Plan was approved by the States of Jersey in March 2022. The LWS is following the same approach and hence this update is known as the *Bridging LWS 2023-26*, covering the next Government Plan 2023-26.

The most recent Census on Jersey was held on 21 March 2021 and the first 2021 Census Bulletin[1] was issued on 13 April 2022 giving an Island population of 103,276. This proved that continuous growth has taken place and is likely to continue. However, due to the timing of the release of the Census data, both the Bridging Island Plan and preceding Infrastructure Capacity Study used the 2019 estimate of population of 107,800 as the baseline for their population predictions.

Given the short strategy timeframes and the fact that new population models projecting from the 2021 Census data are expected to be available only in 2023, this Bridging LWS has been aligned with the Infrastructure Capacity Study Report and the Bridging Island Plan. This allows a unified, albeit

[1] 2021 Census Bulletin 1

conservative, vision to be presented for the development of the next Government Plan and, at worst, means that additional resilience will be built into the respective systems while more robust population models are developed.

The Bridging Island Plan also includes for some 4,300 homes to be built by 2025 with a further 3,600 homes required by 2030 across the Island.

Clearly, house building on this scale and programme is a challenge in itself in the context of Jersey but the impact of large estates on the existing liquid waste system with its existing limitations is potentially catastrophic. The locations of these houses have only been identified in the loosest terms to date which means detailed assessments of upgrades and reinforcement works cannot be completed for specific schemes to be included in this Bridging LWS. However, the Bridging Island Plan has identified sites to the North and West of the Island, as well as St Helier, as the most likely to proceed in the short term. These are around St Peter and Les Quennevais and this information has been used to identify concept solutions which have been named ‘Emerging Projects’. I&E will work with the Planning Team to agree what size of developments need to be allowed for and then the specific local and downstream infrastructure upgrade projects at St Peter, St Brelade and Beaumont will be progressed to suit.

Additional ‘Emerging Projects’ have been identified in the South and East of the Island which are linked to known restrictions in the network and the proposed Five Oaks Master Plan. Some development in the Five Oaks area has already been submitted for Planning Approval but it is anticipated that the majority of the development in these areas will be after 2025. Schemes to serve the initial applications are being considered and will take account of the longer term projects that will be developed in detail for the 2025-35 LWS in conjunction with the potential for additional treatment capacity.

The Bridging LWS also considers the significant disruption and challenges that have been experienced in Jersey from rainfall and storms due to climate change. This is not unique to the Island and is reflected across the world. The reality of climate change is here and requires a strategy of adaptation to deal with it. These issues will not be fully addressed within the scope of this Bridging LWS but it is intended to lay the groundwork for a long term programme of works that will make the Island more resilient to these challenges.

Beyond the large individual schemes, rolling programmes of maintenance and upgrades to meet changing conditions across the network will continue in parallel with a series of investigations and condition surveys in 2022-26. In addition, all of these programmes will be linked to the new asset management system (SAP[2]) which is expected to be in place by 2026.

One of these rolling programmes is the monitoring of final effluent quality at Bellozanne STW which will start in 2023 when the new works are commissioned in its entirety. The monitoring is planned to run for up to five years to optimise the works and build up sufficient data to confirm no deterioration in effluent quality based on the Effluent Discharge Consent Standards and Objectives as outlined by the Regulator on 26 September 2018, particularly in relation to Total Nitrogen.

As part of further laying the groundwork for the 2025-35 LWS, it is anticipated that a number of the above projects will run into 2026 as well as other major projects that have been developed during 2023-26. Definition of these projects for the early years will be carried out in 2023-26 based on the

[2] SAP company website

population and housing data received. Preliminary budget figures for 2023-26 have been included in the funding section to coincide with the next Government Plan 2023-26.

Liquid waste assets are not dissimilar to other infrastructure assets in that they are taken for granted and only noticed when something goes wrong, the Island has been very well served by the current infrastructure but investment needs to happen over the medium term to maintain this level of service.

This Bridging LWS looks in depth at the sewerage network and shows that similar issues to those discovered in the old Bellozanne STW are now affecting the network, i.e. plant and system age; climate change; environmental standards; and, population growth and new developments.

The Island's foul water sewerage network has been developed since Victorian times and connects the majority of the Island's sewers to the sewage treatment works at Bellozanne. This is essential to maintaining the quality of the Island's bathing waters, and Jersey's reputation as one of the best islands world-wide for managing liquid waste.

Due to the age of the foul water sewerage system and climate change, Jersey's sewers have increasingly suffered with ground water ingress which leads to significant problems within the pumping stations and causes operational issues, particularly in the wet periods. This strategy reinforces the work done previously on surface water separation and the continuous hunt for points of ground water ingress and the sealing of these through a variety of means.

What has become clear in developing this Bridging LWS is that the network of 109 sewage pumping stations and rising mains are at a critical point. When the original Bellozanne STW was built, 22 pumping stations and rising mains were connected to the system to pass the sewage to the STW. These critical assets are now over 60 years old. The mechanical and electrical items have been replaced several times but the majority of the structures, wet wells and pressure pipes are the original ones. It is a credit to the original design and the operational teams that these assets are still operating and working 24 hours a day, 365 days a year.

These pumping stations were designed when the Island's population was a fraction of the current figure and the network has reached the point where there is no spare capacity in the system. It is therefore imperative to review and plan the replacement or upgrading of these assets to protect the Island for the next 60 years.

This long-term capital plan has been developed and monies identified to undertake the required work over the next decade. These works are essential and some will be difficult, causing disruption to the public which will not be popular politically as the Island rebuilds after the Coronavirus pandemic. However, catastrophic failure of these critical assets could adversely affect the Island's reputation as a safe and clean location to live, visit and to undertake business and leisure activities.

In conclusion the Bridging LWS calls for a significant investment over an extended period to avoid catastrophic failures and help battle against climate change and population growth whilst maintaining a system which remains efficient, fit for purpose and discrete.

Due to the lack of key consultants and contractors on the Island to undertake the required services and works, it is proposed that long-term frameworks are set up with a mix of UK and Jersey based consulting and contracting entities who can design and build these key assets whilst employing and training local labour to improve the skill set over the period of the programme. This will provide the best value and avoid the challenges that have been seen repeatedly from solely relying on large contracting companies from the UK or Europe.

2. Introduction

Government of Jersey Infrastructure and Environment (I&E) have produced a draft Liquid Waste Strategy in various formats since 2009. Initially this was simply a Statement of Needs which laid out where the sewer network required improvement but subsequent versions have expanded this to consider the most appropriate standards to be adopted, accommodating population growth, changing demands and the impact of climate and environmental factors.

The most recent version of the Liquid Waste Strategy (LWS) was the Wastewater Strategy[3], issued in 2013[4] and approved by the States on 04 June 2014 under P.39/2014, which expanded the 2010 strategy to define the requirements of a new Sewage Treatment Works (STW) at Bellozanne and other programmes of maintenance and expansion of the sewerage network.

2.1. Why do we need an update to the Liquid Waste Strategy?

An effective, adequately funded liquid waste service is required to help to maintain and improve public health, and preserve the environment of Jersey as a place to live, visit or invest in.

Substantial investment has been made in the Liquid Waste system for many decades. Since 2010 this investment has focussed on the WWS's highest priorities to replace Bellozanne STW and carry out a major programme of maintenance and expansion of the sewerage network. Now that the STW Replacement project is nearing completion, it is essential that the strategy is revisited with a view to planning for the further demands of the 21st century and the growth in population and associated expansion of housing identified in the Bridging Island Plan 2022-25. It should be noted that the planned growth in population is intended to rebalance the dependency ratio as the 2021 Census is indicating that Jersey's population is ageing overall.

Recent years have shown significant disruption and challenge from rainfall and storms. This strategy will need to take this into consideration. The reality of climate change requires a strategy of adaptation to deal with this and the ongoing Surface Water Management Plan project (Section 7.3) will identify the areas most at risk so that improvements can be made.

2.2. Historical and geographical context

The Island of Jersey has developed a sophisticated sewage collection and treatment system which began with the development of Jersey in the post war period and the subsequent growth of tourism in the 1950's. This was followed in the 1960's with the emergence of Jersey as a finance centre. As the Island's business, tourism and accommodation sectors have grown, the infrastructure has had to keep pace.

Sewerage is the name for the network of pipes and manholes that collects and transfers wastewater to a STW. There are two basic types of sewerage systems, combined and separate. Combined sewerage is common in older European towns and cities and, as the name suggests, receives both sewage flow from houses and surface water runoff from roofs and paved areas during wet weather.

This mixture of sewage and surface water runoff is dealt with at the STW which is inefficient and costly. Separate sewerage systems overcome these issues with sewage going directly to the STW via one network of pipes (foul system) while the surface water runoff goes to the nearest watercourse via

[3] Wastewater Strategy 2013
[4] Transport and Technical Services public information video

another system of pipes (surface water system). This results in a smaller volume with less variation in flow being transferred to the STW and reduces the risk of pollution and / or flooding due to overflows from the sewers.

It is now deemed best practice to separate out the surface and foul flows in any collection system. However, the historical legacy in much of the world, including Jersey, is that combined systems were installed in many urban areas and these are being separated where practicable and any new development is required to have separate systems. Best practice would also indicate that systems should operate by gravity wherever possible but the topography of the Island forces the use of pumping stations to transfer sewage from most of the population and visitor centres to the treatment facility at Bellozanne.

The development of the sewerage infrastructure can be divided into key themes and drivers since the initial post-war period.

2.2.1 1950's to 1970's

Strategy: Provide the necessary network to support the tourist sector and make sure the Island deals with sewage treatment to a good standard. New legislation in 1953 began the drive for separation and construction of the surface water system also began during this period.

2.2.2 1980's to 2000

Strategy: Increase the environmental performance of the network and expand the network to connect as much of the Island as possible.

2.2.3 2000 to 2020's

Strategy: Focus on surface water separation to protect the STW and network from rainfall events and surface water problems associated with climate change. In addition, the replacement of the STW has been a key capital project.

2.3. Approach to updating the Liquid Waste Strategy

The 2010 draft Liquid Waste Strategy (LWS) was revised in 2013 as the Waste Water Strategy (WWS) to take account of the 2011 Census results and the subsequent population projections developed by Statistics Jersey and thereby verify that the 2010 LWS remained valid. The 2013 WWS included a plan to update the strategy every five years but 2018 coincided with the beginning of construction of the replacement Bellozanne STW which had to be partially funded from the Infrastructure Rolling Vote. This reduction in funding for projects other than the STW meant that an update to the 2013 WWS would not offer any significant value and the review was deferred to coincide with completion of the STW project.

This delay has synchronised the LWS update with the updating of the Island Plan and means that it can be used to inform the new Government Plan 2023-26. However, the timing also means that both the LWS and Island Plan are being formulated during a period of significant uncertainty due to the impact of Brexit and the Coronavirus pandemic. With this in mind the Island Plan was developed to cover a shorter period of three years from 2022-2025. This is being identified as the *Bridging Island Plan* with the intent of following this interim plan with the usual ten-year plan for 2025-2035.

Given that those parts of the LWS related to population growth and development are driven by the content of the Island Plan, the LWS will follow the same principles. This initial *Bridging LWS* will take the best available data to consider the period 2023-2035 but with a particular focus on setting the short-term strategy for 2023-2026 to align with the current Government Plan period. The long-term

LWS will then be prepared in coordination with the full Island Plan and Statistics Jersey's new population forecasts to create a practical vision for the service improvements needed over the period 2025-2035.

In addition, the long-term LWS update will consider possible trends in population beyond 2035. The 2013 WWS looked forward to 2065 for major infrastructure like Bellozanne STW. This will allow issues such as land purchase or other investment for future assets to be considered in a timely manner.

This Strategy will ensure that the collection, treatment and disposal of liquid waste across the Island complies with the latest legal obligations, States of Jersey's policies and is in accordance with the future needs of the Island and international best practice given that the initial design horizon for Bellozanne STW is 2035. The date at which the horizon is actually reached is dependent on real population growth and any change to the effluent quality requirements. This forward looking approach will enable the Minister for Infrastructure to fulfil his obligation to Islanders to prevent pollution and maintain and improve public health by dealing safely and efficiently with liquid waste for the foreseeable future.

2.4. Aims of the Strategy

The key aims and outputs for this Strategy are to, where possible, given current uncertainty regarding population forecasts:

- Review progress against the 2013 Strategy;
- Review latest international best practice in policy and operational processes;
- Identify improvements needed to collection, treatment and disposal services;
- Identify opportunities for early enabling works and land purchase that will facilitate future service security;
- Recommend locations for any new assets such as supplementary or satellite sewage treatment works and network storage;
- Identify parts of the network that require significant maintenance or repair;
- Identify parts of the network that require reinforcement or expansion to improve capacity;
- Identify parts of the network, including current foul sewer extension projects, that require reinforcement or expansion to meet the future demands expected from the Island Plan and proposed new developments;
- Identify the extent of costs and propose implementation timescales;
- Identify appropriate best practice for operation and asset management;
- Review surface water management and identify areas where works are required to reduce flooding risks, making allowance for climate change;
- Identify the parts of the network that offer the greatest benefit from surface water separation;
- Review of design and operational philosophies for Pumping Stations and Rising Mains, including management of wide variation in flows; and,
- Review resources requirements for the operation and maintenance of the Liquid Waste assets.

The majority of the above points have a combined aim of optimising and improving I&E's ongoing operations through maintenance and development of the existing network and treatment assets. This cannot, however, be done in isolation and taking account of the latest Bridging Island Plan is key to producing an integrated and holistic approach to the Island's future.

2.4.1 Meeting the demands of the Island Plan

The Island Plan public consultation was originally structured around four areas: the spatial strategy, a sustainable island environment, a sustainable island economy and sustainable island communities. From these broad themes, the Bridging Island Plan has focused on addressing the availability and affordability of homes; strengthening protection from inappropriate development; responding to climate change; improving Jersey's transport systems; and making improvements to the Town of St Helier, particularly for residents.

Clearly these areas of focus do not all directly bear on the provision of Liquid Waste services but some are central to how the LWS has been developed, i.e.:

- the availability and affordability of homes;
- making improvements to the Town of St Helier; and,
- responding to climate change.

This shortened list particularly relates to areas of new development and population growth and these issues have been a key influence on developing this Bridging LWS whether for feasibility, design or construction works within the period.

3. Benchmarking against the 2013 Liquid Waste Strategy

3.1. Introduction and Summary of 2013 LWS

The primary outcome of the 2010 Strategy was the preferred option to replace Bellozanne STW with a new works and to construct a long sea outfall as part of a 20 year plan to increase capacity; improve Liquid Waste treatment performance and replace an aging asset. In conjunction with this major project, a rolling programme of network improvements including sewers, pumping stations and rising mains was also identified for the same period. These network improvements included provision for new connections, both to new build developments and existing properties.

Based on these recommendations a number of studies were carried out by I&E (Transport & Technical Services at that time) which resulted in the updated Waste Water Strategy of 2013.

The recommendations/conclusions of the 2013 Strategy were developed from those in 2010, in particular:

- Capital replacement and maintenance of the Island's main wastewater assets would require investment over the next 20 years.
- Replace Bellozanne STW, using a phased approach at the same site, to service a design horizon Population Equivalent[5] (PE) of 118,000 in 2035. A conventional ASP with UV disinfection of the final effluent was the preferred solution but was subject to agreement of the discharge consent. The new STW was estimated at £75m in the 2013 WWS. This was based on 2012 cost data and included the related enabling works. See Section 3.2.
- A separate study of St Aubin's Bay concluded that the long sea outfall proposed in 2010 was not required. See Section 3.3.
- The priority for the sewerage network was to address groundwater and seawater infiltration to poor condition sewers as this was identified as taking up a significant proportion of the network capacity. High levels of salinity in sewage are also very detrimental to the sewage treatment process and can cause damage to assets. See Section 3.4.
- An Island-wide adoption and promotion of Sustainable Urban Drainage Systems (SUDS) for all new developments, again to prevent surface water entering the sewerage system and taking up capacity both in the networks and at Bellozanne STW. See Section 3.5.
- Investment in the sewerage network was estimated at £67.5m for the first ten years, focused on addressing the issues in the previous two bullet points rather than expanding the existing foul sewer network.

The Waste Water Strategy was approved by the States in June 2014 under P.39/2014.

3.2. Additional Treatment Capacity - Replace Bellozanne STW

The Liquid Waste asset condition survey was carried out in 2007 and further investigations in 2008 recommended the replacement of the previous sludge digesters and associated works. This was shown to be economically advantageous based on an analysis of whole life costs. A Master Plan was developed for the site in 2009 and the first step was the construction of the new Centralised Sludge Treatment Facilities (CSTF) which was completed in 2015. The new CSTF comprises sludge thickening, storage, screening, pasteurisation, mesophilic anaerobic digestion (temperature at 37°C (±2°C)),

[5] Includes connected resident population; tourists; seasonal workers and visiting friends and relatives; new connections to existing properties; and population growth including new development.

Combined Heat and Power (CHP) plant, digested sludge storage, dewatering plant, and a dewatered sludge cake (biosolids) storage facility. The final product is an 'enhanced biosolids cake' that is suitable for disposal to land.

While the CTSF was being constructed the Bellozanne Master Plan was further developed as part of the 2013 Waste Water Strategy. It was immediately clear that replacing the whole STW in a single project was not practicable and a phased approach was agreed with the Regulators. The Regulatory Road Map of 30 December 2015 outlines this phased approach for the replacement of the existing Bellozanne STW and provided clarification of the relevant issues associated with the New Bellozanne STW and the receiving environment (St Aubin's Bay) for all interested parties.

Phase 1 is the replacement of the current works with a conventional carbonaceous plant that does not include specific nutrient removal technology. This is currently under construction, with the new works programmed for completion by the end of 2023. The new works is designed to meet future population growth and expected discharge consents up to a design horizon of 2035.

Phase 2 is the addition of staged nutrient (nitrogen) removal technology or any other treatment process in an area that has been identified and set aside for these purposes during Phase 1 and the Planning process.

One of the main principles of the regulatory road map, and the Water Framework Directive (WFD) approach, is that there is 'no environmental deterioration' of:

i. the quality of the discharge of treated effluent arising from the replacement works as compared to the existing works.
ii. the receiving environment.

The limits for no deterioration in effluent quality (Effluent Discharge Consent Standards & Objectives) were outlined by the Regulator on 26 September 2018, particularly in relation to Total Nitrogen. Breaching an objective will result in actions by the Permit Holder to inform the Regulator and investigate and address any reduction in effluent quality. However, any ongoing failure of an objective over a period of time following completion and commissioning of the new STW will be considered as a trigger for planning of tertiary treatment (or expansion of the activated sludge plant) at Bellozanne STW under Phase 2.

it is recognised that there may be a requirement to provide a higher quality of effluent at some point in the future and therefore, following completion and commissioning of the new STW, it is planned to monitor performance of the STW for a period of up to 5 years. This should confirm whether future STW Upgrades will be required by 2029 as well as indicate whether tertiary treatment or expansion of the secondary stage activated sludge plant is most appropriate at Bellozanne STW.

The contract for the replacement of Bellozanne STW was awarded in September 2018 with completion originally forecast in late 2022.

Prior to award of this contract I&E completed a detailed feasibility study, environmental impact study and extensive outline designs including Early Contractor Involvement to develop and optimize the final solution. This was followed by a series of Enabling Works projects to clear the site and create additional space prior to construction starting. These included:

- Demolition of the old Energy from Waste Plant (separate project).
- Demolition of the old Sludge Digestion Plant.
- Relocation of the Household Waste Recycling Centre.

- Relocation of the Clinical Waste Incinerator.
- Hillside removal to the north and east of the site.

During the contract negotiation phase, it was concluded that construction of the future growth (+20% population equivalent) provision using a carbonaceous treatment process as part of the New STW project would be far more efficient now than if done at a later date. This included a fourth Aeration Lane and a sixth Final Settlement Tank (FST). Associated projects to upgrade First Tower Pumping Station and the Sludge Treatment Plant have also been combined with the STW project to streamline management processes.

The New STW project has also suffered from delays due to ineffective management by the Principal Contractor compounded with delays associated with the Covid-19 pandemic. The failure of the Principal Contractor in 2021 resulted in I&E taking up that role to complete the project. Finding an alternate Contractor was considered but, in the prevailing economic climate, was not considered likely to offer value for money or a quick resolution. The works required to complete have been programmed with sectional completions that allow I&E to take the operational benefit of new assets as soon as they are completed rather than at the end of the project as a whole. The Inlet Works and Primary Tanks were commissioned in March 2022, the ASP and 4 No. FSTs will be commissioned in Q4 2022 and the remaining works will be completed in Q3 2023.

For example, using the new Inlet Works and PSTs will improve effluent quality even though the sewage is then temporarily still treated by the old Activated Sludge Plant (ASP) until the new ASP is complete. In addition, the new Inlet Works and PSTs are fully odour controlled which has addressed the key odour issues at the site as soon as possible.

The incorporation of additional scope, the Principal Contractor entering into administration, delays and associated costs has resulted in a final outturn estimate for the STW of £83.3m. The project is expected to be delivered in line with the budget allocation, together with provision to cover any potential increase as a result of the inflation pressures.

3.3. Environmental Impact - St Aubin's Bay study

St Aubin's Bay was initially modelled for Department for Infrastructure (later I&E) by MarCon and this model was originally completed as part of studies to assess whether the existing STW outfall needed to be extended. In addition to the STW outfall there are also a number of watercourses that discharge into the bay and these are all included in the model, each generating its own 'plume' which is affected by the tide as it ebbs and flows.

This initial study concluded that extension of the outfall was not necessary but the calibrated and verified model of the bay was retained for use on any additional work in the future.

Following development of the STW Outline Design, the second stage of modelling the bay was carried out in 2016 and considered whether the proposed effluent quality from the new STW would have any impact on St Aubin's Bay in comparison with the effluent from the existing works particularly in relation to the eutrophication of the bay.

Eutrophication is caused by excessive levels of nutrients (particularly Phosphorous and Nitrogen compounds) accumulating in estuaries or coastal waters and results in high levels of growth of algae and plankton.

As a prudent precautionary step, the existing STW had been upgraded in the late 1990's to achieve nitrification, whereby ammonia compounds are converted to less active Nitrite and Nitrate compounds, and denitrification, whereby those nitrite and nitrate compounds are converted to gaseous Nitrogen and Nitrous Oxide which escapes to atmosphere. However, this upgrade was not entirely successful and performance had further degraded over time due to unstable process meaning that by 2013 little nitrification actually occurred.

Achieving nitrification/ denitrification requires a more expensive process to be installed whether this cost is in larger structures, additional mechanical equipment or the use of physical media. Carbonaceous treatment, as proposed for the new STW, is more efficient in treating the organic component of sewage but does not significantly reduce the level of Nitrogen compounds.

Following development of the STW Outline Design, the second stage of modelling the bay was carried out in 2016 and considered whether the proposed effluent quality from the new STW would have any impact on St Aubin's Bay in comparison with the effluent from the existing works particularly in relation to the eutrophication of the bay. This showed that there would be no detrimental effect from the new Bellozanne STW using a carbonaceous treatment process and this was a key part of the proposals receiving Planning Permission.

It should be noted that the approved plan for Bellozanne STW includes for future expansion of the ASP so that further nitrification can be achieved if a higher effluent quality is required in the future. The carbonaceous process requires four ASP cells of approximately 2,870m^3 each, the expansion provision is for up to a further eight cells of the same size.

These additional cells would allow for a higher quality of effluent but will not increase the flow capacity through the STW as a whole. The decision on whether additional treatment is required will be based on the results of the monitoring programme following commissioning of the new STW. This is discussed further in later sections.

3.4. Foul Network improvements

The design, development and construction of Bellozanne STW has required some diversion of funds from the intervening Infrastructure Rolling Votes to ensure the necessary funding was available as the programme progressed. Since the start of construction of the STW was confirmed, the funding has been secured and this has allowed other aspects of I&E's capital programme to resume in full.

Normal maintenance has not been affected but some of the improvements to the network identified in the 2013 WWS have been constrained. These are summarised below.

3.4.1 Addressing Infiltration

Repairing assets to prevent infiltration of ground or sea water to the sewer network restores and protects the capacity available in the network. The need for improvement in this area was identified in the 2013 WWS and a programme of works to address infiltration into sewers and at key structures such as outfalls and pumping stations has been ongoing since 2013.

During this time the Department has had a dedicated team addressing known areas of infiltration. The infiltration comes from a variety of sources including private sector drainage and surface water infrastructure, publicly owned manholes, pumping stations, and gravity pipework. With over 320km of gravity sewers on Jersey, it is inevitable that a component of the flow is derived from infiltration and it has been proven that all traditionally jointed pipes will leak to some degree. It is difficult to identify where specific points of ingress may be without inspecting the full length of sewers using CCTV cameras. In order to see the ingress the ground water must be high enough to submerge the pipe but the pipe must be empty enough for the camera to pass through. In some cases damage to pipes is obvious even in dry conditions if due to corrosion or tree root intrusion, however failed seals between pipes may not be noticeable.

Unfortunately, this means dealing with infiltration remains a constant battle and very challenging to solve. The infiltration team therefore have an ongoing brief to eliminate infiltration hot spots by applying a regulatory stance in private areas and utilising remediation methods within the public systems. New technologies have been employed to assist with detecting and locating leaks and leak detection technology by Electro Scan has proved particularly effective.

One way to address leakage is to use continuously welded materials such as polyethylene for both replacement of old jointed pipes and new build applications.

3.4.2 Additional capacity – Surface Water Separation

The 2009 Drainage Area Plan and Needs Study identified many potential surface water separation schemes across the Island. Many of the schemes which gave the most benefit were in and around St Helier.

A number of projects have been investigated but some have proved to be unfeasible whether on economic grounds, physical constraints or the extent of disruption that the works would cause. These include:

- Springfield Road / Janvrin Road
- Ann Street

The following projects have either been completed or are underway as noted:

- Great Union Road – complete
- Havre des Pas – phase 1 complete, further phases to follow
- St Saviour's School – complete
- West Park Outfall – ongoing
- St Aubin Road – ongoing
- Beach Road / Dicq Road – identified for 2023/24.

3.4.3 New connections and Sewer extensions

The latest assessment of residential and commercial properties connected to the sewer network based on I&E's network model is shown in the table below.

While the rates of connection vary in each parish the overall rate of connection of residential properties is currently 92.2%. The equivalent figure for commercial properties is 85.7% and the overall connection rate is 91.4%. The table below shows the connection rates by parish and type of property (residential or commercial).

	Residential			Commercial		
	connected	**not connected**	**connected %**	**connected**	**not connected**	**connected %**
Grouville	2,163	195	91.7%	82	42	66.1%
St Brelade	4,747	436	91.6%	316	119	72.6%
St Clement	4,024	80	98.1%	105	43	70.9%
St Helier	19,493	444	97.8%	3,705	298	92.6%
St John	989	288	77.4%	83	81	50.6%
St Lawrence	2,033	416	83.0%	123	29	80.9%
St Martin	1,396	351	79.9%	108	36	75.0%
St Mary	520	209	71.3%	30	24	55.6%
St Ouen	1,333	438	75.3%	98	36	73.1%
St Peter	2,104	440	82.7%	244	80	75.3%
St Saviour	5,941	226	96.3%	336	57	85.5%
Trinity	1,060	371	74.1%	168	59	74.0%
Totals	**45,803**	**3,894**		**5,398**	**904**	
	49,697			**6,302**		
Connected %	**92.16%**			**85.66%**		
	91.43%					

Table 3.4.3-1: Connected properties 2021 data

Part of this improvement, particularly in larger settlements, has come from a more accurate assessment of connectivity whereby individual homes within multi-home properties have been counted separately. Notwithstanding this, the figures still show that the programme of main sewer connections in the 2013 WWS, in conjunction with ensuring that new developments are connected to the network, has resulted in a marked improvement from the overall connection rate of 87.4% in 2013 and has already exceeded the objective of reaching 90% connection within 20 years.

3.4.4 Pumping Station Upgrades – rolling programme

Maintenance and upgrading of the network pumping stations is a continuous process for I&E rather than a particular strategy from the 2013 WWS. Specific programmes, like odour control upgrades, can be created to obtain efficiency from suppliers but the work is prioritised to meet the needs of the network as a whole. Since 2013 it has become clear that the Island's pumping stations face the following challenges:

1) 25% of the pumping stations are over 50 years old.
2) In recent years 20% have suffered from surface water ingress.
3) Hydrogen Sulphide degradation is prevalent in the pumping systems carrying water from the bay/coastal locations.
4) The overall reliability and resilience of the pumping stations is declining. This is a combination of aging assets and increasing numbers of blockages due to changes in public behaviour, e.g. increasing use of wet wipes and plastic based hygiene products.
5) In wet winter months operational staff and resources are stretched to the limit trying to manage the impact of the failures and preventing environmental breaches.

The rolling programme of pumping station works has been in place since 2013 and typically includes upgrades and other capital maintenance such as:

- New pumps and pipework;

- New control panels;
- New ventilation equipment;
- Structural repairs; and,
- Replacement access covers.

The current programme of similarly scoped works began in 2021 and will run into the Bridging LWS period as summarised below:

Business Unit	2021	2022	Budget	Deliver by
QZP226		Telemetry	£150,000	Dec 2022
QZP227	Chestnut Grove SPS		£10,000	May 2022
QZP228	Anneport Toilets SPS		£15,000	May 2022
QZP230		Bas Du Marais SPS	£45,000	Nov 2022
QZP231		The Cavern SPS	£95,000	Sep 2022
QZP232		Corbiere SPS	£50,000	Sep 2022
QZP233		First Tower SPS	£50,000	Sep 2022
QZP236		Greve De Lecq 1 SPS	£30,000	Jul 2022
QZP237		La Chasse SPS	£44,500	Jun 2022
QZP238		La Route Du Port SPS	£47,000	Sep 2022
QZP239		Le Dicq SPS (storm)	£65,000	Jul 2022
QZP240		Le Hurel Grouville SPS	£30,000	Jun 2022
QZP241		Les Augerez SPS	£35,000	Sep 2022
QZP242		Les Ormes SPS	£57,000	Oct 2022
QZP243		Links Estate SPS	£50,000	Sep 2022
QZP244		Maufant SPS	£50,000	Sep 2022
QZP246		Rozel 3 SPS (aka Valle De Rozel No.2)	£84,500	Sep 2022
QZP247		Fauvic SPS	£50,000	Jul 2022
QZP248		Pontac SPS	£75,000	Jul 2022
QZP249		Portelet 2 SPS	£20,000	Sep 2022
QZP251	PS Odour Control Replacement		£25,000	Jun 2022
QZP254		West of Albert	£60,000	Aug 2022

Table 3.4.4-1: Ongoing 2022 Pumping Station Upgrade Programme

The sites listed above in 2021 have been affected by a range of issues. Chestnut Grove was postponed after the associated rising main project was delayed by the pandemic. The Anneport Toilets scheme has been delayed by late delivery of equipment from a key supplier and the PS Odour Control Replacement project was being completed by nmcn PLC who went into administration in late 2021. These projects, as well as the 2022 schemes, are all now on schedule for completion in 2022.

The 2023 phase of these ongoing works is expected to be confirmed in Q3/Q4 of 2022 for a start in January 2023 and will be coordinated with the Rising Main Replacement Programme where appropriate. This sequence will be repeated throughout the Bridging LWS period and the relevant issues to be considered are discussed further in Sections 6.6 and 6.7.

3.4.5 Pumping Station Upgrades – key schemes

In addition to the rolling programme of upgrades, a number of larger schemes have also been completed.

3.4.5.1. First Tower PS

As part of the works at Bellozanne STW, the Inlet Works was being relocated at a higher elevation, impacting the head and capacity of the pumps at First Tower PS. The pumps at First Tower needed to be replaced and the existing twin cast iron rising mains relined to provide resilience in the system.

The upgrade of the First Tower PS was designed to be completed in distinct phases to ensure continuity of service. Accommodation and enabling works that began in October 2017 were completed in October 2019.

First Tower PS also experienced significant accumulations of fats, oils and grease in the 6m deep wet well sumps which had to be manually cleaned. I&E engaged Hydrotec to build a physical model of the existing wet well to investigate modifications suitable to ensure that the pumping station operated in a hydraulically acceptable environment and was self-cleansing. Thus reducing the Health and Safety risk to operational staff tasked with manually cleaning the wet wells.

Replacement of the Non-Return Valves (NRVs) in the valve chamber was required to minimise the risks of pressure surges in the rising mains but this work necessitated the dismantling of the existing valve chamber pipework. I&E took this opportunity to rationalise the pipework layout to simplify the system, reduce head loss and thereby reduce the operational costs (OPEX) associated with the pumps.

The final element of the scheme replaced the existing Odour Control Units at First Tower. This particular element was linked to several drivers, primarily the replacement of life expired assets but also sporadic odour nuisance along Bellozanne Valley and a wider programme of works to replace and upgrade Odour Control Systems across Jersey.

Minor asset replacement works are expected to be completed in 2022.

In the long term, First Tower PS is likely to need to be replaced as the wet well is too small for optimal operation and access is poor for maintenance. Lack of space at the site means that this will probably have to be in conjunction with the sea defence works to 'advance the line' around St Aubin's Bay which is part of a 20-50 year programme of coastal works. Further details of First Tower are included in Appendix B1.

3.4.5.2. Odour Management

Following complaints from local residents a series of odour monitoring sensors were installed around Bellozanne STW and along Bellozanne Valley/Route es Nouaux to First Tower. The issue for I&E was that by the time a complaint had been submitted and passed on to the Operations team, the problem had passed which made it difficult to identify the odour source or operation that had caused it.

The installation of real time monitoring gave accurate time data which could be linked to telemetry information from the operating plant and equipment. In addition, the sensors were located in such a way that the varying levels of odour at each one could be used to focus attention in a particular area to identify the odour source location.

While the monitoring system did not prevent odours being released in the first instance, it has allowed the Operations team to carry out repairs and remedial works to equipment and to change operating practices to minimise further releases.

All of the odorous parts of the new STW (Inlet Works, Primary Settlement Tanks and Tanker Import Facility) are covered and have Odour Control Units (OCU) installed.

In addition to the replacement of First Tower's OCU, I&E have been engaged in a rolling programme to replace OCUs at pumping stations around the network. As noted above, the 2021 programme was interrupted by nmcn PLC entering administration. Work at these sites will be completed in 2022:

- Le Bourg PS
- Le Hocq PS
- Pontac PS.

3.4.5.3. Cavern upgrades

The Fort Regent Stormwater Storage Cavern ('the Cavern') is constructed in rock within the hillside under Fort Regent, St Helier and was completed in 1997. It has a capacity of approximately 25,000m^3 and acts as a detention/ balancing tank, receiving unscreened overflows of sewage/ stormwater to minimise spillages into St Aubin's Bay during all but the most exceptional storms.

Combined sewage and stormwater stored in the Cavern is pumped back into the sewer system once flows within the system have abated. This pumping can take up to three days and, consequently, much of the solids in the wastewater settle out in the Cavern and not all would be removed as emptying took place. Over time this settled material would accumulate reducing capacity and becoming hazardous. Cleaning of the Cavern has been carried out annually and could take up to three weeks to complete.

A new mixing system was installed in the main tank to put the settled solids back into suspension during the emptying operation. This ensures that the solids are removed by the sump pumps at the same time as the stormwater and thus greatly reduces the extent of cleaning. The design of the mixing system included a computational fluid dynamic (CFD) modelling exercise for the main tank and a physical model of the sump to determine an optimum design for filling and emptying. The full automated flushing system is not yet operational, and may not be operational until 2023, due to issues with the cleaning of the surface water tunnels. The first planned cleaning operation since commissioning of the mixers was completed in May/June 2022 but actual performance cannot be assessed until the full system is available. A degree of fine tuning and asset optimisation of the mixing equipment is also anticipated to suit the unusual shape of the Cavern as a whole.

Access metalwork in the Cavern has also been repaired or replaced in 2021 to address health and safety concerns with the condition of some components.

Further upgrades have been planned at the Cavern for 2022-23. In order to avoid compromising the performance of the network as a whole, I&E only take the Cavern offline for limited windows of access. Upgrades in 2022 are therefore minor mechanical and electrical works plus inspections and investigations to inform the design of works to be completed in the 2023 window.

3.5. Surface Water Network improvements

In addition to the Surface Water Separation Schemes discussed in Section 3.4 as part of the improvements to the foul network, the following projects and initiatives have taken place.

3.5.1 Adoption/Promotion of SUDS for new developments

Combined sewers are no longer permitted as the outlet from any new development. Separate pipes are required even in the case of drainage connections to existing combined sewers so that any future Surface Water Separation Scheme can easily pick up the two discharges.

Sustainable Urban Drainage Systems (SUDS) further manage the discharge of surface water run off to drain, water course or the sea by capturing rainwater and attenuating the flow to an appropriate quantity. The presence of SUDS on new developments is now assessed as part of the planning application process and is excluded only by exception.

3.5.2 Baudrette Brook Pumping Station

This project was primarily to carry out major maintenance of the existing pumping station but by carefully selecting the replacement equipment it was possible to improve the capacity of the station, thus taking account of the changing climate and protect the upstream catchment from possible flooding.

The control building and structure were also refurbished to improve the visual impact on the local area.

3.5.3 Surface Water Management Plan (SWMP) and Inland Pluvial Climate Change (IPCC) Study

The Surface Water Management Plan is a long term project to create a digital model of the surface water network and key watercourses across the Island. This model will sit alongside the Foul Network model and allow I&E to fully assess the impact of any new development or other construction projects.

The project has included a programme of work to install rainfall and watercourse flow monitoring that will, as actual data is gathered, both inform and verify the model as it develops.

The project started in 2020 and will continue into 2023 to generate the base model that will then be updated and maintained as a resource for the future. Development of the model has been progressed in line with the highest priority areas of the Island, whether that priority is associated with known flood risks or potential future housing sites.

3.6. Asset Management

Asset management as defined by the BSI Publicly Available Standard 55 (PAS55) is "The systematic and co-ordinated activities and practises through which an organisation optimally manages its assets and their associated performance, risks and expenditures over their lifecycle for the purpose of achieving its organisational strategic plan". Asset Management is seen as best practice by utilities and Government departments in the UK and internationally and adoption of these principles was part of the 2013 WWS. This is a wide ranging topic and so the 2013 WWS did not set specific objectives that can be measured against.

The development of Asset Management Plans was not specifically part of the 2013 WWS but they have been recognised as part of best practice in managing a large, complex network. A number of plans have been identified based on the various programmes of work that have taken place since 2013 and are being developed in an effort to address those areas that have been underfunded while Bellozanne STW has been the priority.

The Asset Management Plans will build from past programmes and the Bridging LWS to inform future programmes of work as follows.

- Drainage (Network) Asset Management Plan
- Pumping Stations Asset Management Plan
- Rising Main Criticality Assessment
- Telemetry Asset Management Plan

3.6.1 Telemetry upgrades

Improvement of the telemetry network was, again, not specifically part of the 2013 WWS but it is a key part of operating the network efficiently as a whole as well as providing up to date information on the performance and reliability of each asset.

The telemetry network has been continuously expanded and improved since 2013 to gather data both from operational assets and monitoring such as rainfall and flow in watercourses. This latter data can be used to verify the network models and will thus feed in to the Surface Water Management Plan and Inland Pluvial Climate Change Study.

4. Strategic Drivers

4.1. Introduction

The 2013 WWS considered many issues that faced the Island at the time but, as has been discussed before, the focus was on the immediate need to upgrade the sewage treatment capacity for the growing population. The other issues that were considered at that time have not gone away and the issues arising from climate change have particularly come to the fore in the intervening years.

In broad terms, many of the Strategic Drivers are the same in 2022 as they were in 2013 but the priorities and details have changed. The Liquid Waste system must therefore be reviewed and prioritised based on the following themes:

4.1.1 Surface Water separation

This is a key success criterion which helps future proof the sewerage network and releases capacity for growth.

4.1.2 Climatic changes due to global warming

The frequency and intensity of rainfall events have placed a far greater loading on the network over the past 20 years. This has led to winters of high ground water and consistent infiltration into the system causing regulatory breaches and operational problems.

4.1.3 Population growth

The Island population is increasing and this needs to be accommodated within the sewerage network. The new Island Plan shows increases to housing, not only in St Helier but also in other parishes. This will need to be addressed with additional fit for purpose Drainage Infrastructure.

4.1.4 Rainfall and Ground Water in small sewage pumping stations

Rainfall events and ground water have had a devastating effect on the network, particularly on small sewage pumping stations, and the design parameters need to be reviewed to engineer more resilience into the stations. Despite nearly a decade of monitoring and remedial actions, the infiltration has not been curtailed, and it has been accepted that it cannot be entirely eliminated, despite best efforts.

Recent emphasis has been on relining and rehabilitation of existing sewers to reduce infiltration but this can reduce overall capacity of the pipe by reducing the internal diameter. Catering for a higher percentage of infiltration needs a combination of increasing pipe capacity, more Combined Sewer Overflows (CSO's) and dedicated storm pumping. Surface Water Separation schemes will also support this endeavour.

4.1.5 Efficiency, Automation, Safety and Maintainability

A recent review found that the electricity charges to operate the sewage pumping stations can be as high as £650,000 per annum depending on rainfall and the efficiency of this system is therefore paramount to minimise the fiscal and environmental costs. Newer equipment will be more efficient but introducing automation and intelligence into the system will further allow the system to be optimised with minimal intervention.

With respect to safety and maintainability, the UK water authorities have tried to minimise the need for personnel to enter confined spaces over the past 20 years, whereas I&E have had a culture of intervention and staff entry into confined spaces as the norm. I&E must re-evaluate this position and adopt new designs based on better working practices. This will assist in maintaining the assets, and most importantly make sure the risks of confined space entry and working are kept to the absolute minimum.

4.1.6 Environmental Standards and Policies

Environmental standards for discharges and failures will undoubtedly increase over time. The public are becoming far more sensitive to discharges and failures and reputational damage can be more significant than the actual breach.

4.1.7 Changes to GoJ Legislation

It is not proposed to review specific changes in legislation but to review the key documents, proposals and policies that have been developed by GoJ and form the basis of how legislation is developed and applied. These proposals embody the direction of Jersey for the coming years and are the foundation of the Bridging Island Plan and are summarised below.

4.2. Island Plan

The Island Plan forms the heart of the Government of Jersey's long-term strategic framework and guides decision making, performance review and improvement across Jersey's public service. The development of this framework was established as a priority in the Common Strategic Policy 2018-22[6], and the Island Plan presents the core strategic proposals and policies that will be included as priorities for delivery in future Government Plans.

Normally the Island Plan would provide a ten-year planning framework but the combination of Brexit and the Coronavirus pandemic have made it difficult to plan for the medium- or long-term using recent data as a starting point with any certainty.

To allow time for conditions to settle, the new Island Plan is a Bridging Island Plan and covers a shorter three-year plan period 2022-2025. A new ten-year plan will then be put in place for the period 2025-2035.

I&E are taking a parallel approach for the 2022 LWS. Elements of the strategy are wholly derived from the driver of population growth and property development and it is these factors that are most uncertain in the current circumstances. The 2022 LWS will therefore need to be updated to meet the revised Island Plan's proposals for 2025-2035.

4.2.1 Bridging Island Plan principles and influences

The key justification for bringing forward a Bridging Island Plan is that it provides an early response to current challenges that have been identified through public consultation as well as the Coronavirus pandemic and Brexit.

The key influences have been:

4.2.1.1. Common Strategic Policy 2018-22

The Common Strategic Policy, which details the priorities agreed by the Council of Ministers for its term of office, was agreed unanimously by the States Assembly in December 2018. The Island Plan incorporates each of the strategic priorities below.

[6] Common Strategic Policy 2018-22

- put children first (Children and Young People's Plan[7])
- improve islander's wellbeing and mental and physical health (Active Jersey Strategy[8])
- create a sustainable vibrant economy and skilled local workforce for the future
- reduce income inequality and improve the standard of living
- protect and value our environment.

4.2.1.2. Long Term Planning Assumption

Each Island Plan responds to an agreed planning assumption. A long-term planning assumption is usually used to inform a ten-year forecast of homes, economic development and infrastructure along with other community needs. However, because of the on-going Coronavirus pandemic and Brexit uncertainties, it has been very difficult to model the potential future population and demand figures with any confidence. This is particularly the case as previous in-migration to Jersey has been very closely driven by economic performance.

It has therefore been difficult to establish a long-term planning assumption for the Bridging Island Plan and finalising this assumption has become the first Strategic Proposal for the near future.

This is discussed further in Sections 4.3 and 8 below.

4.2.1.3. Housing

The Objective Assessment of Housing Need[9] (OAHN) makes clear that more homes are required in the coming years as people live longer and household size continues to reduce, as well as to respond to increases in the Island's population.

Quantifying this demand requires confirmation of both the long-term planning assumption and the Island Population Models based on the 2021 Census results.

4.2.1.4. High Standards of Appropriate Development

The Bridging Island Plan recognises that the sustainable development of the Island hinges on the sustainable development of St Helier and sets out, for the first time, a strategic plan for St Helier.

4.2.1.5. Climate Emergency and Sustainability

The States Assembly has declared a climate emergency and agreed a Carbon Neutral Strategy[10]. The Bridging Island Plan also integrates the new Sustainable Transport Policy[11].

4.2.1.6. Protect Against Inappropriate Development

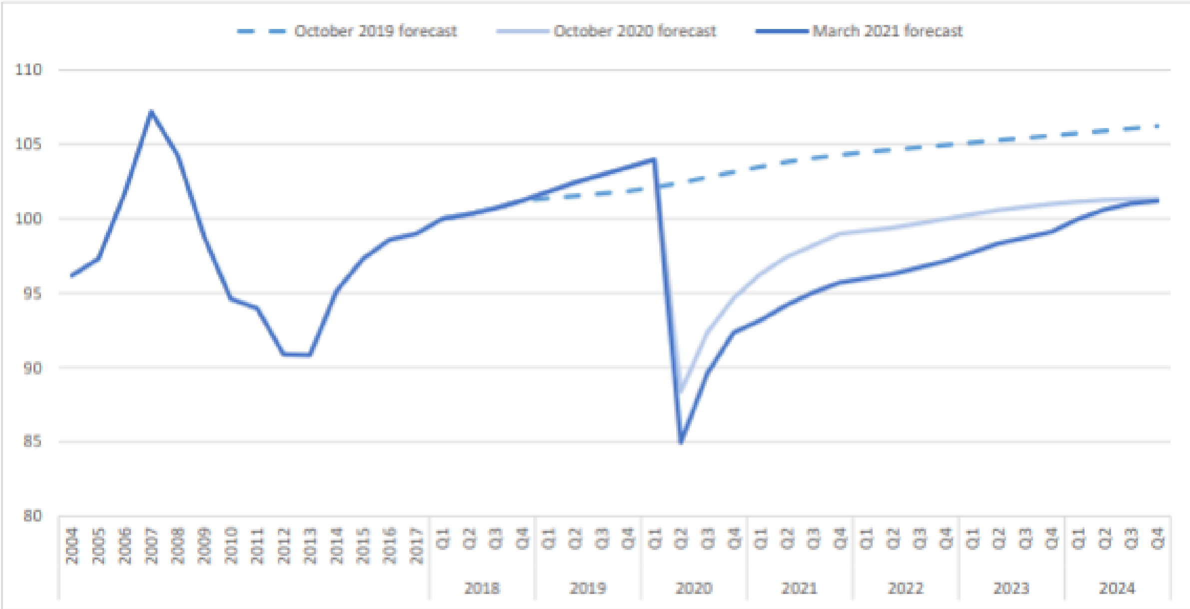
The Bridging Island Plan is informed by two important new studies into the landscape and seascape character of Jersey and the urban character of St Helier.

---

[7] Children and Young People's Plan 2019 to 2023
[8] Inspiring and Active Jersey
[9] Objective Assessment of Housing Need (2019)
[10] Carbon Neutral Strategy
[11] Sustainable Transport Policy

4.2.2 Economic Outlook

Following the Coronavirus pandemic, the economic outlook for the period of the Bridging Island Plan looks challenging. The graph below is extracted from the Bridging Island Plan and shows an illustrative forecast of the Fiscal Policy Panel's updated economic assumptions from April 2021.[12]



Index of real gross value added (GVA), Q1 2018=100

Figure 4.2A: April 2021 Fiscal Policy Panel economic assumptions

The Bridging Island Plan notes ***"The current period is likely to be characterised by steep falls in the non-finance sectors, such as hospitality. Changes in registered employment – as a primary driver of in-migration – are well explained by changes in GVA, but crucially non-finance GVA has an impact on registered employment that is three times greater than the impact of finance GVA. It is considered highly likely that this increase in unemployment, and the predicted sustained dampening of economic growth, will have a depressant effect on employment and lead to a further substantial slowing of the growth in annual net migration.***

The situation for 2022-2025 is further complicated by the challenge of assessing the future direction of economic and immigration trends in the post-Brexit period. Whilst there remains a high degree of uncertainty regarding the potential economic and immigration impacts of Brexit, it is reasonable to conclude that there is a high likelihood that a challenging Brexit transition would also have depressant effect on employment and lead to a further slowing of the growth in annual net migration, in addition to the impact of Coronavirus."

While this uncertainty makes forecasting difficult it is clear from the Bridging Island Plan's preliminary population forecasts that growth is expected to be continuous and significant. The issue for provision of Liquid Waste Services is whether the preliminary forecast represents a conservative view or is an underestimate.

[12] Economic assumptions (gov.je)

4.3. GoJ Strategic Proposals

The current Strategic Proposals are the basis of the Bridging Island Plan and are presented here with the supporting Strategic Policies and planning policies that are intended to deliver the overall strategy.

4.3.1 Strategic Proposal 1 - Development of a long-term planning assumption

Each Island Plan is formed around a core planning need for the Island and this is framed as a long-term assumption. This assumption is to be finalised during the period of the Bridging Island Plan and Bridging LWS but, from Strategic Proposal 1, it is clear that there will be a particular focus on population growth and its impact on the economy.

Strategic Proposal 1 - Development of a long-term planning assumption
Ministers will work together to develop a long-term planning assumption, with a clear and comprehensive methodology, for the next and future Island Plans, that reflects and responds to: • the migration control policy; • the forthcoming population policy; • the findings of the Future Economy Programme; and • the future development of wider relevant policies, including skills.

The detail of how the Bridging Island Plan is considering population growth, and the associated housing development, until the long-term planning assumption is established is discussed in Section 8.

4.3.2 Strategic Proposal 2 - Understanding the requirements of Jersey's energy market

There is no direct link between the energy market and Liquid Waste and so Strategic Proposal 2 is not considered to have a particular impact on this LWS.

Bellozanne STW uses sludge from the sewage treatment process to produce biogas for use on site to generate electricity and heat for use on the sludge digestion plant. The STW uses all of the energy generated on site but is still reliant on mains electricity supply. The option to export electricity and/or gas to the grid was considered when the Digesters were constructed but this did not offer better value for money than reducing the site's energy demand.

It is unlikely that this position will change but I&E will monitor market conditions.

Strategic Proposal 2 - Understanding the long-term requirements of Jersey's energy market
The Minister for the Environment, in discussion with the Minister for Infrastructure and the Minister for Economic Development, Tourism, Sport and Culture, will explore the range of issues necessary to understand the long-term requirement of Jersey's energy market including: • spatial and land use requirements for future Island Plans; • infrastructure requirements; and • regulatory or other economic requirements. Ministers will engage with a range of stakeholders to undertake this work, including the Jersey Energy Forum.

Given the above, Strategic Proposal 2 has not had any bearing on the development of the Bridging LWS.

4.3.3 Strategic Proposal 3 – Creating a marine spatial plan for Jersey

I&E are acutely aware of the potential impact that Liquid Waste can have on the marine environment around Jersey. This can be both during the collection and transfer stage of sewage and surface water due to leakage or flooding and in the discharge of treated effluents, surface water discharges and other overflows.

Strategic Proposal 3 is summarised as:

Strategic Proposal 3 – Creating a marine spatial plan for Jersey
The Minister for the Environment will undertake further work to develop a Marine Spatial Plan before 2025, to organise human and marine resources and activities in Jersey's territorial waters and in particular, to develop a network of marine protected areas, which will be consistent with overall environmental, economic and social objectives. This work will inform the policies of the next iteration of the Island Plan and support coordinated policy development and decision-making on all aspects affecting the marine environment.

Similar to Strategic Proposal 1, the marine spatial plan is to be developed during the period of the Bridging Island Plan and Bridging LWS. The LWS itself therefore cannot take account of any specific requirements of the plan but will continue to apply the principles that have been established through discussions with the Planning Department and the Regulator in recent years. The need to preserve the quality of the marine environment is clear and will influence I&E's own designs and specifications as well as being taken account of when assessing planning applications for new developments.

Pending release of the Marine Spatial Plan, the existing Jersey Integrated Landscape and Seascape Character Assessment (ILSCA)[13] is the key reference document and is discussed further in Appendix A1.

The single most significant marine interaction is the final effluent discharge from Bellozanne STW into St Aubin's Bay and this has already been fully assessed as discussed above in Section 3.3. The Jersey Shoreline Management Plan[14] gives St Aubin's Bay a two stage policy approach:

1. 20-50 years – Advance the Line.
2. 50-100 years – Maintain the Defence.

There will be significant amenity gains from advancing the line around the bay, including creating space for a new First Tower PS but this falls outside the timescale of the Bridging LWS.

The small satellite STW located at Bonne Nuit discharges final effluent to Bonne Nuit Bay on the north coast. This is not an ideal arrangement but has been the only viable solution to providing appropriate liquid waste treatment for the local area. The preferred arrangement for Bonne Nuit is to replace the STW with a transfer pumping station and treatment taking place at Bellozanne STW, however this has not been economically viable to date. The fact that Bonne Nuit STW is approaching the end of its life and pump technologies are continually improving mean it is an appropriate time to reassess the available options and this has been included as part of the Bridging LWS. See Section 6.3 for a full discussion.

[13] Jersey Integrated Landscape and Seascape Character Assessment
[14] Jersey Shoreline Management Plan 2020

In addition to Bellozanne and Bonne Nuit STWs, there are a number of small discharge points across the Island that spill to the sea or watercourse. These include:

- Surface water discharges (highway drainage or similar);
- Combined sewer storm overflows;
- Foul sewer overflows; and,
- Known locations of inundation in extreme tide events. Influx of seawater is the greater issue but can result in some outlet of foul or combined water. These inundation points are part of the ongoing infiltration programme of works.

The inland landscape types will also be considered as part of the Surface Water Management Plans.

4.3.4 Strategic Proposal 4 – A west of island planning framework

I&E are aware that the west of the Island is expected to be the focus of early housing development in conjunction with building in and around St Helier.

Strategic Proposal 4 also specifically mentions Les Quennevais but development around St Peters is expected to be the priority in the short term and therefore most in need of being addressed.

Strategic Proposal 4 – A west of island planning framework
The Minister for the Environment will bring forward a west of island planning framework together with a series of more focused masterplans, for Les Quennevais and adjacent areas, including Jersey Airport, as appropriate, in consultation with key stakeholders, including the parish, landowners, local residents and their children, and businesses. The planning framework will be brought forward first, with specific areas-based masterplans, as necessary, to follow during the bridging plan period up to 2025, subject to the availability of resources.

It is important to note the significance to the LWS of the relative locations of St Peters and Les Quennevais to the north and south of Jersey Airport respectively. Liquid waste from both areas is passed to Bellozanne STW through a combination of pumped and gravity systems and there are known restrictions in the liquid waste networks from north to south at Jersey Airport and from west to east at Beaumont.

The general flow of liquid waste from the west of the Island to Bellozanne STW passes through both of these areas of concern and they will therefore be key areas of focus in this Bridging Liquid Waste Strategy as discussed in Section 9.

4.3.5 Strategic Proposal 5 – An infrastructure roadmap for Jersey

Infrastructure is a broad term that covers all of the basic physical and organizational structures and facilities needed for the operation of a society. Liquid waste is one strand of this but one with particular implications for Public Health and the Environment.

Strategic Proposal 5 is based on the recent Infrastructure Capacity Study[15] (ICS) carried out by Arup and includes a 'road map' for development and improvements.

[15] Infrastructure Capacity Study

Strategic Proposal 5 – An infrastructure roadmap for Jersey
The Minister for the Environment, in discussion with other ministers including the Minister for Infrastructure and Minister for Economic Development, Tourism, Culture and Sport, will develop an infrastructure roadmap for Jersey. The roadmap will build on the Infrastructure Capacity Study to inform short and long-term strategic policymaking and help to understand the costs and consequences for the environment, economy and wider society of key future infrastructure choices. The roadmap will address options for the long-term development of La Collette.

Similar to Strategic Proposals 1 and 3, the roadmap is to be developed during the period of the Bridging Island Plan and Bridging LWS. The LWS itself therefore cannot take account of any specific directives deriving from it. I&E will continue to operate and develop projects in accordance with current best practice and policies until such time as the road map is released.

While the roadmap itself is not expected to be available for some time the principles of the ICS are discussed in Appendix A.

4.4. GoJ Strategic Policy

There are seven main Strategic Policies, each of which is supported by various specific planning policies. Many of the planning policies are not directly relevant to the provision of Liquid Waste services but the key ones within each Strategic Policy that have some possible bearing now or in the future are highlighted and discussed in Appendix A3.1.

4.4.1 Policy SP1 – Responding to climate change

SP1 - 'To promote and achieve a meaningful and long-term reduction in carbon emissions and to mitigate against and adapt to the impact of climate change.'

I&E is committed to minimising their impact on the environment and to play their part in responding to climate change in day to day operation and when designing and constructing new assets or upgrading existing infrastructure. The policies may not affect I&E's own operation but will have a particular bearing on the developers that the network serves.

4.4.2 Policy SP2 – Spatial strategy

SP2 - 'Development will be concentrated within the island's built-up area, as defined on the proposals map.

In particular, development will be focused within the island's primary main urban centre of Town which will accommodate much of the island's development needs. Development will also be focused within the secondary main urban centre of Les Quennevais.

More limited development will take place within the island's local centres, with the scale of development related to local community need and context.'

The 2020 Island Plan Review notes that the spatial strategy of the current and previous Island Plans has generally been based on the principle of integrating development within the Island's existing built-up areas. The town of St Helier has therefore absorbed much of the island's economic and population growth, spilling beyond the boundaries of the parish of St Helier to include parts of the parishes of St

Saviour and St Clement, and also the reclamation of land to expand the town and meet other strategic requirements.

This has encouraged the re-use and redevelopment of land that has already been developed, often resulting in more dense forms of development and hence more efficient use of the land. In parallel with this there has been limited release of greenfield land on the edge of existing built-up areas to provide new affordable housing, usually in the form of family homes. This form of development has occurred principally in the parishes of St Clement, St Saviour and St Brelade, together with the more limited release of land around some of the island's rural parish centres.

The concern from a liquid waste perspective is that reusing and redeveloping existing sites at higher occupancy densities adds pressure to the existing system while simultaneously making it difficult to upgrade those existing assets because they are in built up areas.

The figures below have been extracted from the Bridging Island Plan and show the areas that have been identified as settlements and industrial areas.

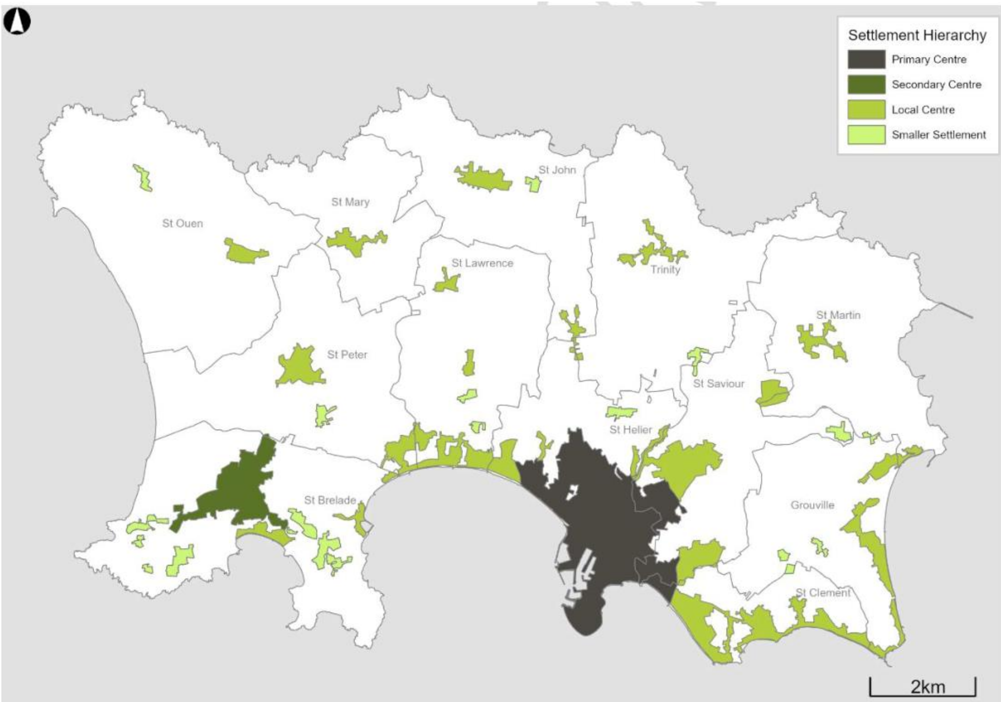


Figure 4.3A : Extract from Bridging Island Plan – Spatial Strategy Settlement Hierarchy[16]

[16] Bridging Island Plan – Volume 2 Places – Figure SP1

Figure 4.3B: Extract from Bridging Island Plan – Spatial Strategy Protected Industrial Sites[17]

In liquid waste terms, there is relatively little industry, i.e. businesses that discharge effluent other than domestic sewage, on the Island and this does not appear likely to change. This is important for the LWS as industrial effluent can take up disproportionately more of the treatment capacity than the same domestic flow.

The Housing Policies are discussed further in Section 4.4.8 and other relevant Planning Policies are discussed in Appendix A3.2.

4.4.3 Policy SP3 – Placemaking

SP3 – 'All development must reflect and enhance the unique character and function of the place where it is located. New development must contribute to the creation of aesthetically pleasing, safe and durable places that positively influence community health and wellbeing outcomes.'

Policy SP3, as a whole, aims to concentrate development in existing settlements. As noted elsewhere, the outcome of this approach is to generate more load on the existing liquid waste assets and network which can be extremely problematic.

Specific Planning Policies are discussed in Appendix A3.3.

4.4.4 Policy SP4 – Protecting and promoting island identity

SP4 – 'The protection and promotion of the island's identity will be given a high priority' by protecting and enhancing the existing facilities, character and provisions on Jersey**.**

There is not considered to be a direct link between this Bridging LWS and the primary aim to protect the Island's identity, however, there are many indirect links whereby I&E support this aim through meeting the broader needs identified in the Bridging Island Plan and complying with relevant policies.

---

[17] Bridging Island Plan – Volume 3 Economy – Figure E5

Specific Planning Policies are discussed in Appendix A3.4.

4.4.5 Policy SP5 - Protecting and improving the natural environment

SP5 – 'The protection and improvement of the island's natural environment, its landscapes, coastline, seascapes, biodiversity, and geodiversity, is a high priority. These considerations will be material in the determination of planning applications.'

I&E are committed to protecting the Natural Environment of Jersey and the requirements of SP5 are not expected to affect this underlying principle. Specific policies may affect the detail of individual projects' scope for I&E but this is not expected to be significant. The policies relating to SP5 are all consistent with those discussed above.

Specific Planning Policies are discussed in Appendix A3.5.

4.4.6 Policy SP6 – Sustainable island economy

SP6 – 'A high priority will be given to the creation and maintenance of a sustainable, productive and diverse economy, with support for new and existing businesses, particularly where they encourage the development of a local market for goods and services, attract small footprint/high value business and foster innovation.'

The provision of adequate Liquid Waste Services is key to supporting the Island's economy and population and this is the aim of the Bridging LWS as a whole.

Specific Planning Policies are discussed in Appendix A3.6.

4.4.7 Policy SP7 – Planning for community needs

SP7 – 'All new development must be able to demonstrate that it is helping to meet the identified needs of our community, both in the short and long-term.'

I&E believe that all of their liquid waste services are provided to meet the community's needs, especially in relation to public health. As the community grows and changes, there is an inevitable impact on the existing system and this must be addressed in a timely manner to avoid liquid waste management becoming a constraint on growth.

Meeting the demands of future population growth will require a number of major liquid waste projects which will have a short-term community impact in terms of disruption and nuisance during construction but once complete will only benefit the community.

Specific Planning Policies are discussed in Appendix A3.7.

4.4.8 Housing Policies

The housing policies do not affect I&E's day to day operation but are expected to have a significant impact on the Bridging LWS in terms of the work that is required on the existing network. These policies directly input to the location, size and density of new developments.

- Policy H1 – Housing quality and design
- Policy H2 – Housing density

Policies H1 and H2 will act together to set a standard for housing developments. H1 will not significantly impact liquid waste services but it does refer to provision of shared internal and external spaces that may affect surface water runoff and housing density. Housing density in any new development is clearly critical to the occupancy of the site and hence to the sewage that will be generated. Policy H2 and the associated Proposal 21 do not include specific standards but the Proposal commits to setting a minimum housing density and H2 states that proposals will only be supported if this density is exceeded after taking account of amenity space, parking and the general quality of the development in the local context.

While no specific figure is given, the sites for affordable homes in Policy H5 below have been shown with an indicative density of 35 dwellings/hectare in the Bridging Island Plan. It is considered likely that affordable homes will be at the upper end of housing density but this will be confirmed by the Minister for Environment as described in Proposal 21 of the Bridging Island Plan.

Proposal 21 - Minimum density standards

The Minister for the Environment will develop and publish supplementary planning guidance to establish minimum density standards for the island's built-up areas including:

- Town;
- Les Quennevais;
- local centres; and
- smaller settlements

As part of the development of any supplementary planning guidance for minimum density standards, the Minister for the Environment will consult the Minister for Housing and Communities; the relevant parish(es); stakeholders and members of the public.

An extract of Policy H2 is below.

Policy H2 – Housing density

A positive design-led approach for the provision of new homes will be encouraged at all sites in the island's built-up area to ensure optimum efficiency in the use of land.

Residential development will be supported where it meets or exceeds the adopted minimum residential density standards established for the island's built-up areas.

- Policy H3 – Provision of homes

Policy H3 is discussed in conjunction with population forecasts in Section 8.5 but can be summarised as:

Policy H3 – Provision of homes

The plan makes provision for the supply of up to 4,300 homes (up to the end 2025) to provide:

- up to 1,650 affordable homes (including key worker accommodation)
- up to 2,650 open market homes

- Policy H4 – Meeting housing needs
- Policy H5 – Provision of affordable homes

Policies H4 and H5 expand on the provisions of Policy H3 to set out what will be considered an appropriate mix of housing types for any given development to meet the Island's needs. Furthermore, Policy H5 includes a list of fifteen fields that have been identified specifically for construction of affordable homes although none have planning permission at this time.

The number of properties that will be built at each site is not confirmed but the fields have a total area of approximately 11.5 hectares. At the indicative density of 35 dwellings/hectare used in the Bridging Island Plan these fields will have approximately 404 dwellings in total.

In addition to these sites, H5 includes a further site that already has planning permission and includes a commitment that any States of Jersey owned land that is offered for development shall be for affordable housing.

The additional site could accommodate a further 21 dwellings giving a total of approximately 425 dwellings under H5. It is noted that this only represents 26% of the 1,650 affordable homes that are proposed to be built by 2025 under Policy H3, however, in conjunction with the 625 homes that had planning permission in 2020 this figure becomes 64% and sites for only 600 remaining homes to be found.

Extracts from Policy H5 are included below.

Policy H5 – Provision of affordable homes

The following sites are specifically zoned for the provision of affordable homes and their development for any other use will not be supported:

1.	Field J1109	St. John	(1.21 hectares/6.71 vergées)
2.	Field J229	St. John	(0.3 hectares/1.7 vergées)
3.	Field J236	St. John	(0.4 hectares/2.2 vergées)
4.	Field MN410	St. Martin	(0.75 hectares/4.2 vergées)
5.	Field MY563	St. Mary	(0.65 hectares/3.6 vergées)
6.	Field O594 and O595	St. Ouen	(1.00 hectares/5.5 vergées)
7.	Field O785	St. Ouen	(0.6 hectares/3.5 vergées)
8.	Field P558	St. Peter	(0.90 hectares/5.0 vergées)
9.	Field P559	St. Peter	(1.90 hectares/10.5 vergées)
10.	Field P632	St. Peter	(1.30 hectares/7.2 vergées)
11.	Field P655	St. Peter	(0.45 hectares/2.5 vergées)
12.	Field P656	St. Peter	(0.50 hectares/2.7 vergées)
13.	Field S415A	St. Saviour	(0.30 hectares/1.7 vergées)
14.	Field S470	St. Saviour	(0.80 hectares/4.4 vergées)
15.	Field T1404	Trinity	(0.50 hectares/2.7 vergées)

The following site has an existing planning permission for affordable housing and is zoned on the proposals map for this purpose:

16. Field J525 St. John. (0.6 hectares/3.3 vergées)

Where States of Jersey or States-owned companies' land is brought forward for the development of new homes, these shall be for affordable homes unless it has been otherwise approved that the development needs to specifically provide open market homes, particularly where this is required to ensure the viability of public realm and community infrastructure delivery, in line with an approved Government Plan. In such cases, a **minimum** of 15% should be made available to eligible persons in accordance with "Policy H6 – Making more homes affordable", for assisted purchase housing.

The development of social rent affordable housing and affordable housing for purchase will be regulated through the grant of planning permission and planning obligation agreements to ensure that they remain available as affordable homes in perpetuity.

4.4.9 Liquid Waste Policies

The only Planning Policies that specifically relate to Liquid Waste are:

- Policy WER6 – Surface Water Drainage
- Policy WER7 – Foul Sewerage

WER6 and WER7 state that a development will only be supported where it provides adequate systems of drainage for surface water and sewage. The preferred solution noted in WER6 for surface water is SUDS or similar but a connection to the foul sewer may be supported if there is no alternative. I&E would resist this, even as a last resort, unless the only available sewer was already a combined sewer and even then a separate connection for use in future separation works would be required.

For sewage, WER7 states that the development must provide 'a system of foul drainage that adequately connects to the mains public foul sewer'. Typically foul water flows from larger housing sites will be attenuated on site, possibly in a pumping station, for discharge to the public sewer at an agreed rate. A similar principle is applied to surface water but the pumping station may be replaced with a SUDS system that operates by gravity.

The SUDS or pumping station and rising main from such developments will not normally be adopted by I&E as public assets even if part of the structure or pipework lies under public roads.

Both WER6 and WER7 state that the developer will be expected to fund sewer network improvements and this may be enforced using planning obligation agreements. In recent times, the connection is typically constructed by the developer as part of the development but costs for upgrades to the wider network have not always been pursued. Preliminary investigations by I&E to consider the impact of future large developments suggest that large storage tanks will be required and the cost of these will be several million pounds. It is unlikely that such costs can reasonably be fully passed to the developer, particularly where the development is intended to directly meet the Island Plan's policies and the level of contribution will have to be considered on a case by case basis.

Policy WER7 also goes on to provide conditions whereby package plant or septic/tight tanks may be accepted. The provision of package plants is a particular concern to I&E given the need for ongoing maintenance and would not be supported by I&E. New septic/tight tanks on the island are not ideal but can be managed.

4.4.10 Climate Emergency

The States Assembly has declared a climate emergency and agreed a Carbon Neutral Strategy that establishes the intent for Jersey to become carbon neutral.

The Strategic Proposals, Strategic Policies and individual planning policies set out in the Bridging Island Plan – which are in line with the existing commitments of the adopted Energy Plan[18] – provide the basis for ensuring carbon emissions are reduced throughout the full life cycle of new development (from design through to demolition). The policies include increased environmental design standards for new developments and support for various eco-friendly schemes. Sections 4.3 and 4.4.1 to 4.4.7 have described how the relevant policies relate to I&E's liquid waste services.

I&E are very aware of how their operations can affect the environment and how they must adapt to meet the demands of Climate Change.

4.5. Government Plan

The Government Plan[19] is a detailed plan with a rolling four-year approach that brings together income and expenditure decisions, for the 12 months ahead, as part of a four-year financial outlook. It sets out how public money will be spent to deliver the day-to-day business of government and on strategic priorities and areas for improvement, including the prioritisation of infrastructure delivery.

The Island Plan Review and Bridging LWS have been funded through and developed alongside the 2020-23, 2021-24 and 2022-25 Government Plans. These have included investigations of long-term future infrastructure requirements in order to inform future Government Plans and financial forecasts. The initial phases of this work were published in the Infrastructure Capacity Study, and future phases will form a long-term infrastructure plan[20] as discussed in section 4.3.5.

The Government elections in 2022 will be the trigger to generate the next Government Plan which will cover both the Bridging LWS period and the beginning of the 2025-35 LWS period.

This Bridging LWS will satisfy the requirements of the current Government Plan and set out I&E's intent for the future for incorporation in the 2023-26 Government Plan. The key drivers of the 2022-25 Government plan, as embodied in the Bridging Island Plan, are:

- Putting children first
- Responding to COVID-19
- Revitalising the economy
- Population growth and climate change
- Health and wellbeing
- Investing in the future

[18] Jersey Energy Plan
[19] Government Plan
[20] Infrastructure Capacity Study

In addition, there are a number of legacy financial issues to be addressed but these are not directly relevant here.

Of the key drivers, the most directly relevant to this Bridging LWS are addressing the issue of Population Growth and Climate Change as has been discussed above and will be addressed in detail in subsequent sections.

4.6. Other legislation

As in 2013, the bodies of legislation that are most relevant to Jersey are from the UK and EU.

The most significant change since 2013 is the impact of Brexit which has caused a great deal of uncertainty in many areas. However, in terms of legislation relevant to the Bridging LWS, little has changed because UK standards remain largely consistent with the previous EU standards.

The UK standards are under review and some change is expected in the coming years but this will be considered in detail for the 2025-35 LWS.

4.6.1 UK Legislation

As noted above, UK legislation will be kept under review as the Brexit process develops and it is anticipated that there will be more to be considered for the 2025-35 LWS.

4.6.1.1. Biosolids disposal

The recycling of biosolids (enhanced treated and dewatered sludge cake) in Jersey are compliant with the practical application of current European and UK legislation, however the UK quality monitoring processes are not relevant and are not followed in Jersey. The current UK legislation includes the following:

- UK Sludge (Use in Agriculture) Regulations 1989 and UK DEFRA Code of Practice for Agriculture Use of Sewage Sludge 1996 and subsequent amendments. The Code requires formal monitoring of sludge and soil qualities / quantities and registry of the land to which the sludge is applied;
- Farming rules for water 2018 (England), which restricts the spreading of biosolids on land that doesn’t have an immediate need for the nutrients; and,
- UK Agricultural Development and Advisory Service (ADAS) Sludge Matrix 2001. The ADAS Sludge matrix was a joint development between the UK water industry and the British Retail Consortium (representing the food industry) in response to public concerns about the safety of food and the increasing volumes of sludge being disposed to land. It represents the minimum sludge to land standards that the food industry would accept, which are:

Crop Group	Untreated Sludge	Conventionally Treated Sludge Note 1	Enhanced Treated Sludge Note 2
Fruit, vegetables, salad & horticulture Note 3	Not allowed	Not allowed	Allowed Note 4
Combinable & animal feed crops	Not allowed	Allowed	Allowed
Grass & Forage – grazed	Not allowed	Not allowed Note 5 & 6	Allowed Note 5
Grass & Forage - harvested	Not allowed	Allowed Note 5	Allowed Note 5

Notes
1. Conventionally treated sludge has been subjected to defined treatment processes and standards that ensure at least 99 per cent of pathogens have been destroyed.
2. Enhanced treated sludge has been subjected to defined treatment processes and standards that ensure virtually every pathogen (99.9999 per cent) which may be present in the original sludge has been destroyed.
3. For salads and vegetables, only with 30 and 12 month harvest intervals, respectively.
4. Only with 10 month harvest interval.
5. No grazing for 3 weeks after sludge applied to land and harvest interval applies.
6. Deep injected or ploughed down only.

Table 4.6.1-1: Summary of Sludge to Land standards

7. The Sludge Treatment Facility at Bellozanne (STW) meets the requirements of an 'Enhanced Treated Sludge (Biosolids)' product.

4.6.2 EU Directives

4.6.2.1. Revised Bathing Water Directive 2006

The EU has had rules in place to safeguard public health and clean bathing waters since the 1970s. The various rules were amalgamated in 2006 to create the revised Bathing Waters Directive (BWD). The BWD requires Member States to monitor and assess the bathing water for at least two parameters of (faecal) bacteria. In addition, they must inform the public about bathing water quality and beach management.

The European Commission launched a review of the BWD in 2021 with initial feedback on the proposed review process required before 01/04/2021. This was followed by public consultation which closed in January 2022 and the results are currently in the evaluation phase[21].

The resulting update to the BWD is currently expected to be adopted in Q1 of 2023, however, this date may be delayed in line with the public consultation period.

Given the Directive has not been amended since the last 2013 WWS, there are not considered to be any additional conditions from the BWD to be incorporated in the Bridging LWS. Any revised standard will be assessed for the long-term 2025-2034 LWS.

4.6.2.2. Urban Waste Water Directive 1991

The objective of the Urban Waste Water Directive (UWWD) is to protect the environment from the adverse effects of urban wastewater discharges and discharges from certain industrial sectors and concerns the collection, treatment and discharge of:

[21] EU Bathing Water Quality review of rules

- Domestic wastewater
- Mixture of wastewater
- Wastewater from certain industrial sectors

The UWWD is also in the process of being reviewed with the Public Consultation period ending in July 2021. An Impact Assessment of the legislation is due from the EU in 2022 and this will be followed by an update to modernise the legal text of the Directive[22]. A timetable for this update has not been issued at time of writing.

There are not considered to be any additional conditions from the current UWWD to be incorporated in the Bridging LWS, however the revised UWWD will be reviewed when it becomes available and certainly in light of producing the long-term 2025-2034 LWS.

4.6.2.3. Quality of Shellfish Waters Regulations 2006

The aim of the Shellfish Waters Directive is to protect or improve shellfish waters in order to support shellfish life and growth. It is designed to protect the aquatic habitat of bivalve and gastropod molluscs, which include oysters, mussels, cockles, scallops and clams.

The 2006 legislation is still current and no additional consideration is therefore necessary.

4.6.2.4. Freshwater Fish Directive

The Freshwater Fish Directive was first issued in 1978 to protect the quality of rivers and watercourses and repealed in 2006 to be consolidated within the Water Framework Directive.

4.6.2.5. Water Framework Directive

The EU Water Framework Directive (WFD) was adopted by the EU in 2000. A review was carried out in 2020/21[23] and the EU found that the legislation was largely fit for purpose albeit that improvements in water management across Europe were very much a work in progress.

No changes to the legislation were identified although the need for a particular focus on chemicals in watercourses was identified. This finding is consistent with conditions observed in Jersey where an issue with nitrates in watercourses from field runoff has been identified and is discussed further below.

Given that the legislation has not changed and the findings of the review are consistent with GoJ's ongoing activities, no new regulation is considered necessary.

4.6.2.6. Sewage Sludge in Agriculture

As noted in Section 4.6.1, the recycling of biosolids in Jersey is compliant with the practical application of current European legislation, i.e.:

- EU Directive on the Use of Sewage Sludge in Agriculture 1986 (86/278/EEC and subsequent amendments). The objective of this Directive is to regulate the use of sewage biosolids in agriculture to prevent harmful effects on soil, vegetation, animals and man, while encouraging its recycled use. Limits were set on the levels of heavy metals in soils.

---

[22] EU UWWD update
[23] EU Water Legislation – Fitness check

In addition, the European Commission (EC) Nitrates Directive requires areas of land that drain into waters polluted by nitrates to be designated as Nitrate Vulnerable Zones (NVZs). Jersey is classed as being a Nitrate Vulnerable Zone.

Complying with the regulations for Nitrate Vulnerable Zones (NVZ) prevents I&E from spreading the biosolids on land during the months of October to January. During these winter months, the biosolids are currently stockpiled at a local farm which is not ideal for any of the parties. This storage is therefore out of I&E's direct control and there is a risk that the farmer will decide, for commercial or agricultural reasons, that he no longer wishes to provide this facility. It is therefore considered that a new, permanent "Long Term Biosolids Storage Facility" is required to provide security of storage of biosolids cake during the winter months.

The proposed facility will provide a minimum of six months' storage from September/ October to March/ April, i.e. the four months defined by the NVZ regulations plus a further two months in case conditions are not suitable for disposal to land in September and/or February or when the Energy Recovery Facility (ERF) is offline for maintenance in November and March. It should be noted that the sludge produced is a limited carbon source and is therefore not ideal for burning. Disposal via the ERF is therefore a last resort when storage capacity is exceeded.

Providing the six months' biosolids storage will also mitigate the potential risk of pollution by fully containing the biosolids during the winter months and therefore minimising the risk of run off to watercourse.

Storage for any longer period is not considered to be required and a covered building ensures that the biosolids will be kept in a suitable condition for direct application to land as soon as conditions permit.

5. International Best Practice

5.1. Introduction

In developed countries worldwide it is considered best practice to provide a suitable sewage collection system (generally piped) to convey foul sewage flows to a STW for appropriate treatment. Wherever possible, surface water run-off should be collected separately for discharge to appropriate water courses through surface water outfalls. Separating these systems is more efficient but also helps to minimise the occasions when foul wastewater overflows from the combined sewer system due to inundation with surface water.

New property developments are generally designed to not increase the rate of surface water run-off by provision of on-site storage and attenuation facilities. This is particularly important in areas served by combined sewers.

In broader terms there is a growing acceptance that water resource and wastewater management should be addressed as part of an integrated approach. This is a complex issue in both technical and public perception terms and is central to Policy UI3 under Strategic Proposal 5 as discussed in Section 4.3.5 and 5.4 below. Developing such an integrated approach is considered to be beyond the scope of this Bridging LWS, however, preliminary discussions with Jersey Water will be held as part of developing the 2025-35 LWS.

The following sections provide a summary of International Best Practice associated with the sewerage catchment, STW treatment, water and wastewater management and the current approach of other islands comparable to Jersey.

5.2. Sewerage catchment

Sewerage is the name for the network of pipes and manholes that collects and transfers wastewater to a STW. Sewerage systems are designed to flow by gravity to the STW where possible; otherwise the wastewater flows by gravity to a low point for collection at a pumping station. Pumping stations typically consist of an underground collection chamber and pumps which will drive the wastewater uphill through a pipe called a rising main. The rising main usually discharges the wastewater to a high point in the system from where the wastewater will then flow by gravity to the STW or the next pumping station.

There are two basic types of sewerage systems, combined and separate. Combined sewerage is common in older European towns and cities and, as the name suggests, receives both sewage flow from houses and surface water runoff from roofs and paved areas during wet weather. This mixture of sewage and surface water runoff is dealt with at the STW meaning the works is unnecessarily treating large volumes of water during wet weather. This is inefficient both in terms of pumping and treatment costs, can affect the effectiveness of biological treatment and increases the risk of spills and overflows during storms. All of these negative issues have become more pronounced in recent years as the impact of climate change has been increasingly felt.

Separate sewerage systems overcome the problems of fluctuations in the flow to the treatment works during wet weather. The sewage goes directly to the STW via one network of pipes (foul system) while the surface water runoff goes to the nearest watercourse via another system of pipes (surface water system). This results in a smaller volume with less variation in flow being transferred to the STW. There are benefits in reduced costs of pumping and treatment and also less risk of pollution and / or flooding due to overflows from the sewers. All new developments should be served by separate sewerage systems.

It is deemed best practice to separate out the surface and foul flows in any collection system. However, the historical legacy in much of the world, including Jersey, is that combined systems were installed in many urban areas and separating them becomes very difficult in areas which have become congested with other services.

Where fully separated systems cannot be achieved, it must be acknowledged that the capacity of a combined sewerage system is finite and was often designed a long time ago to serve smaller populations and less extreme weather events. Combined sewer overflows (CSOs) are structures that are designed to spill an excess mixture of untreated sewage and storm water from the sewer network to a nearby watercourse during heavy rainfall. These structures are located within combined sewerage systems, when the increased flow caused by the storm water runoff exceeds the sewerage system's capacity the diluted wastewater is forced to overflow through the CSO into streams and rivers. It is obviously desirable to minimise discharges from CSOs because of the potential environmental impact. As rainfall events become more extreme due to climate change the frequency of spills increases which in turn attracts greater public attention, as has been widely reported in the UK in recent years.

Clearly, this issue is not unique to Jersey but the system does have the advantage of prioritising spills to the Cavern as far as possible. Nonetheless, some spills from CSOs, which are the safety valves of the system, are inevitable.

Wherever practicable, sewers are built such that flows can reach their intended destination by means of gravity, i.e. flowing from a higher point to a lower point. Unfortunately, the topography and geography of the area can mean that gravity sewers would lie very deep in places and then pumping systems have to be employed. Deep sewers are not only expensive to construct but having deep manholes presents additional, sometimes unacceptable, health and safety risks for maintenance. Pumping systems can generally use shallower sewers but the pumping stations can be expensive to build, operate and maintain.

In other regions where the topography of the land negates the use of gravity systems, and pumping is undesirable, other methods are being utilised. A prime example of this is East Anglia where the land is generally very flat and gravity sewers are simply not an option in many locations. In these areas Anglian Water uses vacuum systems to convey wastewater to its destination. These systems work by 'sucking' the effluent along the sewer network, which can be consequently laid at much shallower depths.

The strategy for I&E's Sewerage Catchment is discussed in Section 6.

5.2.1 Surface Water Systems

When it is possible to effectively separate surface water there are additional elements of best practice to be considered.

Sustainable Urban Drainage Systems (SUDS) is an approach which is already being adopted both in Jersey and internationally when managing surface water. There are a number of techniques that can be applied, all of which will store and attenuate flows, but others can provide an opportunity to create water features to generate local biodiversity or a degree of treatment before discharge. Such methods can be combined to deal with surface water both in terms of quantity and quality.

Where areas such as roads and car parks are being drained it is considered good practice to install oil interceptors to reduce the negative impact that hydrocarbons have on receiving waters. Indeed, some authorities demand that as a pre-requisite to planning permission, oil interceptors must be utilised.

A basic tenet of SUDS is that post-development run-off must not exceed pre-development run-off levels in an effort to reduce the impact on the environment as well as protecting the network capacity. This is the approach adopted by GoJ through the planning process.

In addition to SUDS, the UK government has adopted Integrated Urban Drainage Management (IUDM), which is a joined-up approach to drainage management. This was first published in 2009 and was then updated in May 2021. The IUDM approach has been developed in recognition of two important aspects of flood risk management. Firstly, the mechanisms of flooding can be complex, with floodwater originating from a variety of sources and being transmitted via complex flood pathways to impact a wide range of locations. Secondly, the responsibilities for urban flood risk management fall across a range of diverse stakeholders, from individual property owners through to large public and private bodies. The main components of IUDM are:

- pluvial (surface water) and fluvial (river, stream) flooding;
- sewer flooding;
- groundwater rebound and flooding;
- impact from/on transport network; and
- Sustainable Urban Drainage Systems (SUDS).

IUDM emphasises the need for different authorities responsible for different parts of the drainage system to work together to assess and manage flood risk, taking a long term, strategic approach.

The strategy for I&E's Surface Water Catchment is discussed in Section 7.

5.3. STW Treatment

The 2013 WWS considered the types of sewage treatment that were suitable for Jersey and concluded that a conventional carbonaceous process with UV disinfection of the final effluent was the most appropriate technology. This remains consistent with best practice in the UK and abroad and, given the new Bellozanne STW is under construction, has not been further assessed for this Bridging LWS.

Following completion and commissioning of the new STW, it is planned to monitor performance of the STW for a period of up to 5 years. This monitoring will start in May 2023 when the new works are fully commissioned and run until mid-2028 when a decision will be made as to whether any additional treatment is required at the STW. Funding has been included in the Long Term Capital Programme (Section 11) in 2026 for preliminary work to assess the results after three years and potentially start feasibility studies if the trend is towards enhanced treatment being required.

The design of the new STW makes provision for a tightening of the effluent discharge consent if the monitoring concludes that this will help to protect the marine environment of St Aubin's Bay. The area occupied by the old FSTs was initially set aside in the site plan for future Secondary Treatment process. However, it has been determined during the design and construction phase of the New STW that this may not be feasible and other options are available as will be discussed in Section 6. As and when decisions are made on effluent standards a fresh review of available technologies and best practice will be carried out to ensure that the best possible solution is applied.

The new Bellozanne STW was developed for a design horizon of 2035 and a Population Equivalent (PE) of 118,000 but uncertainty in this figure led I&E to make provision for a further 20% growth on the basis of carbonaceous treatment process. A PE of 118,000 requires 3 No. Aeration Lanes and 5 No. FSTs with one additional lane and FST required for the enhanced growth or change in effluent quality standards. The provision was originally to be limited to leaving space for the additional Aeration Lane and FST to be built as and when required but, during the design and construction of the New STW, it became clear that it would be very difficult to build these structures at a later date. The resulting excessive future costs were deemed unacceptable and it was decided that building the fourth lane and sixth FST now was the most cost-effective solution. Initially these were not intended to be commissioned until needed, but it was later agreed that the benefits from the additional operating capacity outweighed the costs by providing flexibility for improving the effluent quality.

As a result, for an unchanged discharge consent if population does exceed 118,000, no further construction is required until the enhanced growth limit is reached although some upgrades to key mechanical plant may be necessary. While Bellozanne can potentially treat sewage from additional growth, there is no certainty that the network will be capable of carrying the additional sewage to the STW. There is an underlying assumption that as population grows, sufficient surface water can be diverted away from the combined sewers, or flows can be stored and balanced in the network, to maintain a consistent flow to Bellozanne.

As is discussed in Section 8, the population growth identified in the Bridging Island Plan is likely to mean that feasibility studies for future treatment options will be required in the latter half of the 2025-35 LWS to allow time for provision of additional capacity, whether quality needs to be addressed or not. This will be kept under review and the 2031 Census will also be key in confirming the long term strategy.

The strategy for I&E's Sewage Treatment Capacity is discussed in Section 6.3.

5.4. Water Resources and Wastewater Recycling

Encouraged by the Water Framework Directive, European best practice is now focusing on considering the full water cycle in a holistic, sustainable manner. This places increased emphasis on the need to reduce the flows and loads discharging into the sewerage network, whilst ensuring that sewerage discharges do not cause environmental pollution, particularly to drinking water sources. Jersey legislation provides the statutory basis for limiting pollution, however septic tanks and private STWs across the Island are considered to have a greater pollution risk when compared with the discharges draining to Bellozanne STW via the sewer network.

Various sustainable water resource and wastewater recycling technologies are available and are outlined below. Each has the potential to reduce the flows and loads discharging into the sewerage network.

5.4.1 Water re-use

Water re-use (where wastewater is treated to extremely high standards and then used as a resource to be treated to potable standards) has been implemented in a number of countries including the UK, USA and Singapore. More widespread use is being considered in many other places, particularly as it is considered to be more cost effective than desalination of sea water.

Water re-use can help to protect the environment by providing an alternative source of potable water to replace current abstractions which are causing environmental damage and as a source of additional water to meet population increases.

5.4.2 Grey water recycling

'Grey' water refers to wastewater from all domestic sources, except toilets. Most grey water recycling systems collect this water, treat it to a desired level and use it on site for a range of uses, from toilet flushing to watering plants. This system is usually applied at a household scale and significantly reduces the quantity of wastewater a household generates.

Such systems are gaining popularity and acceptance on a large scale, especially in drought prone areas such as SE Australia and the Middle East, where reductions in the water demand and increased water use efficiency are vital in maintaining water resources.

Grey water recycling has been discussed as a popular approach to reducing water demand and waste in drought prone areas and as such is also a prominent topic on the international stage. However, the implementation of such systems, especially in retrofitting large areas, leads to a decreased dilution of wastewater flows and hence more concentrated sewage arriving at treatment works which has to be addressed throughout the treatment system.

5.4.3 Rainwater Harvesting

Rainwater harvesting is another prominent topic on the international stage that is receiving particular attention in drought prone and conversely flood prone areas. Rainwater 'runoff' from impermeable surfaces in and around a property is collected via drainage systems and stored in a tank for later use. This tank will usually incorporate a pre-filter system to stop pollution of the water by biological material. During wet seasons excessive rainfall can be stored, thus reducing the overall runoff within an area that leads to flooding. This water can then be stored for drier periods.

5.4.4 Summary

Rainwater and grey water recycling have never been used on a large scale in the UK and would require both public commitment and significant investment in modifying property drainage and the provision of tanks, etc. However, with the current trend towards building more eco-friendly and sustainable housing such, systems may gradually become more standard practice.

Integrating water resource management with wastewater strategies may gradually become accepted practice, especially in areas where there is already an available water resource deficit. With Jersey already utilising desalination to supplement available freshwater resources and a forecast increase in resident population, future Island planning should consider following such an integrated approach.

I&E has an interest in the above technologies and anticipates that their use will become more widespread in the future, particularly in cases where it would be expensive to connect properties to the sewerage system. They tend to lend themselves to new and smaller developments rather than being retrofitted to large urban areas. Therefore, whilst they may reduce the flows and loads to a treatment works, the flow reduction is unlikely to be significant in the short to medium term. However, over time, as the drive towards better environmental and sustainable solutions accelerates and future technological advances are developed, the accumulated reductions in flows and loads may have a beneficial impact on the treatment works in the future.

5.4.5 Community Awareness

When considering the public mindset with regard to the disposal of wastewater there are two main elements to be taken into account. Firstly, the impacts that individuals and businesses have on the environment need to be reinforced in the mind of the public. Secondly, the concept of the 'Polluter

Pays Principle' as enshrined in the Water Framework Directive should be considered to build on the recommendations of the Department of Environment's 2016 Water Management Plan[24].

Simple ideas like the use of dual-flushing toilet systems, which reduce volumes being discharged to the foul collection systems, can have a significant impact on how our resources are managed.

Businesses can be made more responsible for installing and maintaining systems such as grease traps, to reduce the negative impacts of food waste on both the network and the treatment works. In the UK, under the Enhanced Capital Allowance scheme, there are tax breaks for companies who use water-saving technologies. Water metering is also a useful way of encouraging businesses and individuals to use the water resources in a more responsible manner, and thus reduce the volumes of wastewater requiring treatment.

Adoption of any form of water recycling would need to be accompanied by a programme of education to mitigate any negative public perception, particularly where wastewater is recycled to potable water.

5.5. The Approach of Other Islands

Other Islands in particular are facing the same challenges as Jersey in dealing with both liquid waste and water as a resource in general. Relevant examples of the approach undertaken on other islands is summarised as follows.

5.5.1 States of Guernsey

The States of Guernsey has one main Wastewater Centre to treat sewage at Belle Greve that offers only preliminary treatment before discharging the Island's raw wastewater into deep water through a long sea outfall. The treatment is simple screening, maceration and grit removal, with no facility to remove bio-solids or disinfect the effluent. The works includes a 4000m^3 stormwater storage tank to temporarily retain flows during times of high rainfall and high tides. The partially treated effluent is discharged from the STW via a long sea outfall of length approximately 2.4km, located to the east of the island. A short sea outfall adjacent to the long sea outfall carries storm flows including flows from combined sewer outfalls (CSOs).

The Belle Greve Wastewater Disposal Facility was commissioned in 1971 and directly or indirectly served 90% of the Island's population. The Belle Greve catchment has since been extended to serve 99.7% of the population, following the commissioning of the Creux Mahie transfer pumping station. The outstanding small catchment comprises approximately 70 houses at Fort George. 4000 properties on the island are not presently connected directly to a sewer; these houses have watertight cesspits which are emptied regularly by tankers that transport the sewage to discharge points into the sewerage system discharging to Belle Greve STW.

In 1997 the States of Guernsey resolved to introduce full sewage treatment within 5 – 10 years, however following a debate in 2012 the States of Guernsey have decided against installing 'full' treatment facilities. However, the existing (preliminary) treatment facilities and outfalls were upgraded between 2012 and 2015 at a total cost of £35 million. The works included replacement of the inlet works[25] and both sea outfalls[26], and construction of a new storm tank[27]. Guernsey Water

[24] Water Management Plan 2016
[25] Water Projects - Belle Greve Wastewater Centre Phase IV
[26] Guernsey Water – Belle Greve Outfall Replacement
[27] Premier Construction News - Belle Greve Wastewater Centre

consider that the level of treatment provided now complies with 'the principles of EU and UK Directives' and there appear to be no immediate plans to further improve the current level of sewage treatment.

Guernsey Water published their Surface Water Management Policy[28] in 2016 which focussed on the introduction of SUDS to relieve pressure on the combined sewerage system. They utilise CSOs in line with standard practice but do not have a facility equivalent to the Cavern to minimise spills.

5.5.2 Isle of Man

Similar to Jersey, the Isle of Man is independently governed by its own Parliament and is not part of the European Union. Sewage Treatment on the Isle of Man is operated by Manx Utilities[29] and the main STW on the Isle of Man is Meary Veg STW, which was constructed in 2004 and discharges to a sea outfall. Meary Veg[30] treats sewage from Douglas, Onchan, Union Mills and the south of the island using an activated sludge process and treats sludge from Meary Veg and other regional STWs. The 'Integrated and Recycling of Island's Sewage (IRIS[31]) Regional Sewage Treatment Strategy Phase 1[32]', which was approved in 2011, included the development of the regional treatment strategy whereby smaller STWs treat those remote areas currently not connected to the main Meary Veg STW in Santon.

Phase 1 has now been completed and included the upgrading of treatment facilities within ten catchments to full treatment by Integrated Rotating Biological Contactors (IRBCs) and providing first time treatment for three further catchments, also using IRBCs. Phase 1 also included an upgrade to the sludge treatment plant at Meary Veg STW. The sewerage network includes 18 STWs and 76 wastewater pumping stations which transfer flows to Meary Veg STW and the other local STWs.

The basis of the strategy[33] was cost effectiveness together with a reduced scheme completion time and provision of greater flexibility for the future treatment and disposal of sludge. There was also concern over the failure to comply with bathing standards in North West England despite United Utilities spending over £200 million on long sea outfalls and secondary treatment.

Regional Sewage Treatment Strategy Phase 2[34], which was approved in 2018 includes the provision of new treatment to a further three catchments in the west of the island to stop discharges of raw sewage into the sea close to shore.

One of these, at Glenfaba south of Peel was cancelled in December 2020[35] because the proposed STW site was considered to be of 'high landscape value and scenic significance' despite being identified as satisfying a national need[36]. A second new STW at Laxey Harbour was also stopped in July 2020[37] following objections from residents although alternative designs are believed to be being developed. The third new STW at Baldrine is understood to be proceeding.

[28] Guernsey Water - Surface Water management policy
[29] Manx Utilities – Sewerage overview
[30] Manx Utilities - Meary Veg
[31] Manx Utilities – IRIS Master Plan summary (Meary Veg Tour May 2017)
[32] Manx Utilities – Sewage Treatment Strategy
[33] Manx Utilities – Strategic Review 2017
[34] Manx Utilities – Sewage Treatment Strategy Phase 2 Review
[35] IOM Today - Cancellation of Sewage Works at Glenfaba December 2020
[36] Glenfaba House/Peel STW - National Need August 2020
[37] BBC News - Rejection of Laxey STW

5.5.3 Isle of Wight

The Isle of Wight is part of the UK and is therefore subject to all relevant legislation. There were several local STWs across the Island, initially built with limited treatment processes and short sea outfalls that resulted in persistent failure to meet bathing water standards.

Southern Water took the economic decision to build one major STW and sludge treatment plant at Sandown, and then steadily de-commission the existing regional Works, except for a few small local sites serving remote discreet catchment areas[38]. In 2009 the last remaining regional STW was decommissioned as Newport is now connected to Sandown Works. In addition to Sandown, there are currently twenty smaller STWs, of which only 5 serve a population of greater than 1000. The sewerage network includes 167 wastewater pumping stations which transfer flows from the twenty individual catchments to Sandown STW or one of the other local STWs. 95% of homes and 89% of businesses are connected to the sewerage system. Rural properties rely on septic tanks which are emptied periodically.

The final effluent is discharged through a long sea outfall into the deep waters of the English Channel. To date, the new Sandown STW has performed to expectations and conformed to European Directives.

The entire Island's sludge is transported to Sandown to be digested, dried and then sold to farmers in cake and granular form.

Southern Water are currently preparing a Regional Drainage Water Management Plan (DWMP)[39], including the Isle of Wight, for the period 2025-30.

5.5.4 Summary

As outlined above each of the islands tend to have a different strategy for dealing with their own wastewater although there are some areas of similarity both with each other and with Jersey. In general it appears that Jersey is ahead of, or at least on par with, these jurisdictions in the development and implementation of strategies to deal with both foul and surface water.

Each of the above strategies is very much dependent on the particular island's constraints, topography and existing infrastructure; however, all the islands are generally continuing to upgrade and improve their assets in order to comply with current EU Directives and Legislation insofar as they have been adopted by the UK after Brexit. It is too soon to predict how, or if, UK standards will deviate from the EU standards in the future.

[38] Southern Water - Isle of Wight Catchment Strategy
[39] Southern Water Regional DWMP (draft)

6. Existing Sewerage Catchment

6.1. Introduction

For the purposes of the Bridging LWS, the Sewerage Catchment includes any part of the system that carries or treats foul sewage flows including any combined sewers where surface water and sewage are mixed.

Parts of the system that deal solely with surface water are discussed in Section 7.

6.2. General

I&E is responsible for the sewer network, and pluvial and fluvial management. This level of responsibility is consistent with UK standards.

The sewerage catchment covers most of the Island and over 91% of the population is currently connected to either Bellozanne STW or Bonne Nuit STW. The remaining population use privately owned septic or tight tanks which are systematically emptied and the contents taken to Bellozanne STW for treatment via the new Tanker Import Facility.

There is an ongoing programme to connect properties to mains sewers but this is always subject to any particular scheme offering value for money. The Foul Sewer Extension programme has been affected by the diversion of funding to the Bellozanne STW project in the past but will be reinvigorated in the short term with dedicated funding. It is also anticipated that works on the network to serve the proposed housing developments will offer opportunities to connect some remote properties.

The sewer network as a whole is at or close to its capacity to transfer flows to Bellozanne STW and this is becoming more critical as population grows and more extreme weather events are experienced. While foul flows are reasonably predictable and proportional to population, taking account of surface water runoff during storms is becoming less and less predictable as climate change becomes more significant.

I&E currently design to the typical UK standard of a 1 in 30 year storm with a further 40% provision for climate change but this only applies to new sections of the system and older sections continue to cause restrictions. It is not economically feasible to construct a sewerage system with a capacity to cope with the most extreme weather events, and it is with this in mind that I&E have been engaged in a programme of Surface Water Separation to divert surface water away from combined sewers and into separate pipes.

Surface water can then be discharged to the nearest watercourse or the sea without needing any treatment or being transported long distances. Separation minimises the risk of combined sewers overflowing during a storm which can cause pollution and flooding. Combined sewer overflows (CSOs) are structures that are designed to spill an excess mixture of untreated sewage and storm water from the sewer network to a nearby watercourse during heavy rainfall. These structures are located within combined sewerage systems and are effectively the safety valves of the system. As such, they cannot be removed indiscriminately. However, the aim is to minimise discharges from CSOs because of the potential environmental impact and separation is the preferred solution where feasible.

The most significant CSO in the network is the Weighbridge CSO, details are included at Appendix J2.

The surface water separation programme is supported by planning policies that require all new developments to have separate foul and surface water sewers. When surface water is separated 'at source' a number of methods can be engaged to deal with these flows and dispose of it in an environmentally sound manner. Where this is not possible within the site footprint, separation means that the two outlets can be connected to the appropriate public sewer now or in the future when it is installed.

Separation of surface water affects all aspects of the Sewerage Catchment because:

- it frees up capacity in gravity systems;
- reduced flows mean pumping stations operate less; and,
- treatment becomes more efficient.

All of these aspects of the system are discussed below.

6.3. Treatment

The treatment of sewage on Jersey takes place at two locations that cover 91.4% of properties on Jersey (connectivity is detailed in Section 8.4.1). The vast majority of this is treated at Bellozanne STW and, in the peak of the tourist season, it is estimated that this represents a connected population equivalent of up to 117,000. The second, much smaller, STW at Bonne Nuit serves a local population of approximately 200 plus local amenities.

The remaining unconnected properties are served by privately owned septic tanks which are emptied by tanker and transferred to Bellozanne STW via the new Tanker Import Facility.

6.3.1 Bellozanne STW

The existing Bellozanne STW is currently being replaced with a new works, due for completion in 2023. Maintenance works will continue on the existing assets to ensure effluent quality is kept as high as possible during the construction period but investment is kept to a minimum.

The new STW is being commissioned in stages during 2022-23 and the equivalent assets will then be decommissioned as soon as the new assets' performance has been established. Following decommissioning, the existing assets are to be repurposed where possible or demolished to leave space for possible future options.

The treatment process for the new Bellozanne STW is similar to the existing process but with greater capacity and more efficient design. It can be summarised as:

Primary treatment

- Inlet Works and Primary Settlement Tanks (PSTs), with odour control.
- The Inlet Works remove floating debris, rags and grit.
- Flows arriving at the site that exceed the treatment capacity are split after the Inlet Works to be stored in new storm tanks for treatment later.
- The PSTs then remove the majority of solid organic materials as sludge and the settled sewage passes on to Secondary Treatment.
- Sludge from the PSTs is used to generate biogas that is used on site.

Storm Tanks

- If the storm flow exceeds the capacity of the storm tanks then the overflow from the tanks is disinfected with UV before blending with the final effluent for discharge to St Aubin's Bay. The Storm Tank overflow therefore receives basic treatment of being screened, settled and disinfected before discharge.

- The Storm Tanks are emptied to the PSTs as the inlet flow abates after the storm event.

Secondary Treatment (Activated Sludge Plant)

- Selector tank for the mixing of Return Activated Sludge and Settled Sewage from the PSTs.
- Anoxic tank facilitates the partial removal of nitrogen from the system.
- The Aeration Lanes use microbes and bacteria with oxygen/air to treat the organic material remaining in the settled sewage.
- The Final Settlement Tanks (FSTs) separate the treated liquor into 'activated' sludge and effluent.
- Sludge collected in the FSTs is known as 'activated' because it contains the active bacteria that carries out the treatment. This sludge is continuously returned to the Aeration Lanes to be mixed with fresh sewage.
- Over time this sludge accumulates and a proportion is regularly extracted to be thickened and mixed with the PST sludge to generate biogas through pasteurisation and digestion.
- The effluent is collected and passes on to Tertiary Treatment.

Tertiary Treatment

- The effluent from the FSTs is disinfected with ultraviolet light before being discharged to St Aubin's Bay as 'final effluent'.

The process is monitored at various points to ensure treatment is to the required standards.

As discussed in Section 5.3, the new Bellozanne STW was developed for a design horizon of 2035 and a forecast PE of 118,000. Uncertainty in this figure led I&E to include space in the site plan for future assets to treat a further 20% 'enhanced' growth, i.e. a PE of 141,600 provided that the discharge consent does not change from the original design standard. The provision was originally to be limited to leaving space for an additional Aeration Lane and FST to be built as and when required for enhanced quality or growth. As the design and construction of the New STW progressed, it became clear that it would be very difficult and expensive to build these additional structures so close to the existing ones so the fourth lane and sixth FST are being constructed now.

The additional units , however, only increase the treatment capacity of the STW by 20% and not the total flow that can be sent to Bellozanne STW. The Peak Flow that can be accommodated at the New STW is 1,300 l/sec which is governed by First Tower PS, the rising mains, Inlet Works and Storm Tanks.

The theoretical Peak Flow (Formula A) from Jersey's combined sewer network for a design horizon of 2035 and a forecast PE of 118,000 is 2,260 l/sec and this will increase to 2,700 l/sec with a further 20% 'enhanced' growth, i.e. a PE of 141,600. . The difference between the flow from the network and the flow to Bellozanne STW is currently managed by the Cavern storage facility but, as flows increase, this will become increasingly inadequate and overflow spills to sea will increase. The growth in population must therefore be accompanied by efficiencies in the network through surface water separation and other flow management to maintain peak flows at current levels. Flow management, such as storage tanks, in the network will stop peaks of flow reaching the STW but smoothing out these peaks will mean the STW is operating at its maximum for more of the time.

In the short term, the additional capacity will treat the existing sewage flow to a higher standard than the original design intended but this benefit will gradually reduce as population grows beyond the original horizon of 118,000 PE. If network flows cannot be managed and/or higher standards of treatment are required then additional treatment capacity separate from Bellozanne STW may be required.

6.3.1.1. Effluent Quality and St Aubin's Bay

Once the new Bellozanne STW is fully commissioned a continuous programme of performance monitoring will start in 2023. The monitoring is planned to run for up to five years to optimise the works and build up sufficient data to confirm no deterioration in effluent quality based on the Effluent Discharge Consent Standards and Objectives as outlined by the Regulator on 26 September 2018, particularly in relation to Total Nitrogen.

Subsequent to monitoring of performance of the new STW for a period of up to 5 years, the Regulator may decide whether to amend the Bellozanne STW discharge consent to achieve a higher quality final effluent. At the time that planning permission was granted, this was considered most likely to be in relation to a stricter Ammonia or Total Nitrogen concentration so that was the basis of the future provision that was included.

6.3.1.2. Future provisions

Removal of Ammonia would be achieved through a process that expands the Secondary Treatment stage at Bellozanne. The bacterial chemistry is slightly different but in terms of constructed assets the only requirement is additional aeration volume in lanes similar to the four that are currently under construction.

Treatment of ammonia can be done to two levels to achieve different degrees of Nitrogen removal.

The first level is called nitrification and this converts the ammonia compounds to nitrite and nitrate compounds. These are less active than the ammonia compounds but the Nitrogen remains in the effluent. The second level is called denitrification and converts these nitrite/nitrate compounds to the gaseous chemicals Nitrous Oxide and Nitrogen. By converting to gaseous forms, the Nitrogen is released to atmosphere rather than entering St Aubin's Bay.

The current Bellozanne STW has four aeration lanes to achieve carbonaceous treatment to the current consented standard for a PE of up to 141,600. However, the extent to which additional PE can be increased from the design PE of 118,000 will be dependent on a number of factors, including:

1. network capacity to manage and deliver the flow to the STW;
2. process performance of the new STW; and,
3. the level of treatment required to achieve the agreed effluent quality from the STW.

If nitrification is required then a further four lanes will have to be built, i.e. 8No. lanes in total, while denitrification will require another four lanes, i.e. 12 No. lanes in total. If nitrification/ denitrification is required, the new STW will have to be re-rated to a PE of less than 50,000.

Flow from the PSTs will be distributed equally between the 8 No. or 12 No. lanes and then combined to pass through the 6 No. FSTs. Each lane requires aeration similar to the original four and so energy consumption and hence operating costs increase as well as the additional capital cost for construction.

The initial future provisions are shown in the figure below.

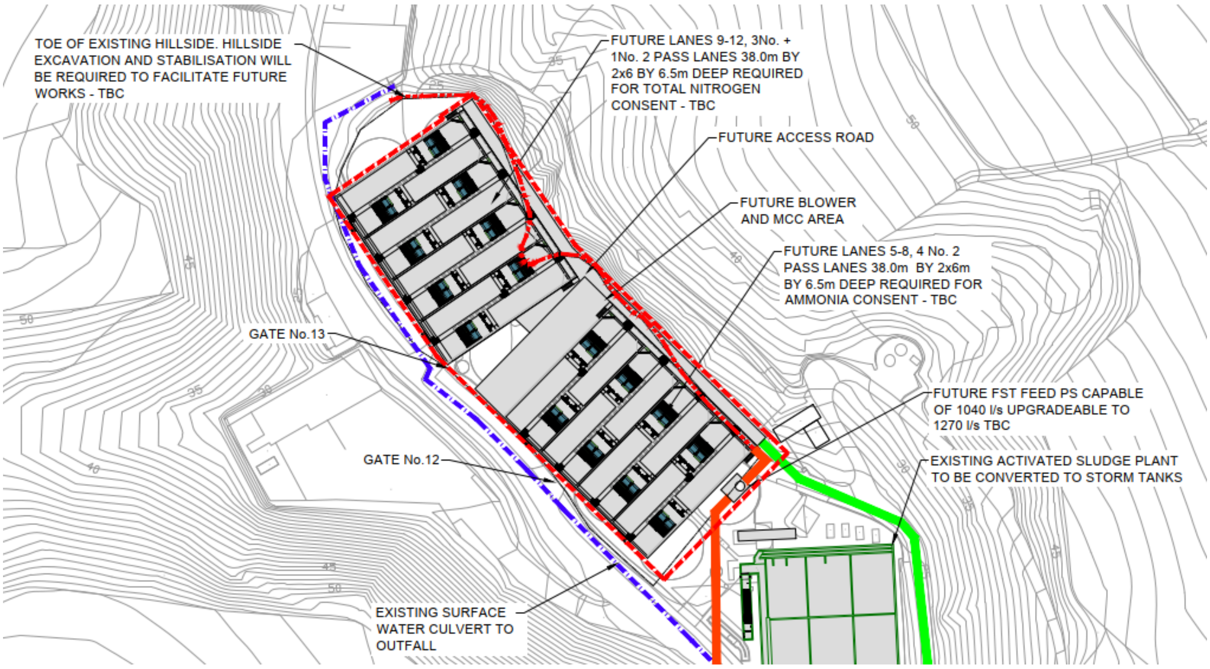


Figure 6.3A: Future Provision for Effluent Quality

Process	No. of Aeration Lanes	Volume per cell	Total volume
Carbonaceous	4	3,000 m^3	12,000 m^3
Nitrifying	8	3,000 m^3	24,000 m^3
Denitrifying	12	3,000 m^3	36,000 m^3

Table 6.3.1-1: Future Provision for improved Ammonia/Nitrogen Effluent Quality

The above numbers of Aeration Lanes assume that the Flow to Full Treatment at Bellozanne is 976l/s from 141,600 PE in all cases. As noted elsewhere, it is not possible to increase the hydraulic flow to the works even though the process capacity can be increased. Thus the flow to the works is limited to 1300l/s but as load from PE increases the flow to full treatment can increase with population. This is because the treatment process is biological and therefore requires a certain amount of 'food' to sustain the active bacteria, large dilute flows will result in poor treatment just as much as overloaded flows will.

If a higher effluent quality is required without constructing more treatment capacity then an alternative approach would be to reduce the flow to Bellozanne STW to maximise the effluent quality from the original 4 No. lanes and 6 No. FSTs. Clearly, this would require the remainder to be treated elsewhere at a new facility but if additional capacity is required anyway (see below) then not extending Bellozanne STW could be a viable option and also allow the use of any forthcoming more efficient treatment technologies at the new STW.

The area occupied by the old FSTs was initially set aside in the site plan for future Secondary Treatment process as noted above. However, it has been determined during the design and construction of the New STW that transferring flow to and from this location may not be feasible due to the congested services on the site and so other options will need to be explored as outlined below.

As and when decisions are made on effluent standards, a fresh review of available technologies and best practice will be carried out to ensure that the best possible solution is applied.

6.3.1.3. Alternate Solutions for Improved Effluent Quality

Where the nitrification/ denitrification option expands the Secondary Treatment stage, other solutions will expand the Tertiary Treatment stage, e.g. additional filtration, or the Primary Treatment stage, e.g. chemical dosing.

In terms of space, the nitrification/ denitrification solution is still expected to represent the worst case. Sufficient space is available at the location shown in Figure 6.3B to expand the Secondary Treatment stage if necessary, however, the challenge of flow diversions from and to the New STW will remain the same.

Tertiary Treatment in particular can be optimised so that FST effluent is split with one stream being treated and then blended with the second stream to achieve the required standard. This is as shown in Figure 6.3B below.

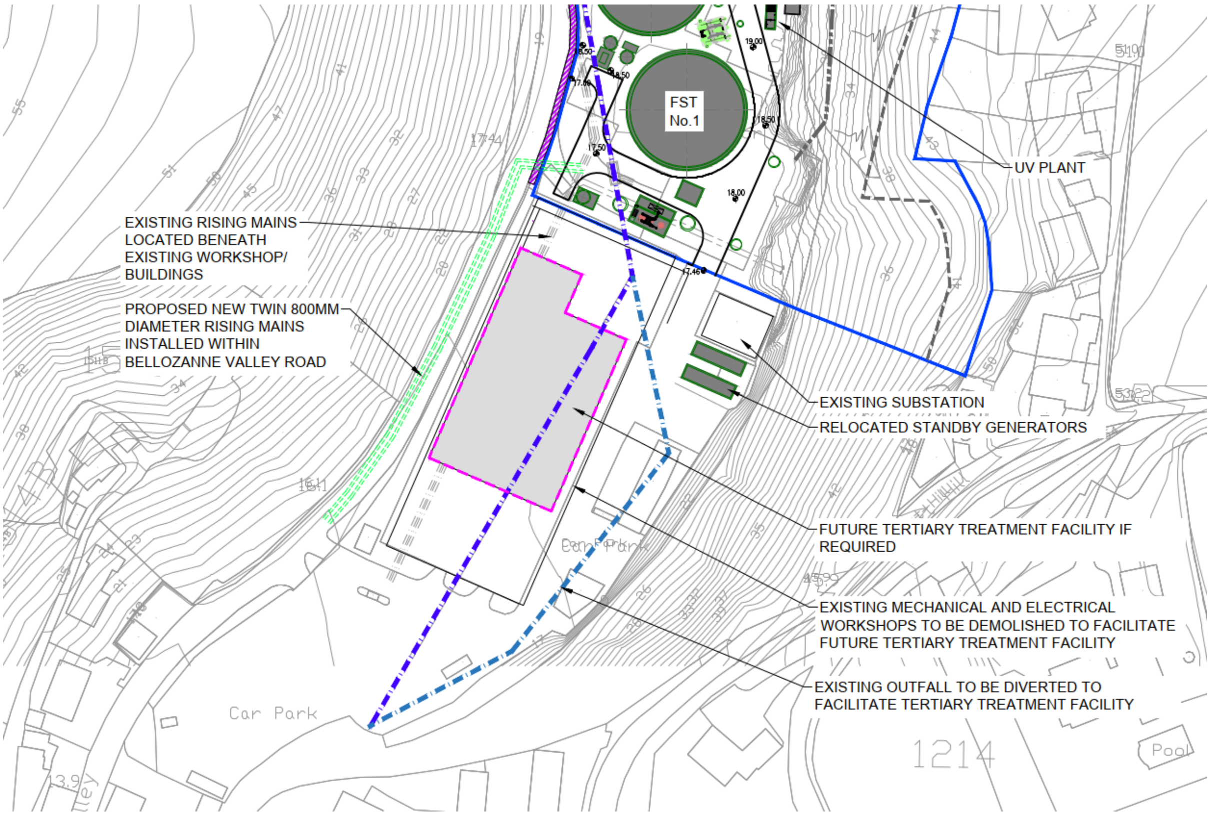


Figure 6.3B : Future Provision for Alternate Solution

However, none of the above methods of improving the effluent quality will increase the flow through the works. Even the additional volume for nitrification/ denitrification is only required to increase the retention time so that more treatment can take place.

6.3.1.4. Additional Treatment Capacity

The ultimate hydraulic and treatment capacity of Bellozanne STW is constrained by these assets which cannot be further expanded:

- Inlet Works including screens and grit removal.
- Primary Settlement Tanks upstream of the aeration stage.
- Final Settlement Tanks.

There are two elements to consider for an STW's capacity, namely flow and load. A large part of treatment design relates, directly or indirectly, to retention time in each stage of the process. As flow increases the retention time decreases for a given volume in a tank and so more tanks are required to achieve the same standard of treatment for a larger flow.

Load is the concentration of the various contaminants found in sewage and remains reasonably consistent as a population grows but is increased by any industry within a catchment and decreased by allowing surface water to enter the foul system.

As a population grows they will naturally produce more sewage so flow increases but the load per cubic metre remains the same. In combined or partially combined systems as on Jersey, the sewage also includes surface water. This means that during rainfall the flow goes up but load decreases because the rainwater dilutes the sewage. If this happens for a sustained period the STW can start to struggle to treat the sewage because there may not be enough organic material to sustain the active 'good' bacteria.

The increased flow can also be too much to pass through the channels, pipes and tanks that make up the STW so anything above this limit, called the flow to full treatment (FFT), is diverted to storm tanks for treatment later. If the storm tanks are filled then they will overflow through an ultraviolet disinfection plant before passing out to sea. This is not a desirable outcome but discharging some partially treated and disinfected sewage is much better than an overflow of raw sewage somewhere else in the network.

The expected Peak Flow (Formula A) for a combined sewer network with a design forecast PE of 118,000 is 2,260 l/sec and this will increase to 2,700 l/sec for a further 20% 'enhanced' growth, i.e. a PE of 141,600. However, the Peak Inlet Flow that can be accommodated at the New STW is 1,300 l/sec and the excess flow will have to be dealt with elsewhere.

Hence, the ability of Bellozanne STW to treat a future PE between 118,000 and 141,600 based on carbonaceous treatment without any changes to the Discharge Consent relies on diverting rainfall and surface water out of the sewer system or balancing flows in tanks around the network to smooth out the peaks of sewage diluted by rainfall.

The network is also limited in how much flow can be transferred to Bellozanne without large scale upgrade works. Some of these upgrades are unavoidable in order to accommodate new housing developments which, without additional separation of surface water, will overwhelm the existing network at one or more locations.

Ultimately, depending on location, the works required to accommodate flows from the large new developments discussed in the Bridging Island Plan may be deemed unfeasible even if Bellozanne STW still has capacity available. For example, major upgrades and reconstruction of the strategic sewer in Victoria Avenue and the need to expand First Tower PS are likely to be unacceptable until they can be incorporated into the Advance the Line Scheme around St Aubin's Bay.

Should this prove to be the case, it will bring forward the need for additional treatment capacity at a new location and this will be earlier than might be predicted by simply considering Bellozanne's capacity against population growth.

Hence, the release of the population models associated with the 2021 Census results by Statistics Jersey and definition on the location and sequence of large housing developments is critical but will not be available until 2023. Data that has been made available suggests that the population is growing more slowly than was forecast in 2013 but flow is becoming more critical because of the large proportion of combined sewers in the system and the consequent impact of climate change.

Whatever the key driver for additional treatment capacity proves to be, expansion will have to be at a different location on the island because there is simply no space available to expand the Inlet Works and increase the number of PSTs and FSTs at Bellozanne. The best location for a new STW is entirely dependent on the specifics of the served catchment area including the population, topography, environment and the body of water that is to receive the treated effluent.

An obvious location to be considered is La Collette as flows could be intercepted in St Helier to split the Island catchment into east and west zones. The west zone would continue to be served by Bellozanne STW and the east zone served by La Collette.

This is discussed further in Section 9.3.

6.3.2 Bonne Nuit STW

Bonne Nuit is on the north coast of the Island and forms a small sewage catchment including 14 houses, 27No. apartments, a care home, a café and public toilets. A small package treatment plant was commissioned in 2003 to treat this sewage before final effluent is discharged at the end of the harbour wall below the mean low water level of Bonne Nuit Bay.

The package plant consists of a primary settlement tank, a submerged aerated filter with associated settlement zone and a UV disinfection unit. The plant is approaching its design life and it is therefore an appropriate time to reassess options for the site.

The Bonne Nuit STW has never been considered an ideal arrangement but has been the only viable solution to providing appropriate liquid waste treatment for the local area. As part of the Bridging LWS a feasibility study of converting the existing STW to a transfer pumping station will be carried out. Sewage from Bonne Nuit would be pumped to join the existing network in the vicinity of St Johns from where it will pass to Bellozanne STW. The study will also consider the option of a foul sewer extension to connect properties adjacent to Les Charrières de Bonne Nuit to the new PS (approximately 59 properties).

Pumping sewage from Bonne Nuit to Bellozanne has not previously been economically viable but the Feasibility Study will confirm if this is still the case.If suitable pumps can be identified there will be significant savings in operating and maintenance costs at Bonne Nuit.

Construction is likely to be phased with the rising main from Bonne Nuit to St Johns completed first so that a temporary pumping station can be installed. The Bonne Nuit STW will then be converted to the permanent Pumping Station within its existing footprint. It is expected that the initial feasibility study / concept design, detailed design and construction of both phases can be completed within the timescale of this Bridging LWS.

Further detail on Bonne Nuit STW is included in Appendix J1.

6.3.3 Sludge cake storage and disposal

Biosolids (enhanced treated sewage sludge) is a by-product of wastewater treatment. When treated, sludge becomes biosolids, which have to be recycled or disposed of by methods which are safe and compliant with legislation, acceptable to stakeholders and economic.

The Bellozanne Sewage Treatment Works (STW) Centralised Sludge Treatment Facilities completed in 2015 comprises sludge thickening, storage, screening, pasteurisation, mesophilic anaerobic digestion (temperature at 37°C (±2°C)), digested sludge storage, dewatering plant, and dewatered sludge (biosolids) cake storage facilities.

Approximately 1,400 tonnes dry solids of biosolids are produced at Bellozanne STW each year, which equates to approximately 6,800m3 of dry solids requiring recycling / disposal each year.

Recycling of biosolids to agricultural land is currently the preferred route where suitable land is accessible.

Biosolids recycling brings agricultural benefit from the recovery of plant nutrients and organic matter with resulting improvements in soil quality, and has several valuable properties, such as:-

- Spreading biosolids to land improves the organic content of the land and can improve the water-retaining capacity and structure of soil.
- It contains nutrients and valuable trace elements essential to animals and plants.
- It is a more efficient and sustainable alternative to inorganic fertilisers and mineral fertilisers, such as phosphates. Biosolids can supply a large part of the Nitrogen or Phosphorus that most crops need.
- Provides a source of slow-release Nitrogen ideal for use in land restoration.

As a result of its origin, there are strict controls including statutory legislation. In order to comply with current legislation and guidelines, the industry has to keep extensive records of its biosolids recycling activities, and this serves to demonstrate that compliance is being achieved.

In addition, despite recognition of the benefits and scientific assurance of safety of use, the satisfactory recycling of any organic waste e.g. pasteurised biosolids as produced in Jersey, to agricultural land depends on the willingness of farmers to take materials and a beneficial outcome in terms of achieving the expected crop performance, with respect to yield and quality, without any environmental problems or end-market limitations. As a result of supermarket protocols, for the production of produce, and enhanced crop assurance schemes, the landbank for receipt of biosolids is becoming smaller, with some food producing companies not permitting the use of biosolids recycling on fields and /or restricting the use of biosolids 5 years prior to a harvest, despite a number of growers in Jersey still wishing to use the material.

To achieve the most benefit from recycling of biosolids, the biosolids shall be spread when the crop growing can make the best use of it and in the right amount for the crop that is being grown.

Currently, the only alternative to biosolids storage is to burn the biosolids at the Energy Recovery Facility (ERF) at La Collette. The ERF incorporates biosolids handling facilities, however the burning of the biosolids is energy intensive, is not ideal for burning and results in the loss of a natural fertiliser. Furthermore, the ERF cannot keep up with the volume of biosolids produced, with no availability during periods when the ERF is shut down for routine maintenance in the months of November and March.

An alternative recycling route could be the production of either compost or topsoil from biosolids and green waste. However, at this stage this is not considered a viable alternative on the basis that the volume for disposal would increase, it will become more difficult to spread and is still reliant on the demand for the final product.

Given that the extent of the recycling route to farmland is at ever increasing risk due to potentially more stringent supermarket and legislative standards, the inclusion of an additional long term biosolids storage will relieve pressure on solid waste operations at the Energy Recovery Facility (ERF) to burn the biosolids and retain the product as a natural fertiliser.

The proposals for future Biosolids management are discussed in Section 9.2.

6.4. Network Storage

The Fort Regent Cavern ('the Cavern') has a capacity of approximately 25,000m^3 and acts as a detention/ balancing tank, receiving unscreened overflows of sewage/ stormwater (possibly contaminated with seawater) at times of high flows in Jersey's main sewerage system. The Cavern facility is constructed within the rock of the hillside under Fort Regent and prevents spillages into St Aubin's Bay during all but the most exceptional storms.

In addition to the Cavern there are many Pumping Stations within the system that include storage or have an associated storage facility. This storage helps to smooth and balance flows through the system and also acts as emergency storage if the pumping station should fail.

One of the effects of climate change is that the storage provided at pumping stations is becoming inadequate as flows increase, the same will be true as large housing developments are constructed around the Island. Where pumping stations do not currently have storage some are now starting to need it. Pumping station storage capacity is discussed further in Section 6.6.

The Cavern is still considered to be adequate but will be kept under review as part of the Surface Water Management Plan and other network studies.

6.5. Gravity Systems

In addition to the issues associated with surface water separation discussed above the gravity system can suffer from infiltration of ground or sea water and the illegal connection of surface water run-off.

Infiltration is most significant during the winter months when the Island's ground water level can rise to a point whereby the positive pressure on the infrastructure drives the ingress of ground water, but it can also be caused by tidal effects in coastal areas.

In large sewers and pumping stations, the infiltrate is generally pushed forwards as it would be in a combined sewer, this is taking up capacity but not necessarily affecting performance of the asset. Problems particularly arise where the ground water gets into small sewers and pumping stations which have been designed exclusively for sewage flows and any ingress becomes a significant proportion of the flow.

The small sewage pumping stations designed and installed in the 1990's and 2000's were all designed in accordance with Sewers for Adoption (UK standard) which had a small percentage addition for ingress. This has proved to be inadequate over the long term and as the sewers and wider system degrades the pumping systems are getting beaten by ground water ingress.

Section 6.6.7 on infiltration at pumping stations (where the ingress manifests in failures) provides a range of solutions to combat this trend.

The existing framework for sewer condition surveys comes to an end in late 2022 and will be re-tendered for 2023. Over these five years approximately one third of the gravity network has been inspected, with a particular focus on the pumping station catchments with the highest infiltration, but progress has been hampered by the pandemic. Under normal circumstances it is expected that the full gravity network could be inspected on a ten year cycle to support the maintenance programme.

Most emergency drainage repairs are currently found to occur on gravity sewers and typically on the pre-1950's sewers so assets in this category can be prioritised for surveys.

6.6. Pumping Stations

Sewage pumping stations are a hidden asset which operate without incident for the majority of the time. However, any failure that does occur can cause catastrophic public health and reputational damage. The risk of a failure can be minimised through robust design, 24 hour monitoring and planned preventative maintenance.

The Island's pumping system has grown and developed over a long period and is due for a fundamental strategic review, including current standard operating regimes, in order to address the changes of the past 60 years and future challenges:

1) The Island's population has more than doubled.
2) The water pollution law has been implemented.
3) The climate has changed with more and higher intensity rainfall.
4) Plastic products are more prevalent within the system and cause more blockages and other maintenance problems.
5) The integrity of the sewer network when ground water levels are high is compromised despite a decade of dealing with these issues.
6) The public is becoming more sensitive to sewage spills. The Department is rightly open with this information even though it causes negative publicity.
7) The Island has set an ambitious zero carbon target of 2030 which will require a significant behaviour change and a re-focus on minimising the energy usage of the system.

The review of pumping stations has included consideration of the opportunities that are offered by adopting best practice:

1) The new Bellozanne STW can be best optimised if the flows and loads are pumped to the works in a steady and controlled fashion, this will maximise the treatment whilst minimising the energy needed to meet the required standards.
2) The network of 109 pumping stations naturally suppresses the normal diurnal flow pattern to a degree as peaks travel through the system and the provision of new strategic storage will further smooth out peaks while reducing stress on the network.
3) Using the data collected over the new telemetry system to provide both real time information and long term performance trends helps to improve efficiency, reliability and confidence in the pumping network. Problems can be identified and addressed before a failure occurs.
4) The same real time data can be used to operate the system automatically in a manner which smooths out the flow to Bellozanne when it can or maximises the flow when adverse weather is forecast. In short, the whole system becomes integrated and 'smart'.
5) Some telemetry is installed at all of the Island's pumping stations and upgrades to fully achieve items 3) and 4) will be fitted as each one goes through the asset renewal cycle. Critical installations have already been updated.

In addition, pump technology is continually improving and driving design efficiency:

1) Variable speed drives which can smooth flow have become integrated which makes them more compact and a viable option for more locations.
2) Telemetry and integrated control systems are commonplace and easier to install.
3) Pump efficiencies and operation range have improved.

4) Higher lift pumps are now available for sewage applications.

The proposals for the Pumping Station Strategy are discussed below.

6.6.1 Pumping Station design and construction

Pumping station design standards have come a long way over the past 60 years and it is essential that the Island is well served for at least the next 50 years by both existing and new installations. The majority of the Island's pumping stations are designed around submersible pumps, generally having two pumps in a duty and standby configuration, i.e. only one pump operates at any given time and this alternates to extend their life. Alternation is usually slightly unequal to minimise the risk of both pumps failing simultaneously.

Submersible pumps, as the name suggests, work underwater and require a volume of water above them to operate. The pumps must therefore sit below the level of the local sewerage network in what is known as a wet well. This wet well provides the volume of liquid for the pumps to operate in and can also provide storage to protect against a pump failure or to smooth flow.

While this general arrangement has been consistent for many years, what has varied over time and in different locations is the structural design, including the amount of storage capacity provided within the stations. In some cases this has been driven by poor ground conditions, either due to sand and/ or granite, which has meant that deep excavations have proved to be too expensive and pumping stations have been shallower resulting in small operating/storage volumes.

Where it has subsequently proved that additional storage is required, the wet well can have an adjacent overflow sump which nominally holds 24 hrs storage in dry weather conditions. This design has led to stations requiring more manual cleaning and intervention than a single, properly sized, wet well configuration. Small wet wells result in a high frequency of starting and stopping because there is no buffer volume. When these small wet wells become inadequate for the flow through them, the adjacent storage starts to receive frequent spills of small volumes rather than occasional large spills. This can cause deposition of material which accumulates and then requires manual cleaning. However, even with this disadvantage, the benefit of the extra storage has been to protect the Island for many years from flooding and pollution events and enabled the safe maintenance of the system.

Pumping station design capacity and selection of the subsequent intervention strategy are necessarily driven by the reliability, performance, need, sensitivity and provision for future growth through climate change and/or increased development.

Replacing every pumping station with one designed to the latest standards is clearly not practicable or economically viable so the pumping stations have been assessed for the most appropriate solution for their condition and criticality. The asset inventory of pumping stations and rising mains has been divided into the following broad categories for the purposes of this evaluation:

- Pumping stations and rising mains over 50 years old.
- Pumping stations less than 50 years old with Ductile Iron rising mains (full or part).
- Pumping stations with rising mains less than or equal to 100mm diameter.
- Pumping stations with rising mains greater than 100mm diameter.

6.6.2 Pumping Stations and rising mains over 50 years old

The Island's move to a central STW began in the 1950's as the tourist industry became established and the sewage volumes became excessive for local treatment or discharge to sea. The adoption of this strategy also began the process of constructing the island-wide pumping network and many of those earliest pumping stations are still in service up to 70 years later.

Substantial civil engineering structures can have a design life of between 60 and 120 years and will often be serviceable for much longer. Mechanical and Electrical equipment normally has a life of 15 to 25 years so is replaced and upgraded within the existing structure.

In 2021, 22 pumping stations and the corresponding rising mains were recorded as being over 50 years old. The table below lists these sites with details of the rising main and year of construction. First Tower has also been included, making the total 23, on the basis that some parts of the infrastructure around this station are original. First constructed in 1957 to serve the original Bellozanne STW, it was rebuilt in 1996 and is the single biggest pump installation on Jersey.

The age of these assets does not present a problem in itself as long as they are surveyed, maintained and repaired as necessary. Issues are arising when development within the pumping station's catchment has outstripped its original capacity or they only receive attention when a failure occurs.

In the case of First Tower, the catchment is effectively the whole Island, which makes this a particularly critical asset and also one most affected by the rapidly growing overall population.

Each of these stations has a particular management and maintenance plan, and the issues associated with the critical sites are detailed in Appendix B.

ID No.	PUMPING STATION	Critical	RISING MAIN DETAILS		
			Diameter	Material	Year Installed
23	LE DICQ	Y	12"	Cast Iron (CI)	1957/1968
			18"	CI	1957/1968
22	FIRST TOWER	Y	24"	Spun Iron (SI)	1957/1996
			24"	SI	1957/1996
--	BEAUMONT	Y	12" (east)	CI	1958
		Y	300mm (west)	DI	1986/7
9	ST BRELADE No 1	Y	7"	CI DI (part)	1959 2005[a]
8	ST BRELADE No 2	Y	250mm	PE	2015[b]
19	MAUPERTUIS	Y	8"	CI	1960
			10"	CI	1960
7B	MONT NICOLLE		4"	CI	1960
7	ROUTE ORANGE	Y	8"	CI	1962
7A	ST PETERS ARSENAL		1½"	uPVC	1964
9A	ST BRELADE SLIP		4"	CI	1965
16	FIVE OAKS		6"	uPVC	1966
44A	LA COLLETTE POWER STATION		2"	uPVC	1966
17	RUE DES PRES	Y	12"	CI	1966
7C	FIELD 206		1¼"	uPVC	1967

ID No.	PUMPING STATION	Critical	RISING MAIN DETAILS		
			Diameter	Material	Year Installed
26	LE HOCQ	Y	20"	SI	1968
27	PONTAC	Y	15"	SI	1968
5	ROUTE DU SUD		4"	uPVC	1969
23	LE DICQ		15"	uPVC	1970
4	ATLANTIC		200 mm	uPVC	1971
32	GOLF LANE		100mm	PE	2012[c]
29	LE HUREL (GR)		4"	uPVC	1971
30	RUE DU PONT		4"	uPVC	1971
14	ST JOHN		63 mm	PE	1992[d]

Notes

a) Beaumont west was partially diverted for a property reconstruction in 1986.
b) St Brelade 2 was originally a 7” CI main laid in 1959.
c) Golf Lane was originally a 4” uPVC main laid in 1971.
d) St John was originally a 6” uPVC main laid in 1971, replaced when Rue des Buttes was built.

Table 6.6.2-1: Pumping Stations and Rising Mains over 50 years old in 2021

It is immediately apparent that this list includes the majority of the critical pumping stations within the network and a review of their condition and capacity has therefore been prioritised for the Bridging LWS period with a view to creating a programme of works for the period 2025-35.

6.6.2.1. Existing Pumping Station Capacity

The population of Jersey over the period of development of the sewerage pumping network has grown as follows:

Year	Period to 2019	Population	Growth	
1951	68 years	55,244	0	100%
1961	58 years	59,489	4,245	108%
1971	48 years	69,329	14,085	125%
2019	0 years	107,800	52,556	195%
2021	+2 years	109,400[40]	54,156	198%

Table 6.6.2-2: Population growth during network development period

This table clearly shows that for some of the oldest pumping systems the population has effectively doubled in size. This may be more or less than the actual growth in a catchment depending on the impact of tourism reducing, connection of septic tanks and new housing but it is representative of the Island as a whole.

On this basis, all assets over 50 years old need to be reviewed for their suitability to deal with the flows and loads presented to them today and predicted over the next 25 to 50 years. While a structure may be physically sound, it may not have the volume necessary to install the pumps that are required and the existing rising mains may not be large enough to carry the predicted flow.

[40] Estimated 2021 population - see Section 8.2

The methodology for the review is discussed in Section 6.6.10.

6.6.3 Pumping Stations less than 50 years old with Ductile Iron rising mains (full or part)

Ductile Iron replaced Cast and Spun Iron in the 1970's because it offered better performance, easier installation and was more resilient to imposed loads. It also changed the way pumps were specified as higher pressures could be achieved, but otherwise did not affect the design of the station itself. These structures are therefore subject to the same issues with capacity as the older stations albeit they are generally somewhat less acute.

In network applications, Ductile Iron rising mains tend to be the most efficient solution in larger diameters but other factors, such as ground conditions and traffic loads, can have a bearing. As a result, there are very few pumping stations on Jersey that have exclusively Ductile Iron rising mains.

A number of rising mains and other pipelines have been repaired or partially replaced with Ductile Iron mains. The most significant of these is First Tower which has therefore been included in the table below.

ID No.	PUMPING STATION	RISING MAIN DETAILS		
		Diameter	Material	Year Installed
58	L'ETACQ	150mm	DI	1996
109	LA FONTAINE	75mm	DI	2005
107	LES AUGEREZ	80mm	DI	2004
47	HIGHFIELD VINERIES (RUE A LA DAME)	80mm	DI	1991
	ELIZABETH AVENUE	100mm	DI	1982
	FALDOUET	150mm	DI	1980
	FB FIELDS	300mm	DI	1982
22	FIRST TOWER	24"/600mm	SI/DI	1957/1996
		24"/600mm	SI/DI	1957/1996

Table 6.6.3-1: Pumping Stations with Ductile Iron Rising Mains

While these pumping stations require the same review as the older assets, there are particular issues with Ductile Iron rising mains and these are discussed in Section 6.7 below.

The methodology for the review is discussed in Section 6.6.10.

6.6.4 Small Pumping Stations with rising mains less than or equal to 100mm diameter

The nature of Jersey's topography and distribution of population means that this is by far the largest category of pumping stations around the Island. The full list is included at Appendix C and is summarised below based on rising main material and the implications of pipe material are discussed in Section 6.7.

ID No.	PUMPING STATION	RISING MAIN DETAILS		
		Number[41]	Diameter[42]	Year Installed
--	Pumping stations with uPVC mains <100mm	31	1¼" (30mm) to 89mm	1964 to 2004
--	Pumping stations with uPVC mains 100mm	17	4" or 100mm	1969 to 2001
--	Pumping stations with MDPE mains <100mm	15	40mm to 80mm	1990 to 2004
--	Pumping stations with CI/SI/DI mains <100mm	5	75mm to 4"/100mm	1960 to 2005

Table 6.6.4-1: Pumping Stations with rising mains <100mm diameter

The design of small pumping stations and their rising main is a balance between retention time in the wet well and pipe, the velocity at which the sewage is pumped and a pipe size which will allow sufficient solids and contaminants to be transferred. The relevant issues can be summarised as follows:

- Long retention times result in the sewage becoming septic with the associated issues of odour nuisance and chemical attack.
- Higher velocities mean the sewage is moved quickly through the system to treatment but with small flows this requires small diameter pipework.
- Sewage contains rags and solids which require pipes of a certain size to ensure blockages do not occur and larger diameters mean lower velocities for the same flow.

The traditional approach is to design a pumping station for as few starts per hour as possible and certainly no more than fifteen. Fewer starts per hour requires a larger storage volume which increases retention time but does mean that the pumps will run for longer, giving better turn over in the rising main itself. Providing smaller storage volumes increases the risk of flooding in bad weather or if the pumps fail.

The ideal minimum standard for a rising main is a 'self-cleansing' velocity of 0.75m/s and a diameter no less than 100mm to avoid blockages. This has proved to be a good compromise between the energy required to pump and the reliability of the system but results in a required flow rate of 5.9l/s which is too high to be sensibly achieved at the smallest catchment pumping stations without having long retention times.

Hence, there is no simple solution to balance all of the potential issues. However, a designer has a number of options to achieve a compromise as follows:

1) Utilise macerator pumps and/or progressive cavity pumps.
    - Macerator pumps 'chew' the sewage to break rags and solids down and make blockages less likely.
    - Progressive Cavity (PC) pumps will push sewage into the pipe and therefore tend to be better at driving a potential blockage through.

[41] Note: this number includes relevant pumping stations already named in 6.6.2 or 6.6.3.
[42] Diameter given is the approximate internal diameter in all cases.

- Both can be expensive in both Opex (Operational Expenditure) and Capex (Capital Expenditure) terms and PC pumps are more prone to being beaten by water ingress.

2) Design on a higher operating velocity, eg. around 1.5m/s.
    - This is an alternative approach which really challenges the issue of rising main velocity but theoretically keeps the pipe clear. This option gives rise to more surge pressures, higher energy costs and limits future growth capacity. It is not recommended at this time.
3) Utilise an inverter or a storm pump concept
    - An inverter pump is also known as a Variable Speed Drive (VSD) and allows the pump to vary its operation to suit measured conditions. The VSD can adjust the velocity for the level in the well between start and stop points within the wet well to provide continuous flow. It can also be set to draw the wet well down to almost empty (known as a snore cycle) to periodically clear floating debris.
    - The storm pump concept has a second pump in the wet well of higher capacity to deal with higher storm flows and protect against flooding.
4) Planned preventative ice pigging
    - Ice pigging is a system whereby ice slush is pumped through the rising main to clean it. It has proved very effective in clearing and preventing blockages and is discussed further in Section 10 – Operational Issues.

6.6.4.1. Recommendations for small pumping stations

The proposed strategy will be a long term programme to replace all mains with an internal diameter less than 100mm (except ones that already have macerator or PC pumps) with mains of at least 100mm diameter and to adopt a smart system with invertor drives, flow meters and periodic ice pigging. This will provide:

- Additional storm pumping capacity when required;
- Minimal power consumption under normal conditions;
- Lower normal operating pressures (extending the life of all equipment);
- Be future proof if more connections and capacity is required;
- Better ability to handle solids and minimise pump chokes; and,
- Allow wet well levels to vary avoiding build-up of fats on the surface and rags and grit on the invert of the wet well.

The negative to this is a normal velocity within the rising main of less than 0.75m/s. It is recommended that a velocity of 0.3m/s is adopted as a minimum design velocity as long as the station is on a regular ice pigging regime and a pump with suitable suction and delivery characteristics is available.

Prioritisation of pumping stations and rising main will be based on the Pumping Stations Asset Management Plan and Rising Main Criticality Assessment discussed in Section 3.6.

6.6.5 Pumping Stations with rising mains greater than 100mm diameter

There are no common issues that affect this batch of assets as there are with the older and smaller stations noted above. They will require the same review of capacity and condition as the other assets and any issues relating to the material of the rising mains in Section 6.7 will need to be addressed.

ID No.	PUMPING STATION	RISING MAIN DETAILS		
		Number[43]	Diameter[44]	Year Installed
--	Pumping stations with uPVC mains >100mm	14	6" /150mm to 15" (375mm)	1966 to 2004
--	Pumping stations with MDPE mains >100mm	1	160	2015
--	Pumping stations with CI/SI/DI mains >100mm (excluding First Tower)	17	6" /150mm to 15" (375mm)	1957 to 1996

Table 6.6.5-1: Pumping stations with rising mains greater than 100mm

6.6.6 Pumping Station Asset Replacement

Given that it is not viable to redesign and rebuild every pumping station, the drivers for an infrastructure asset replacement can be summarised as follows:

1) The asset has reached the end of its life.
2) The asset fails.
3) Technology changes make the asset obsolete.
4) External factors mean the asset is the wrong size.

Any one of these factors can drive the need for investment and this has to be monitored and managed to make sure the Department has sufficient funds to fulfil its requirements for the environmental and public health needs of the Island.

A review of industry best practice has shown that a make do and mend strategy has been adopted within the UK Water Industry. This is underlain by key condition surveys and some failure analysis to determine the priority of works. However, it should be noted that the average UK water company is responsible for a far larger network than exists on Jersey, for example Anglian Water have some 5,000 pumping stations in their network so wholesale change becomes prohibitively expensive. With I&E's 109 pumping stations the requirements for installing intelligent asset management systems become more

The new telemetry system will be utilised to gather data that will allow intelligence based strategies that use failure frequency condition monitoring and early warning techniques to be developed. The necessary monitoring systems and management software are now in place but a period of data gathering and analysis is required before the strategic benefits will begin to be seen.

However, not engaging in a proactive maintenance and monitoring regime clearly increases the risk of sudden unexpected failures. Sudden failures and emergency repairs will never be completely eliminated but they can be minimised and the approach to Emergency Repairs is discussed in Section 10 – Operational Issues.

The proposals for the maintenance regime are listed in Section 6.6.10.

[43] Note: this number includes relevant pumping stations already identified in 6.6.2 or 6.6.3.
[44] Diameter given is the approximate internal diameter in all cases.

6.6.7 Water Ingress at Pumping Stations

6.6.7.1. Saline/seawater intrusion

Saline intrusion occurs in pumping stations in close proximity to the sea. High salinity in sewage can cause high levels of septicity in the wet well and rising mains at low flows with all the corresponding challenges that brings within the system. The recent asset survey, section 6.6.8 below, has found that the current trend for dealing with the problem is to minimise the retention time in the Wet Well and pass the fluid forward.

This has the advantage of minimising the volume of sewage stored in the pumping station and the retention time but generates a high number of starts per hour for the pumps. Unfortunately this has some negative consequences as the pumping station is forced to operate within a very small band and the pumps are called to run on a frequent basis causing additional wear. Each start will move only a small volume of sewage into the rising main which then takes several start/stop cycles to reach the next station or gravity system. During this time the septicity has increased significantly which causes major issues downstream. This has been observed as a particular issue at Greve 2 and St Ouens pumping stations as an example.

In order to address the issue of salinity and subsequent septicity, the key concerns are as follows:

- Minimise the ingress of sea water. This is the key priority but due to the proximity of the system to the sea, it is not always possible.
- Avoid the long retention times within the wet well and downstream network. Unfortunately in dry weather conditions, some of the stations have very low flows. Even if the wet well is kept empty, septicity will start to develop in the rising main or subsequent pumping stations.

Chemical dosing systems are available to inhibit septicity and many trials have been undertaken on various systems but none have proven to be effective either on performance or value for money criteria, although some could be reassessed for use at small stations with low chemical consumption..

The pumping stations most affected by saline intrusion are identified below with further details in Appendix D. The table also includes how critical they are to the network and repeats the rising main material for reference to the risk of corrosion. MDPE and uPVC pipes are low risk materials while any form of iron, if not cement lined, is considered a high risk.

ID No.	PUMPING STATION	Critical asset?	RISING MAIN DETAILS	
			Material	Year Installed
39	ARCHIRONDEL	Low	uPVC	1982
24A	BRECQUE DU SUD (ROZEL NoI)	Low	uPVC	1982
1A	GREVE DE LECQ No 1	Medium	uPVC	1989
1	GREVE DE LECQ No2	Medium	uPVC	1989
89	LA ROUTE DU PORT	Medium	MDPE	2002
65	LES LAVEURS	Low	uPVC	1998
58	L'ETACQ	Low	DI	1996
63	MILANO	Low	uPVC	1998

ID No.	PUMPING STATION	RISING MAIN DETAILS		
		Critical asset?	Material	Year Installed
11A	OUAISNE	Low	uPVC	1988
6A	PORTELET No 1	Medium	uPVC	1976
8	ST BRELADE No 2	High	CI	1959
9	ST BRELADE No 1	High	CI	1959
9A	ST BRELADE SLIP	Low	CI	1965
	LE BOURG	High	SI	1968
27	PONTAC	High	SI	1968
26	LE HOCQ	High	SI	1968
--	BEAUMONT	High	CI DI	1958 1986

Table 6.6.7-1: Pumping Stations prone to saline intrusion

It is a fact that pumping stations suffer if flows into the station are too high. However, for pumping stations with salinity ingress, the problems can be worse when incoming flows are too low. In the absence of other viable solutions, an operational alternative has been identified. This is discussed in Section 10 – Operational Issues.

6.6.7.2. Surface water ingress

The work discussed in Section 3.4 will continue through the Bridging LWS period with the aim of minimising the flow of ground and surface water into the public sewerage system. In addition, any identified private and/or unadopted networks that discharge incorrectly or even illegally will be addressed. Tackling these 'Private' connections is currently only possible as and when they are identified and is often as part of responding to some form of failure in the vicinity. Systematically identifying and pursuing illegal connection will require the allocation of dedicated Regulatory resources. The cost/benefit analysis of an active approach will be undertaken during the Bridging LWS period.

If it is accepted that some ingress is inevitable and this will worsen as part of climate change, the design of pumping station pumps and rising mains should include more resilience to allow more flow to be passed forward than the standard 'Sewers for Adoption' normally requires. This should, however, only be done in a measured way and in conjunction with surface water separation projects and the ingress prevention works.

The recent use of ElectroScan surveys to identify ingress to pipes has proved more effective than the traditional method of CCTV surveys. The outputs given are more accurate and surveys can be carried out in both wet and dry weather as they detect the flow of water either into or out of a pipe. CCTV surveys remain the best method of carrying out condition surveys and will be used in conjunction with ElectroScan surveys as appropriate in the future.

It is essential that the success of measures installed to deal with ingress are kept monitored so all pumping stations, where practicable, should be fitted with a calibrated flow meter which can monitor operation and flow rate trends accordingly.

6.6.8 Pumping Station Condition Survey

A preliminary condition survey of all of I&E’s pumping stations has been completed as part of the preparation of this LWS. More detailed surveys will follow where areas of concern have been identified. A breakdown of the survey results is below and full details are provided in Appendix E. The Key Tasks are listed below.

Key Task	No. of sites where work is required	Notes
Main working covers need replacing	59	The number of covers to be replaced at each site varies between 1No. and 5No.
Overspill/overflow access covers need replacing	37	The number of covers to be replaced at each site varies between 1No. and 5No.
Sump needs cleaning or modifying	6	Accumulation of debris can affect the operation of the station and lead to septicity and odour issues.
Branchage – Trees/hedges require maintenance	15	Overgrown foliage can be a hazard for access by staff.
Operating levels require adjustment to optimise efficiency	56	Adjustment of start and stop levels can increase efficiency and also improve conditions in the network both upstream and downstream of the station.
Ducting to be checked, cleaned or repaired	14	Should not affect operation of the station but can lead to odour and nuisance issues.
Infiltration identified and needs further investigation	22	See Section 3.4 for discussion.

Table 6.6.8-1: Summary of Pumping Station Condition Survey

The seven ‘Key Tasks’ listed above are not the only work required at each site but are the most common themes of work that were identified. A total of 107 pumping stations were surveyed and every one of them had some work identified but not all required one or more of the ‘Key Tasks’. By the same token no sites were found that required all seven of the ‘Key Tasks’.

	Number of ‘Key Tasks’ required							
	0	1	2	3	4	5	6	7
Number of sites	22	17	31	22	11	4	0	0

Table 6.6.8-2: Comparison of maintenance tasks at each site

The above findings will be used to identify programmes of work and prioritise those stations most in need of improvement works in the coming years.

6.6.9 Pumping Station Control and monitoring

As discussed in Section 3.6.1, the telemetry system across the pumping station network has been greatly improved since the 2013 WWS. The ‘heart’ of the telemetry system is now considered to be state of the art and there is an ongoing programme to upgrade all of the existing installations to maximise the benefits offered by this investment.

The collection of data from an asset for analysis and monitoring purposes can be multifaceted and it is important that the extent of the data collected is tailored to suit the individual asset's criticality and complexity.

Any telemetry system is built up from a chain of components. This chain consists of the individual sensors on each piece of equipment; the control units that will be instructed to start or stop; the outstation or receiver/transmitter at the asset; the communications medium which may be wireless or cabled; the telemetry master station hardware servers and finally the operator interface. Each link of the chain also has both hardware and software elements to be considered.

The selection and configuration of each of these elements has a part to play in what data is extracted from an asset, what that data 'looks' like, how fast it is communicated back to the master stations and how it is then handled, displayed, analysed and stored for future use. This level of technology comes at a cost and hence it is important that each installation is designed to suit the relevant needs of the site, both now and in the future, rather than adopt a 'one size fits all' approach which could result in the collection and storage of far more data than might ever be useful. The same amount of care that goes into the physical design and operation of a pumping station is therefore required in the control, monitoring and reporting system of all assets including old, new, large and small.

6.6.10 Pumping Station Recommendations

6.6.10.1. Strategic Pumping Stations – Capacity Assessments

In reality each of the major stations within the Network will require Capital Investment and the key is to prioritise this based on a risk and need assessment. i.e. For each of the strategic pumping stations, undertake the following:

1) Carry out detailed condition surveys of the structures identified in the preliminary condition survey.
2) Investigate the condition of the rising main as a matter of urgency. Investigations to be consistent with the material as discussed in Section 6.7.
3) Conduct a feasibility study to confirm the capacity and efficiency of the pumping station and rising main and options for replacement / refurbishment as necessary.
4) Develop a business case for the works based on the conclusions of items 1 and 2 as required.
5) Develop medium and long-term capital programme and secure funding.
6) Optimise the operation and maintenance to make sure the asset lives are maximised, avoiding failures and pollution incidents.

In addition to the above, a separate programme of inspections is required to assess the condition of surge suppression equipment. Not all pumping stations require surge suppression and the need arises from a combination of operating pressure, flow, pipe diameter and material. Where it is installed, it can include pressure vessels that require regular inspection and certification. In at least one case, the initial pumping station condition survey identified that the pressure vessel had been isolated and was not in use. The list of pumping stations with surge suppression equipment is included in Appendix F.

These proposals will be developed and implemented during the period of the Bridging LWS.

6.6.10.2. Asset replacement and proactive maintenance programmes

A typical scope of work for a pumping station refit is included at Appendix G. Not every pumping station will require the full scope of refit at each maintenance period but each item should be considered.

In order to ensure that appropriate continuous monitoring is established, it is proposed to update the Asset Replacement and Maintenance Programme as follows:

1) Change the asset life of pumping stations and rising mains to 50/60 years within the asset system.
2) Mechanical and Electrical systems to have a typical 15 year life (see below).
3) Update the asset system to reflect the current network.
4) Overlay the wide area network study to assess capacity issues.
5) Programme in regular independent surveys of pumping stations and rising mains. Surveys currently include drop tests cross checked with telemetry data to assess efficiency and accuracy of the installed equipment.
6) Update the Asset Management software, in conjunction with the telemetry system, to assist in monitoring and measuring the system performance, efficiency and reliability.
7) Continue to train, recruit and support local technicians and operators to support the infrastructure on a day to day basis.
8) With a Capital Programme in place, develop a strategic partnership with a designer, supplier and contractor to deliver the programme in a seamless manner ensuring that local staff are employed, trained and empowered to undertake this work.

Using a 15-year lifespan for Mechanical and Electrical assets has worked well for the Pumping Stations Operations as it provides resilience with little disruption and failure of the Mechanical aspects of the stations. However, this 15-year period is not a single rule with some of the priority stations using an 8-year lifespan to prevent breakdowns and failures while some assets in the network have been kept in service for over 20 years with suitable maintenance.

These proposals will be reviewed over the period of the Bridging LWS and in conjunction with the introduction of the new asset management system (SAP[45]) across Government of Jersey by 2026. It is anticipated that the SAP system will be instrumental in identifying and developing the maintenance and inspection programmes. However, this will be supported by "manual" condition assessments in the short to medium term as data is collected. The Drainage and Pumping Station Asset Management Plans will gather data to create a bespoke degradation matrix which will also inform the prioritisation of aging assets before actual failures occur.

6.7. Rising Mains

Rising Mains are originally designed in conjunction with the pumping station to ensure that the system is optimised with allowances for future growth as appropriate. Over time, the inner surface of a rising main will degrade which increases friction and means the pumps have to work harder to deliver the same flow. Some of this degradation can be addressed by cleaning the pipe but eventually it will need to be relined or replaced.

Relining a rising main reduces its internal diameter and therefore its capacity which can mean the pumps have to be upgraded to suit. Replacing the rising main can be more expensive and more disruptive than relining. Therefore, upgrading the pumps can be a more cost effective solution, particularly as the efficiency of pumps is continually improving.

When new housing is built near an existing pumping station, the additional flow through the station and the rising main must be considered. Forcing more flow through a pipe increases the pressure

[45] SAP company website

which can cause leaks or even major failures. However, it can be possible to manage the additional flow by running the pumps for longer periods of time at the same rate if adequate storage is available.

The review of pumping station capacity discussed above includes an assessment of the existing rising mains so that a holistic approach is taken to each site. In addition to this, there are known issues with some pipe materials as they age. A new Rising Main Criticality Assessment is programmed for late 2022 and this will consider issues such as population served, age and material to prioritise the condition survey and Rising Main Replacement programmes of work.

6.7.1 Rising Main Condition Surveys

No specific rising main condition surveys have been carried out in preparing this Bridging LWS. A programme of investigations has been identified based on a preliminary risk analysis of the network.

A review of industry best practice has shown that a make do and mend strategy has been adopted within the UK Water Industry with key conditional surveys and some failure analysis to determine the priority of works. It appears that strategies are predominantly aligned to condition surveys and failure frequency condition monitoring and early warning techniques have not gained traction on this area at the present time.

The challenge with a condition survey strategy is how to assess this on a pressure system and minimise the disturbance.

Common industry practice is for rising main life to be set at 100 years, however this can be optimistic in areas affected by high salinity, septicity or grit. It is therefore recommended that the asset life for rising mains be set at 50 to 60 years for asset management purposes due to the pressure, abrasion, cyclic loading, vibrations, fatigue and corrosion. The design life specified for new projects should remain at a minimum of 100 years but the asset management period will trigger a detailed review of capacity and suitability.

The asset life will be assessed as the condition surveys progress and may vary based on material, risk and capacity.

6.7.2 Ductile, Cast and Spun Iron Rising Mains

Ductile Iron replaced Cast and Spun Iron in the 1970’s. The new manufacturing process optimised the wall thickness and strength to weight ratios compared to the traditional cast material and made the material more resilient to imposed loads.

Ductile Iron has been specified and used extensively across the world for sewage, raw and potable water applications. For potable water a cement lining was specified to avoid any contamination and corrosion over time, but this was not deemed necessary for sewage applications and the view was that the sewage fats and solids would from a protective barrier.

In reality, early failures of unlined Ductile Iron pipes in sewage applications have shown that pitting can form on the inner surface, generally on the invert of the pipe, and the pitting grows as a function of corrosion over time. Ultimately this can lead to a premature failure which can, in some cases, be catastrophic to the integrity of the pipe leading to flooding and pollution.

As a result, Ductile Iron pipe for all applications is now cement lined and, In conjunction with this development, the iron wall thickness of pipes was reduced. While the lining gives good protection to the invert of the pipe, the cement lining at the soffit (inner surface at the top of the pipe) can be subject to H_2S / Sulphuric Acid attack if sewage becomes septic and air pockets form.

The failure of the inverts of DI pressure pipes over 300mm diameter is an industry wide issue and has been experienced on Jersey in recent years. As an example, below is a piece of the West Rising Main from First Tower Pumping Station which failed recently. The picture clearly shows the scale of the corrosion and the obvious failure mode of the pipe.

Figure 6.7.2A: First Tower West Rising Main Ductile Iron Section

As can be seen, the pitting has penetrated the wall of the pipe allowing it to leak. Between these penetrations the corrosion has connected the pits and almost cut through the pipe.

In network applications, Ductile Iron rising mains are typically the most efficient solution in only larger diameters and fortunately, it has therefore only been utilised in a few rising mains, in some repairs and sections of the First Tower Rising Mains.

ID No.	PUMPING STATION	RISING MAIN DETAILS		
		Diameter (mm)	Length (m)	Year Installed
58	L'ETACQ	150	1035	1996
109	LA FONTAINE	75	--	2005
107	LES AUGEREZ	80	987	2004
47	HIGHFIELD VINERIES (RUE A LA DAME)	80	129	1991
45	TRINITY	100	part	1990
		150	part	1990
22	FIRST TOWER	600	part	1996
		600	part	1996
	ELIZABETH AVENUE	100	--	1982
	FALDOUET	150	--	1980
	FB FIELDS	300	--	1982

Table 6.7.2-1: Ductile Iron Rising Mains

As shown in the table above, only the First Tower rising mains are above 300mm diameter. There is not as much research or evidence from pipes that are under 300mm diameter, however, samples taken around L'Etacq and Bas du Marais show the inverts are in good condition.

The rising mains at La Fontaine and Les Augerez which were laid in 2005 and 2004 respectively may be cement lined but inspections will be required to confirm this.

6.7.2.1. Condition Surveys of Ductile/Cast/Spun Iron mains

In order to address the risks associated with the various Iron pipes, the following programme of works will be undertaken during the Bridging LWS period for all such rising mains:

1) CCTV survey to assess corrosion and other damage.
2) Take samples for testing.

The results of this work will be used to review the condition of the mains and assess whether any remedial work is required. Remedial work would likely be in the 2025-35 LWS period and may consist of:

- Installing a structural or non-structural liner.
- Partial or full replacement with new cement lined Ductile Iron pipework.
- Full replacement with an alternative fit for purpose material.

6.7.3 uPVC Rising Mains

In January 2018, I&E commissioned Sweco to carry out a review of the latest research on the working life of uPVC pipes. This was specifically in relation to the rising main at Route du Sud as it was approaching 50 years of age but included consideration of other rising mains at Archirondel, Atlantic and Anne Port Pumping Stations which were either of a similar or age or the same classification of uPVC. The discussion here is a summary of this study.

uPVC pipes were extensively used in the 1960s in the UK, Europe, North America and Canada for pressure water mains in diameters up to 24" (600mm). The earliest technical reference to thermoplastic based sewers in the UK is found in BS3505: “Class B pressure pipe approved as sewer pipe” in 1965. However, a number of pipes subsequently failed in a brittle and catastrophic manner. These failures were attributed in part to manufacturing defects but more importantly to a lack of understanding of the performance characteristics of the material which led to inadequate design and poor installation. For example, the notch sensitivity, operational limitations in terms of impact, point loading and fatigue were not appreciated or identified. These problems were exacerbated by the variable and sometimes poor performance of the field made solvent welded joints. These initial problems were, for the most part, overcome by improvements to the pipe quality, jointing and installation methods although there is no specific date that allows pipes from before or after it to be defined as “bad” or “good” respectively.

It is also important to note that the class of the pipe is not linked to any changes in manufacturing and installation methods overtime; so Class C, for example, is not necessarily newer than Class B. The class of a uPVC pipe is indicative of the pressure rating of the pipe, as shown below, rather than denoting any difference in the material or manufacturing process.

Class	Pressure Rating (bar)
B	6
C	9
D	12
E	15

Table 6.7.3-1: uPVC Class and Pressure Rating

As the pressure rating increases so does the wall thickness and the thicker wall also makes the pipe more robust during installation and any subsequent disturbance. The 2018 review was particularly concerned with Class B pipes which had experienced some failures on the Island in the past. However, following those failures the Department have favoured the "over design" concept in terms of pressure rating and tended to use Class D or E unless in very low pressure systems.

The abbreviation of uPVC refers to unplasticized polyvinyl chloride and comes from the manufacturing process used as well as the material. No plasticisers were used in the manufacturing process as these could contaminate potable water when in use. Over the years these pipes have been known as PVC, PVC-u and uPVC but all refer to the same material and the change reflects a standardisation in the naming convention.

6.7.3.1. uPVC Pipe Failure Factors

The failure of uPVC pipe is dependent upon, and can be affected by, many factors including:

- Quality of materials/manufacture;
- Quality of construction/installation;
- Pipe operating pressures (i.e. operating pressure compared with design pressure);
- Cyclic effects (e.g. whether there are frequent large dynamic pressure ranges such as in pumping systems);
- Ground conditions (e.g. likelihood of movement);
- Ambient conditions (e.g. vibration from traffic, farm equipment etc.);
- Works close by (e.g. excavations by other utilities);
- Age; and,
- Pipe wall material.

In view of the number of variables and unknowns, the likelihood of failure of any particular pipeline (or section of pipeline) cannot be assessed accurately without extensive investigations including site trial holes, sampling and laboratory testing. Even with such investigations, it is unlikely that the condition of the pipe could be fully determined and the likelihood of bursts accurately assessed. Any intrusive investigations could also increase the probability of failure due to the disturbance of bedding material etc.

The best measure of the condition of a uPVC pipe was found to be the first failure event, i.e. when a pipe has failed once it is likely to keep failing along its length. The probability of failure for uPVC pipelines is actually highest during installation and in the first few years of operation, which is largely attributed to manufacturing and installation issues. The study found that research into failures identified three types:

- **Early Failures** – 2 years – high failure probability due to material defects, quality changes in production, installation, application errors, dimensioning error and operational errors.
- **Random Failures** – up to 20 years – relatively constant failure rate due to random failures and spontaneous failures of otherwise sound systems (e.g., buckling failures, interventions).
- **Wear-out Failures** – 20 years+, noting that the original design life estimates were for 50 years – increasing higher failure probability due to ageing, deterioration, fatigue and cyclic stress/strain (e.g. pump start/stop).

The conclusion of the study was that, provided there are no significant changes to the operating regime or environment, there is no apparent need to replace the uPVC rising mains on a purely precautionary basis. Should there be a change in circumstance, for example if flows/pressures increase, 'random' bursts begin to occur or there are significant works planned close to pipelines, then the need for replacement of the pipelines will have to be considered.

Accommodating new developments through existing pumping stations could very well be sufficient disturbance to the existing conditions to warrant replacement of uPVC pipes.

6.7.4 Telemetry monitoring and control system

I&E has recently completed the installation of an island wide Schneider Electric GeoSCADA Telemetry monitoring and control system. This consists of two Master Stations at Bellozanne STW that receive data from seven communications groups which cover the whole Island. Each group has a data multiplexer that brings the local field data together for transmission to Bellozanne.

Various communication methods are used across the system, depending on the geographic location and type of data and outstation in use:

- UHF and VHF Radios
- Fibreoptic lines
- 2G/3G/4G/NB-IOT

Most of the Pumping Stations are connected via the UHF radio network, with data coming back from the stations approximately every thirty seconds.

The system is used to monitor and control the Liquid Waste assets around the island. The data that comes back is used for two main purposes:

1. Alarms from the assets will alert the operational teams and Out of Hours on Call Personnel if there is a problem at an installation.
2. Collection of secondary data, eg. pump run time, water level change etc, that can be used to help analyse the operation of the assets and diagnose long term or recurring problems.

Until recently, all analysis of the collected data was carried out manually using either the telemetry system itself or using Excel spreadsheets or similar software. In 2022 additional logic has been written for the pumping stations to automatically calculate pump efficiencies, flows and volumes of water from each station. This is far more efficient for the operations teams who use the data to plan maintenance and for the modelling team in future planning. This type of use of our operational data, though an improvement on the manual efforts previously, is still just the beginning of what is possible with modern Artificial Intelligence (AI) programmes.

The system can be extended by adding new software packages that will automatically extract and process the data to advise on maintenance programmes and predict potential failures. The potential options for expanding the system are discussed in Section 9.2.8.

6.8. Meeting the demands of the Island Plan

6.8.1 Is there spare capacity in the network?

The Liquid Waste networks are generally operating at or near their ultimate capacities. Surface Water Separation schemes can release capacity in the Foul network but in some cases, this only transfers the problem into the surface water system. Where there is no suitable nearby watercourse or sewer it becomes difficult to manage increasing demand without construction of significant assets.

Separation schemes are also not always beneficial or required in rural areas where flows are relatively low and having a combined system gives better turnover in the system to avoid septicity. Where this is the case, addressing infiltration is the priority. Separation is best carried out in urban areas where, while the schemes are complex, the benefits are instantly realised and permanent.

The Bridging Island Plan identifies the potential scale of population growth and housing development but is less definitive on when and where this is likely to happen. On this basis it is only possible to confirm that the existing network, for the most part, will not be able to accept the required flows and transfer it to Bellozanne.

Parts of the network can accept additional flow but these will always encounter a restriction at some point along the route. It is therefore important that areas for significant housing development are identified with the relevant stakeholders so that the network can be assessed. The timing and priority of such developments should also be agreed so that network improvements can be put in place in advance of these developments being occupied. However, it is also recognised that the development of any site is subject to a developer coming forward with a proposal and this is outside of the control of any of the parties to the Bridging Island Plan.

6.9. Identified Rising Main schemes

Section 6.6 above has discussed the strategy for the pumping stations and where works have been identified this will include an assessment of the rising main for any change in duty. In addition to this, a number of rising main relining and replacement schemes have been identified. These are discussed further in Section 9 below.

6.10. Emergency repair strategy

The approach to Emergency Repairs is discussed in Section 10 – Operational Issues.

7. Existing Surface Water Catchment

7.1. Introduction

The benefits of surface water separation to the sewer network and sewage treatment facilities have been discussed in Section 6. In broad terms, the surface water network acts to capture storm water and other run off that does not require treatment and directs it to the nearest water course or to sea to prevent local flooding. It can therefore be thought of as many small networks, or 'catchments', that are connected by water courses and culverts to ultimately discharge to sea around the Island.

In some cases a discharge to sea is not possible at high tide and so, to prevent tidal flooding, there are a number of Coastal Pumping Stations that ensure surface water can always be released. One such example is on the end of Baudrette Brook (Section 3.5.2) and one of the largest such installations is at West of Albert (Appendix J3).

Realising the benefits of surface water separation is becoming all the more critical as the effects of climate change are increasingly felt around the world. I&E recognise this and in mid-2020 began a programme of work to create a new island-wide digital model of the surface water system similar to that for the sewer network that was built in 2009. The sewer network model includes key parts of the surface water system where the two interact but these are largely in built up areas and only a small number of watercourses were included.

The sewer model has been constantly maintained and updated to reflect changes to the system since 2009 but the surface water elements had remained limited. The need to be able to assess and monitor the wider surface water system as new developments are proposed was clear but a single model combining both systems would be unwieldy and difficult to use. Hence a separate surface water model that covered the whole Island and all significant watercourses was commissioned.

When complete, the model will be used to develop a Surface Water Management Plan (SWMP) that supports the policies of the Island and Government Plans relating to watercourses and the marine environment around Jersey. In parallel with the SWMP, I&E are developing the Drainage (Network) Asset Management Plan which will cover the open surface water network in detail including streams, control structures and impounding areas. Together, they will be used to identify and address areas that may be at risk of flooding in the future through upgrading or extending the networks.

Areas that are already known to suffer from flooding will be prioritised in the short term.

7.2. Surface Water Catchment Model

The process of building the model began in mid-2020 and, as of March 2022, the build is largely complete. The next phase is known as verification where real rainfall and flow data from pipes and watercourses is used to check that the model generates results consistent with observations.

Rainfall data has been collected by Jersey Met for many years but monitoring of flow in the system has been limited to critical points and has not been done at all in most watercourses. New monitoring systems have been installed across the Island during 2021 and data is starting to be collated. Unfortunately, for these purposes, it has generally been a dry winter so data from the usual storm events has not yet been obtained in sufficient quantity to be used. Ideally at least twelve months of data will be gathered for the verification process but it is also important that the data is considered to be representative.

The lack of data will extend the network modelling programme but does not stop the initial development of the Surface Water Management Plan or prevent new housing developments being assessed for their impact.

Reviewing planning applications for new developments will continue to be done using industry standard assumptions and allowances as they have been in the past using the sewer network model. As the new surface water model is finalised and verified these assessments will become more tailored to real conditions on Jersey.

7.3. Surface Water Management Plan

The Surface Water Management Plan (SWMP) will be the basis of I&E's approach to managing surface water in the future. The Surface Water Catchment model will be a live tool for assessing changes but will also produce a Statement of Needs for works around the network to address existing problems. Issues with local flooding are known and are being addressed as quickly as possible. However, the lack of a 'joined up' model and plan can mean that solving one problem is actually only moving it to a different location downstream.

The SWMP is being developed in conjunction with the existing Jersey Shoreline Management Plan[46] and will together become part of the Catchment Flood Management Plan identified in the Bridging Island Plan.

Proposal 34 – Catchment Flood Management Plan

The Minister for the Environment will work with the Minister for Infrastructure to further explore opportunities for the strategic management of inland flooding in the form of a catchment flood management plan (CFMP).

The CFMP should consider all types of inland flooding including surface water, watercourse and reservoir-related, and include the likely impacts of climate change, the effects of how we use and manage the land, and how we can sustainably develop land in the future.

Figure 7.3.1A: extract from the Bridging Island Plan

The SWMP will be a live document that takes account of changing circumstances, legislation and guidance. For example, it will be fully co-ordinated with the Marine Spatial Strategy as this is formalised and incorporate the recommendations of the United Nations' Intergovernmental Panel on Climate Change.

7.4. Intergovernmental Panel on Climate Change

The Intergovernmental Panel on Climate Change (IPCC) issued their sixth assessment report[47] in February 2022. This report states in very stark terms that "***climate change is a grave and mounting threat to our wellbeing and a healthy planet. Our actions today will shape how people adapt and nature responds to increasing climate risks***.

[46] Jersey Shoreline Management Plan (2020)
[47] IPCC 6th Assessment Report

The world faces unavoidable multiple climate hazards over the next two decades with global warming of 1.5°C (2.7°F). Even temporarily exceeding this warming level will result in additional severe impacts, some of which will be irreversible. Risks for society will increase, including to infrastructure and low-lying coastal settlements."

These concerns are clearly relevant to Jersey and I&E are committed to doing whatever they can to make the Island as resilient as possible through implementation of the SWMP and working with the Planning Department and Council of Ministers to meet the demands of the Island Plan in a sustainable way.

7.5. Developer connections/SUDS and IUDM

As was noted in Sections 3.5 and 5.2, Government of Jersey have adopted the policy that all new developments shall use Sustainable Urban Drainage Systems (SUDS) to manage surface water. This policy is described in *Strategic Policy 1 – Responding to Climate Change* and *Strategic Policy 2 – Spatial Strategy* and specifically enshrined in *Planning Policy WER6 - Surface water drainage.*

SUDS is an internationally recognised methodology for managing surface water. A basic tenet of SUDS is that post-development run-off must not exceed pre-development run-off levels which is key to reducing the impact on the environment as well as protecting the network's capacity and forms the basis of the review I&E completes on every new development.

Ideally surface water is dealt with inside the boundary of the development via soakaway or a controlled discharge to an adjacent watercourse. This is not always possible so in some cases the controlled discharge is to a local surface water sewer (if present) or the combined sewer as a last resort. Where discharge must be to a combined sewer the requirement is for separate foul and surface water discharge pipes so that the surface water can be collected into any future surface water separation scheme by I&E.

Beyond SUDS is the Integrated Urban Drainage Management (IUDM) model. This considers the two most important aspects of flood risk management in a more holistic way. Firstly, the mechanisms of flooding can be complex, with floodwater originating from a variety of sources and being transmitted via complex flood pathways to impact a wide range of locations. Secondly, the responsibilities for urban flood risk management fall across a range of diverse stakeholders, from individual property owners through to large public and private bodies.

IUDM emphasises the need for different authorities responsible for different parts of the drainage system to work together to assess and manage flood risk, taking a long term, strategic approach. This is less relevant to Jersey given that many of the bodies who would be public stakeholders in the UK are represented by various departments of I&E. However, the principles of IUDM are applied by I&E and will be incorporated in the SWMP.

Currently I&E rely on Building Control to sign off on drain installations but this is not always completed and is not always within the experience of the Building Inspection team. As a result there is not always certainty that connections have been completed to the appropriate standard or are fully separated. I&E will review whether there is a need for them to carry out independent inspections, particularly on larger developments.

7.6. Meeting the demands of the Island Plan

7.6.1 Is there spare capacity?

As was discussed for the foul network, the surface water system is broadly operating at its limit and will struggle to accommodate large new developments as it stands. This is evidenced by reports of local flooding during heavy storm events and evidences the need to strictly apply Policy WER6 and the installation of SUDS on new developments.

Completion of the Surface Water Catchment Model and SWMP will be key to optimising the system and identifying the most urgent areas for reinforcement.

8. Population and Development Forecasting

8.1. Introduction

The most recent Census on Jersey was held on 21st March 2021 and the first 2021 Census Bulletin[48] was issued on 13th April 2022 giving an Island population of 103,276. Prior to this bulletin, the latest population figure had been an estimate of 107,800 in 2019.

The 2021 Census result is clearly significantly lower than the 2019 figure used in the Bridging Island Plan as a baseline but did represent growth of approximately 5,400 since the 2011 Census. The bulletin also includes some preliminary analysis of the Census findings but the review is expected to continue for some time and will be followed by updated population forecast models later in 2022.

In addition, the Island was subject to travel restrictions which may have affected the presence of people with other residences available to them, e.g. in the UK. Notwithstanding this, the figure does include 2,205 residents who responded as being absent from the Island on Census Day. The restrictions are also likely to have suppressed the number of short term residents that could be included, i.e. anyone who intended to stay longer than one month but not permanently. The data gathered from visitors for less than one month is also limited and so tourism trend data will not be meaningful.

As discussed elsewhere, the approach in issuing both the Bridging Island Plan and Bridging LWS is to respond to the need to develop strategies for the Island while acknowledging the significant uncertainty that has arisen from the coronavirus pandemic and Brexit. It appears that this uncertainty has manifested in the Census findings, resulting in a potentially volatile population figure, i.e. relaxation of the restrictions in 2021 noted above could lead to a period of rapid growth relative to the Census as economic conditions stabilise and improve.

The Statistics Jersey population models are expected to be available in 2023 and will consider these issues in full. These models will inform the 2025-35 Island Plan and be incorporated in the 2025-35 LWS. However, given the short time frame of the Bridging LWS it is considered most appropriate to maintain consistency with the model used in the Bridging Island Plan. While this will overestimate the population demands in the short term, it does not change the fact that the existing liquid waste network is known to be at its limit and so any over provision in the short term will only build resilience in the system for the longer term. No major, population sensitive projects will be committed to within this Bridging LWS time frame and this approach is likely to yield conservative forecasts for the longer term.

Prior to the 2021 Census Bulletin, the latest available data was the 2019 estimate, as referenced in the Infrastructure Capacity Study Report[49] (ICS) and the Bridging Island Plan. Both of these documents used a common growth model from the 2019 population of 107,800 to give a 2025 population of 112,600. Even allowing for a period of rapid population growth/return this is currently considered to represent a high growth scenario but is not excessive for strategic purposes.

Hence, I&E have concluded that consistency with the ICS and Bridging Island Plan figures is the preferred approach in the short term and a detailed reassessment for the medium and long term will

---

48 2021 Census Bulletin No.1
49 Infrastructure Capacity Study (2020 Arup)

take place during the Strategy Period in conjunction with the Island Plan team and Statistics Jersey's ongoing studies.

8.2. 2021 Population vs 2013 Forecasts

Statistics Jersey issued a range of possible growth scenarios in 2012 and these were used in the 2013 WWS to arrive at the basis of the design for the new Bellozanne STW of a design horizon Population Equivalent (PE) in 2035 of 118,000.

> One Population Equivalent is the organic biodegradable load having a five-day biochemical oxygen demand (BOD_5) of 60 g of oxygen per day.
>
> This is the average load produced by one person/day as defined in the European Union's Urban Waste-water Directive 91/271/EEC of 21 May 1991[50].
>
> Trade effluent loads from new businesses and industry are converted to the equivalent number of 'average persons' using this figure when they request a connection to the network. This provides a simple measure of capacity at the STW although the full chemical content of any effluent has to be assessed for how the works will cope with it.
>
> Jersey has no heavy industry and relatively little trade effluent in comparison with a similar UK catchment so this is not a major contributor to load at Bellozanne overall. There is, however, a higher than typical number of restaurants and hotels which can lead to high levels of fats, oil and grease (FOG) in the sewage. The new Inlet Works collects FOG and it is combined with sludge to generate biogas at Bellozanne.

Given the range of scenarios issued by Statistics Jersey the design for Bellozanne STW allowed for a further 20% growth based on carbonaceous treatment in terms of the load on the works but not for an increase in flow. The theoretical network Peak Flow (Formula A) for a design horizon of 2035 and a forecast PE of 118,000 is 2,260 l/sec increasing to 2,700 l/sec for a further 20% 'enhanced' growth, i.e. a PE of 141,600. However, the Peak Flow that can be accommodated at the New STW is 1,300 l/sec. Avoiding an increasing population resulting in both higher flow and load at the STW requires an extensive programme of surface water separation works and this has been discussed in Sections 6 and 7.

As will be shown below, up to 2019, the Statistics Jersey estimate of population growth was reasonably consistent with the predictions of the 2013 WWS but was slightly higher. If that trend had been confirmed by the Census then Bellozanne STW was expected to reach its design capacity earlier than expected.

However, the first 2021 Census Bulletin (issued on 13th April 2022) showed that population is lower than the latest forecast estimates had suggested. The ICS includes the following figures for the resident Island population between 2001 and 2019 and the same figures were used in the Bridging Island Plan:

2001	2003	2005	2007	2009	2011	2013	2015	2017	2019	2021
88,900	89,600	91,000	94,000	96,200	98,100	100,000	102,700	105,600	107,800	103,276

Table 8.2-1: Population data 2001 to 2019 with 2021 Census data highlighted

[50] EU Urban Wastewater Directive

As a comparison, the 2013 Wastewater Strategy (WWS) was based on I&E's projections from the 2011 Census which used the various scenarios identified by Statistics Jersey in 2012 to arrive at a 'most likely' resident population profile.

This 'most likely' profile is shown in the table below, extracted from the 2013 WWS , as 'Forecast' and was approximately +400hh (heads of household) based on an average occupancy of 2.6 people per property. All of the 2012 scenarios predicted that the level of occupancy would reduce after 2028, and in some but not all scenarios, this resulted in a declining population in the future.

Note that there is a slight discrepancy in the 2011 figure between the 2013 WWS extract (97,857) and the more recent data (98,100). This is not considered significant and is assumed to be due to subsequent refinement of the 2011 Census data by Statistics Jersey.

Scenario	2011	2015	2020	2028	2035	2065
Net NIL	97,857	97,857	97,857	96,597	95,757	80,757
+150hh	97,857	99,457	101,157	103,377	104,857	103,457
+200hh	97,857	99,957	102,157	105,637	107,957	111,057
+250hh	97,857	100,457	103,257	107,937	111,057	118,757
+325hh	97,857	101,257	104,957	111,377	115,657	130,257
Forecast	97,857	102,112	107,431	109,811	111,131	109,731
+650hh	97,857	104,557	111,857	126,017	135,457	179,957

Table 8.2-2: Population forecast models extracted from the 2013 WWS

The Infrastructure Capacity Study Report and the 2020 Preferred Strategy Report discuss growth per year of +800 for the five years 2020-2024 and +1000 thereafter. A resident population in 2019 and 2021 was not considered in the 2013 WWS but has been interpolated from the above table for comparison purposes.

	2015	2019	2020	2021
2013 Forecast	102,112 (forecast)	106,367 (interpolated)	107,431	107,729
2019 data	102,700 (SJ*)	107,800 (SJ*)	108,600 (2019 + 800)	109,400 (2019 + 1,600)
Difference to forecast	**+588**	**+1,433**	**+1,169**	**+1,671**
2021 Census	--	--	--	103,276
Census difference to forecasts				**-4,453 (2013)** **-6,124 (2019)**

* SJ denotes estimated by Statistics Jersey

Table 8.2-3: Predictions of 2021 resident population

Given the inherent uncertainties of predicting population, the 2020 figure predicted in 2013 compares reasonably well with the Statistics Jersey 2019 figures. However, by looking back to the 2015 figures it is clear that it was at this point that the growth models diverged.

The 2021 Census indicates actual growth has been approximately 50% of the forecasts but this is likely to have been suppressed to a degree by the combination of the pandemic and Brexit. This suppression could easily be reversed in part or in full in a relatively short time frame as economic conditions restabilise.

8.3. 2021 growth models from the Statistics Jersey Team

New population models are expected to be released based on the Census data in 2023 but recent studies and reports have used the following preliminary models:

1. The Infrastructure Capacity Study Report discusses growth per year of +800 up to 2025 and +1000 thereafter without an indication of an end date for this level of growth although the report only considers the period up to 2034.
2. The 2020 Preferred Strategy Report expands this to inward migration of 3,500 over five years (+700/year 2020-24) plus natural growth of +100/year, ie. +800/year. This allows for suppressed migration due to the pandemic and Brexit of a similar order to that seen following the economic crash of 2008, ie. approximately 35% lower than previous years.
   2025 onwards is then at pre-Brexit levels of +1,000/year and notes that the next Island Plan will be for the period 2025-2034 so constant growth at this level is implied.
3. The Bridging Island Plan uses the same assumptions for 2021-25 ie. a total of 4,000 in the period with an average of +800/year although it also notes that inward migration is expected to slowly increase per year between 2020 and 2025. Longer term growth is expected to return to pre-Brexit levels of approximately +1,100/ year.

Projecting from the 2019 population estimate and 2021 Census through to 2065 using the above assumptions for comparison with the 2013 WWS gives the following predictions for resident population:

Growth :		+800/year to 2024			+1000/year from 2025			
Year	**2019**	**2020**	**2021**	**2024**	**2028**	**2030**	**2035**	**2065**
2021 Forecast	107,800	108,600	109,400	111,800	115,600	117,600	122,600	152,600
2013 Forecast	106,367 #	107,431	107,729	108,621 #	109,811	110,188 #	111,131	109,731
2021 Census	--	--	**103,276**	105,676	109,476	111,476	116,476	146,476

Interpolated values calculated from the 2013 Forecast in Table 8.2.1.2

Table 8.3-1: Resident population forecasts compared with Census

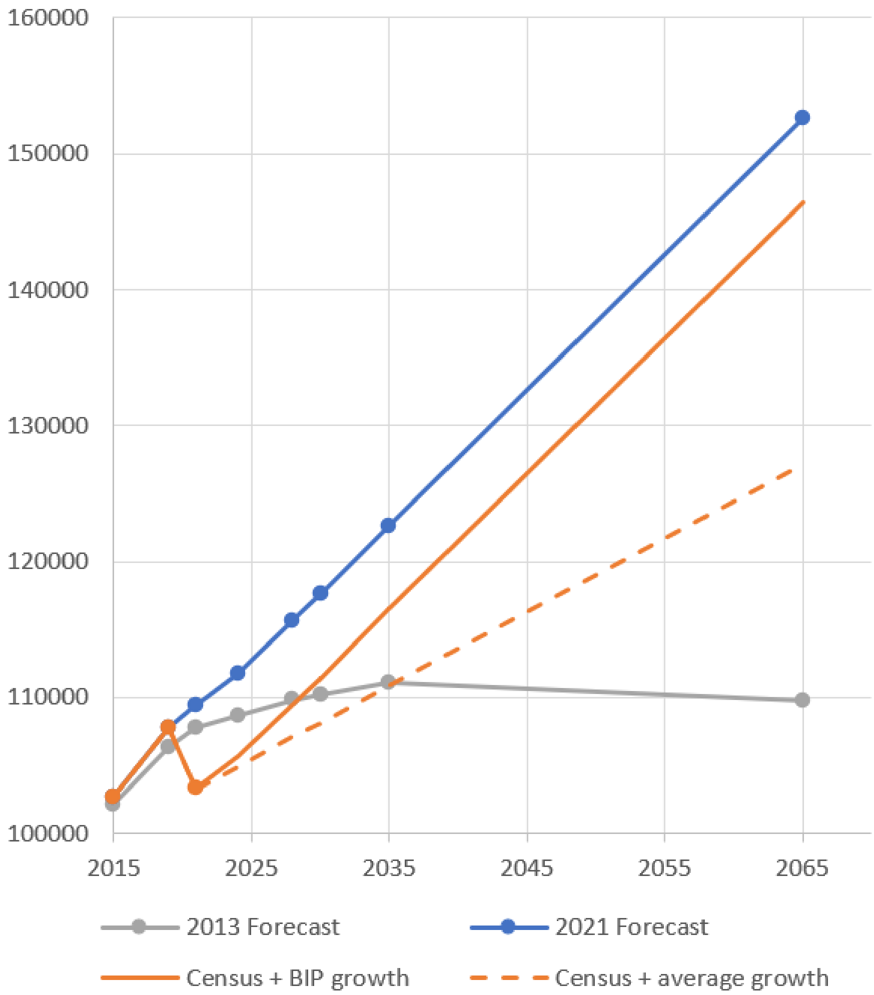


Figure 8.3A: Resident population forecasts compared with Census graph

Assuming continuous population growth will re-establish either with or without a period of rapid 'bounce back' the housing development identified in the Island Plan will still be required and the availability of sites and acceptability to existing residents could become a governing factor on whether the original long term population growth can be achieved as predicted. The dashed line in the above graph is based on continuing the average actual growth seen between 2011 and 2021 of +542/year.

In 2013 the models generally predicted a slowing of growth after 2035, if not a reduction in population, and while the Bridging Island Plan had not predicted this will be the case, the new models to be issued by Statistics Jersey based on the Census data may well result in a re-evaluation of the long term figures.

Projecting from the 2021 Census figure using the Bridging Island Plan model predicts that population will match the 2013 forecast in 2030 and in 2035 using the average actual growth.

8.4. Population growth vs Bellozanne STW capacity

The design horizon for Bellozanne STW was set at 2035 with a PE of 118,000. In addition to this, the design also took account of a further 20% growth to 141,600 based on carbonaceous treatment and provided that there would be no changes to the effluent Discharge Consent.

Initially it was intended that additional capacity would either only be built when needed or would be built as part of the ongoing project but not fully commissioned. However, it became clear that the efficiencies in constructing and commissioning identical assets at the same time were substantial and these works have been incorporated in the constructed scope to provide flexibility.

Section 6.3 discussed the fact that as PE grows above 118,000 there will be an increasing need to manage the flow of sewage by reducing the amount of surface water in the foul system. However, even with this caveat, the decision appears to have been fully justified as the current population forecasts (shown below) indicate that the PE will exceed 118,000 before the original 2035 design horizon if tourism and visitor numbers quickly return to pre-pandemic levels.

8.4.1 2013 Connected Population Forecast

The population connected to Bellozanne STW calculated in the 2013 WWS was based on a number of assumptions with the 2011 Census population as the starting point.

These assumptions are summarised below.

	assumption	2020	2028	2030	2035	2065
2011 Resident population : 97,857	87% connected			85,136		
Tourists : 14,900	87% connected			12,963		
Seasonal workers and Visiting Friends and Relatives : 4,249	87% connected			3,697		
New connections of existing properties (cumulative from 2008 to 2028)	70 prop/year (occupancy varies)	1,869	3,057	3,057	3,010	3,010
Population growth including new developments (cumulative from 2011)	100% connected	9,574	11,954	12,331	13,274	11,874
2013 Forecast		**113,238**	**116,806**	**117,184**	**118,079**	**116,679**

Table 8.4.1-1: Connected Population Forecast 2013

Given the natural uncertainty in predicting population, and in order to allow for some additional growth, the Bellozanne STW was then designed to be easily upgraded to accept a potential increase in connected PE to up to 120% of the horizon, ie. 141,600. This upper limit was based on carbonaceous treatment and the assumption that there would be no changes to the effluent Discharge Consent. The design Peak Flow (Formula A) for a design horizon of 2035 and a forecast PE of 118,000 is 2,260 l/sec and this will increase to 2,700 l/sec for a further 20% 'enhanced' growth, i.e. a PE of 141,600. However, the Peak Flow that can be accommodated at the New STW is 1,300 l/sec.

It should be noted that while the flow to the STW is limited to 1300l/s the flow that receives full treatment will increase from 813l/s to 976l/s as population increases. The flow that can be treated is closely related to the load in the incoming flow to ensure that the biological process is maintained and not 'washed out' by long term dilute flows. Therefore, as population increases there must be a continuous programme of works to separate surface water from the network and maintain the sewage concentration while also managing the flow arriving at Bellozanne.

8.4.1.1. 2021 Connected Population Forecast

The latest assessment of residential and commercial properties connected to the sewer network based on I&E's network model is shown in the table below.

While the rates of connection vary in each parish the overall rate of connection of residential properties is currently 92.2%. The equivalent figure for commercial properties is 85.7% and the overall connection rate is 91.4%.

This shows that the overall connection rate has improved since 2013 and this is for a variety of reasons as discussed in Section 3.4.3.

The table below shows the connection rates by parish and type of property (residential or commercial).

	Residential			Commercial		
	connected	not connected	connected %	connected	not connected	connected %
Grouville	2,163	195	91.7%	82	42	66.1%
St Brelade	4,747	436	91.6%	316	119	72.6%
St Clement	4,024	80	98.1%	105	43	70.9%
St Helier	19,493	444	97.8%	3,705	298	92.6%
St John	989	288	77.4%	83	81	50.6%
St Lawrence	2,033	416	83.0%	123	29	80.9%
St Martin	1,396	351	79.9%	108	36	75.0%
St Mary	520	209	71.3%	30	24	55.6%
St Ouen	1,333	438	75.3%	98	36	73.1%
St Peter	2,104	440	82.7%	244	80	75.3%
St Saviour	5,941	226	96.3%	336	57	85.5%
Trinity	1,060	371	74.1%	168	59	74.0%
Totals	**45,803**	**3,894**		**5,398**	**904**	
	49,697			**6,302**		
Connected %			**92.16%**			**85.66%**
	91.43%					

Table 8.4.1-2: Connected properties in 2021

In order to regenerate the connected PE forecast the following assumptions have been used or adapted from the 2013 WWS.

1. The latest residential connection rate has been applied to the 2019 population figure.
2. The 2013 WWS assumption that Tourist and other Seasonal populations would remain constant over time has been retained.
3. The latest commercial connection rate has been applied to figures for Tourists, Seasonal Workers and 'Visiting Friends and Relatives'.
4. The rate of new connections of existing properties has been kept at 70/year but, given the current predictions of continuous growth up to at least 2035, the occupancy of existing houses connected to the network has been made constant at the 2011 value of 2.3 people/house rather than the new build occupancy of 2.6 people/house.
5. New connections of existing properties have been applied for 2022-2028. This retains the original 2008-2028 programme of connections and assumes that all new connections up to 2021 are included in the above data.

6. 100% of population growth from 2019 onwards is connected to the network, primarily through new development

Assumption 3 is noted as likely to marginally underestimate the connected population as people visiting friends and relatives are likely to stay at their house and would therefore fall under the residential connection rate. In contrast, Assumption 6 is likely to marginally overestimate the connected population as some growth, whether from inward migration or births, must be accommodated in existing properties. In combination, and for the purposes of this strategy, the overall impact of these assumptions is considered negligible. Applying these assumptions to the 2019 population figure gives the following prediction of connected population.

	assumption	2020	2028	2030	2035	2065
2019 Resident population : 107,800	92.2% connected	99,353				
Tourists : 14,900	85.7% connected	12,763				
Seasonal workers and Visiting Friends and Relatives : 4,249	85.7% connected	3,639				
New connections of existing properties (cumulative from 2019 to 2028)	70 prop/year (occupancy of 2.3)	incl.	1,127	1,127	1,127	1,127
Population growth including new developments (cumulative from 2019)	100% connected	800	8,000	10,000	15,000	45,000
2019 Projection		**116,555**	**124,882**	**126,882**	**131,882**	**161,882**

Table 8.4.1-3 : Connected Population Forecast projected from 2019

Completing the same analysis for the 2021 Census result gives the following:

	assumption	2021	2028	2030	2035	2065
2021 Census : 103,276	92.2% connected	95,184				
Tourists : 14,900	85.7% connected	12,763				
Seasonal workers etc : 4,249	85.7% connected	3,639				
New connections of existing properties	70 prop/year	incl.	1,127	1,127	1,127	1,127
Population growth	100% connected	incl.	7,000	9,000	14,000	44,000
2021 Census Forecast		**111,586**	**119,713**	**121,713**	**126,713**	**156,713**

Table 8.4.1-4: Connected Population Forecast projected from 2021 Census

A comparison of the 2013 and 2021 Resident and Connected Population Forecasts is shown in Table 8.4.1-5 below. It is important to note that these figures can only be considered as indicative until the new Jersey Statistics population models are released in 2023 when this analysis will be repeated. For the purposes of the Bridging LWS, the analysis is considered to be robust and potentially the worst case scenario in the short term.

		2021	2028	2030	2035	2065
2013 Resident		107,729	109,811	110,188 (interpolated)	111,131	109,731
2019 Projection Resident		109,400	115,600	117,600	122,600	152,600
2021 Census Resident		103,276	109,476	111,476	116,476	146,476
Change in Residents	**2019 :**	**+1,169**	**+5,989**	**+7,612**	**+11,669**	**+43,069**
	2021 :	**-4,453**	**-335**	**+1,288**	**+5,345**	**+36,745**
2013 Connected		113,238	116,806	117,184	118,079	116,679
2019 Projection Connected		116,555	124,882	126,882	131,882	161,882
2021 Census Connected		111,586	119,713	121,713	126,713	156,713
Change in Connected	**2019 :**	**+3,317**	**+8,076**	**+9,698**	**+13,803**	**+45,203**
	2021 :	**-1,652**	**+2,907**	**+4,529**	**+8,634**	**+40,034**

Table 8.4.1-5: Connected Population comparison 2013 to 2021

Based on the Forecasts above, the PE connected to Bellozanne STW will reach its original design horizon (118,000) and the enhanced horizon (141,600), based on carbonaceous treatment and provided that there would be no changes to the effluent Discharge Consent, in the following years.

	Condition	118,000	141,600
In Peak Tourist Season	2019 Projection	2022	2045
	2021 Census forecast	2027	2050
Off peak (including visiting friends etc)	2019 Projection	2034	2057
	2021 Census forecast	2039	2063

Table 8.4.1-6: Design Horizon years

Horizon years for peak and off-peak population have been identified separately because only considering the August tourism peak would be unnecessarily conservative when the STW will be more than capable of managing a short spike in load, particularly as the surface water element of the incoming flow should be relatively low. The off-peak condition is more representative of the underlying capacity available but it must be considered that Jersey's tourist season typically begins at Easter and continues through to September or October. There will therefore be a point at which the extended summer population peak is above 118,000 for long enough to warrant bringing the additional capacity online. This will become apparent from the active ongoing monitoring of influent and effluent quality as well as interstage testing at the works.

In broad terms, using the information available in Q2 2022, Table 8.4.1 suggests that Bellozanne STW will be adequate to meet demands, including holiday season peaks, up to its design horizon of 2035.

Treatment capacity appears to be potentially available up to 2050 but this is dependent upon the effluent quality required and will rely on surface water being separated from the network to offset the increasing population's sewage.

Furthermore, the dates also confirm that it is prudent to proceed using the 2019 projections, consistent with the Bridging Island Plan and ICS, in the short term of the Bridging LWS. It is anticipated that the release of new growth models in 2023 will provide further clarity in time to plan for the long term in the 2025-35 LWS.

If observed growth should begin to trend towards the upper range of the 2019 projection figures in the future, or if surface water cannot adequately be separated in the existing network, then construction of additional treatment capacity will need to be considered and a major concern is that there is no space for this at Bellozanne.

Provision has been made for Bellozanne STW to leave space for additional treatment capacity to achieve a higher standard of effluent in the future if required. This is discussed in detail in Section 6.3 and the area identified is over the old FSTs. Even if another location is used to allow for future provision, the old FST area cannot be used to meaningfully increase flow through the works because of the constraints arising from the layout of the necessary process assets.

Construction of other assets in this space could preclude any future improvement in effluent quality unless an alternative provision is found. The options for this are discussed in detail in Section 9.3.

While the likelihood of the enhanced design horizon actually being reached cannot currently be established, if no additional treatment capacity is constructed then all wastewater on the island must be transferred to Bellozanne through the existing sewer network. This is already understood not to be feasible and the existing network will require significant improvement and reinforcement in order to meet that future demand.

Given the potential cost and disruption caused by such improvement works, particularly where the existing network passes through St Helier, a separate STW that takes a proportion of the flow may prove to be a more cost effective solution for the Island as a whole even if Bellozanne has not reached its design limit.

The cost-benefit balance for this comparison is particularly sensitive to where new development takes place and how it then impacts on the network.

8.5. Island Plan Development strategy

8.5.1 Strategic Policies

The Strategic Proposals and Policies discussed in Sections 4.3 and 4.4 and as applied via the Bridging Island Plan take steps to address the provision of and affordability of homes on Jersey. The key intended outcomes of these policies are summarised in the Bridging Island Plan as follows.

8.5.1.1. Addressing the identified backlog of new housing

In 2019, Statistics Jersey estimated that during the period 2011-20 a shortfall of some 1,800 houses had arisen as the population grew but new housing was not built. In addition to this, the Objective Assessment of Housing Need (OAHN) identified that a minimum of 6,100 new homes will be required over the ten-year period of 2021-30.

The OAHN methodology includes provision for migration, people living longer and household size continuing to reduce. The OAHN also assesses the type of housing required against all tenures (non-qualified; owner occupier; qualified rent; social rent).

The Bridging Island Plan refers to this as a 'backlog of homes' of a minimum of 7,900 properties and sets out the intention to address at least 50% of this before the end of 2025.

8.5.1.2. Up to 4,300 new homes including affordable homes

From the intent of addressing half of the housing backlog by the end of 2025, the draft Bridging Island Plan included making provision for up to 4,150 new homes in a range of types, sizes and tenures to meet the island's different housing needs. Following approval, the final Bridging Island Plan has increased this figure to 4,300 with at least some of the increase being attributed to provision of homes for key workers. This is defined in Policy H3 – Provision of Homes.

Policy H3 – Provision of homes

The plan makes provision for the supply of up to 4,300 homes (up to the end 2025) to provide:

- up to 1,650 affordable homes (including key worker accommodation)
- up to 2,650 open market homes

To enable the supply of homes, proposals for residential development will be supported in the island's built-up areas; and on sites specifically allocated for the provision of up to 600 affordable homes.

Development proposals which would result in a net loss of housing units will not be supported except where:

i. the proposal would result in the replacement of substandard accommodation with homes that meet current standards; or
ii. the replacement homes would better meet the island's housing need in terms of size, type and/or tenure.

At an average occupancy of 2.6 people, 4,300 homes represent a population of 11,180. This will clearly not all be from population growth up to 2025 because much of the backlog is addressing the lack of available housing stock, particularly in the case of affordable homes. The 1,650 affordable homes, at the same level of occupancy, represent a population of 4,290.

This approach is intended to align with new housing policies that update and improve the range of affordable housing products and ensure all affordable homes are allocated through the Housing Gateway in line with relevant criteria.

With regard to the impact on the Liquid Waste Strategy, this initial phase of house building is therefore not particularly creating an issue of load on Bellozanne STW but the redistribution of population around the island could significantly impact the network and this will need to be addressed rapidly.

I&E's preliminary investigations suggest that this will entail construction of large storage tanks in the network at a cost of several million pounds.

It is not currently clear how the 2021 Census result will affect the programme for construction of the housing backlog, however, the market forces identified in the Bridging Island Plan and the need for more affordable homes is unchanged so more houses will be required at some point.

As will be discussed in detail below, there are not currently enough sites identified to accommodate the 4,300 property aspiration and even the sites included in Policy H5 will not accommodate the planned 1,650 affordable homes by 2025. Notwithstanding this, the number of affordable homes is expected to remain the minimum target for 2025.

The Census identified some 4,027 private dwellings as unoccupied in 2021 and the Bridging Island Plan identified 5% of the shortfall (nominally 200 properties) as coming from release of existing property for any reason.

Sites for new affordable homes will extend established main and local centres. The concern for I&E is that this increases the stress on the existing network which is generally near, at or even over capacity already.

8.5.1.3. Appropriate housing stock

New housing will provide a mix of property allowing people to ‘right-size’. In conjunction with the policy of expanding existing centres, this recognizes the fact that some residents might choose to move and, in so doing, release larger houses to become affordable family homes, if they could remain within their current local community.

8.5.1.4. Use of publicly owned land and buildings for housing

The Government of Jersey’s Public Estates Strategy[51] is to maximise the use of publicly owned land and buildings to support the development of new affordable homes.

8.5.2 Development locations – the Spatial Strategy

The 2020 Island Plan Review notes that the spatial strategy of the current and previous Island Plans has generally been based on the principle of integrating development within the island’s existing built-up areas. The town of St Helier has therefore absorbed much of the island’s economic and population growth, spilling beyond the boundaries of the parish of St Helier to include parts of the parishes of St Saviour and St Clement, and also the reclamation of land to expand the town and meet other strategic requirements.

This has encouraged the re-use and redevelopment of land that has already been developed, often resulting in more dense forms of development and hence more efficient use of the land. In parallel with this there has been limited release of greenfield land on the edge of existing built-up areas to provide new affordable housing, usually in the form of family homes. This form of development has occurred principally in the parishes of St Clement, St Saviour and St Brelade, together with the more limited release of land around some of the island’s rural parish centres.

As noted above, meeting the higher forecast of demand requires in the region of 4,300 houses by the end of 2025 and a minimum of a further 3,600 homes by the end of 2030. If population growth remains at a consistent rate after 2030 then house building will have to keep up but these longer-term strategic considerations will form part of the Island Plan for the period 2025-2034.

---

[51] Island Public Estate Strategy 2021-35

The strategic direction of the spatial strategy is to:

- focus development in the Town of St Helier
    - facilitate the development of key urban opportunity sites
    - use public land to meet immediate needs
- generally maintain the existing definition of built-up areas
    - encourage the re-use and redevelopment of already developed land at higher densities, appropriate to the context.
- enable the sustainable and proportionate growth of some built-up areas – involving the planned release of greenfield land including
    - extending some built-up area edges
    - around some parish centres, where this contributes to the overall community wellbeing and sustainability of an existing settlement
- limit development around the undeveloped coast and in the countryside to those uses which require a specific location.
- positive consideration of future land-reclamation proposals in St Helier.

The location of all of the initial 4,300 homes has not been confirmed at time of writing but preliminary indications are that new housing will be built first near St Peters and Les Quennevais/St Brelade and so the focus of the Bridging LWS is on the North and West of the Island as well as St Helier as mentioned in the above summary. The next phase after 2025 is likely to be associated with the newly announced Five Oaks Master Plan, see below.

The Bridging Island Plan recognises that the strategy of growing St Helier has the potential, over time, to create additional challenges for Town residents if there is not also continual improvement of the experience of town living by, for example, increasing access to open space, reducing the impact of vehicles, protecting the character of Town, and improving the public realm and access to community facilities and amenities. This challenge was demonstrated in the findings of the Jersey Opinions and Lifestyle Survey 2018[52], which found that just 36% of St Helier residents were satisfied with their local neighbourhood, compared to 81% of residents of rural parishes and 63% of largely suburban parishes.

None of the above has been found to consider the need to maintain an appropriate level of basic services wherever development takes place and even the Infrastructure Capacity Study does not specifically address Liquid Waste disposal. As has been noted elsewhere, for the period up to 2030 I&E's primary concern with new developments is not with the available treatment capacity at Bellozanne but with how the additional wastewater is transferred to the STW site and that additional surface water runoff does not enter the sewer network.

In the centre of St Helier this can only be achieved through improvements to the network by upsizing existing pipes and/or installing separate surface water pipes. This work is inherently disruptive and often only permitted in short windows. Rural areas are less constrained in terms of timing but are typically larger schemes which can be just as disruptive as one in the town centre.

The way in which development is approved, allowed to start construction and be occupied must take account of the availability of these basic public health requirements.

[52] Jersey Opinions and Lifestyle Survey (2018)

8.5.3 Property demand vs availability – the need for a planned sequence of development

Development proposals are commercially sensitive and hence confidential. With that in mind the plan below is only indicative and shows those developments that I&E have been approached to assess for planning permission up to the end of 2021. This does not include the development at Les Quennevais which is mentioned in Strategic Proposal 4 or anything associated with the new Five Oaks Master Plan.

Proposal 23 – Five Oaks masterplan

The Minister for the Environment will bring forward a masterplan for Five Oaks, during the bridging plan period, in consultation with key stakeholders, including the Parish, Andium Homes, other landowners, local residents and their children, and businesses which will include consideration of travel and transport improvements, particularly for active travel (walking and cycling); the provision of community facilities and open space; and future employment land opportunities.

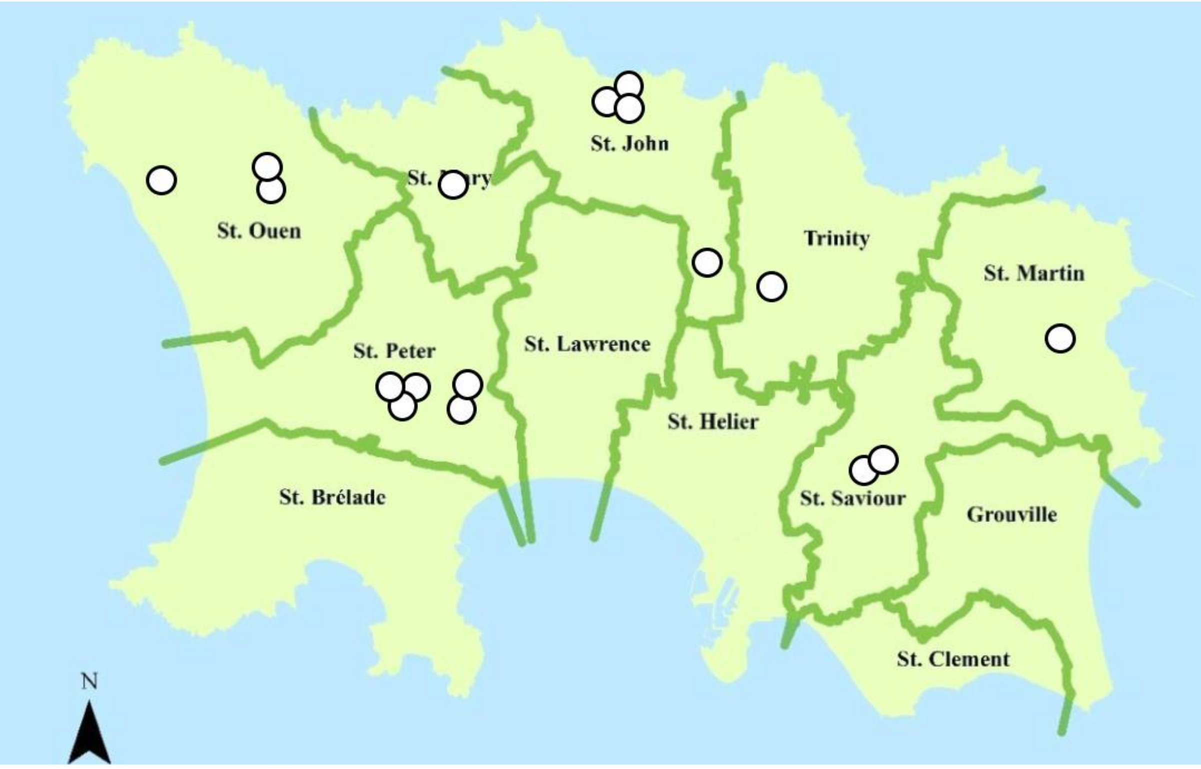


Figure 8.5A: Greenfield developments (indicative only)

At time of writing, the majority of these sites are supported by Policy H5 for provision of affordable homes, see Section 4.4, but do not have confirmed numbers or types of properties attached to them so the population associated with these sites can only be estimated.

The sites in Policy H5 total a little over 12 hectares and at the Bridging Island Plan's indicative housing density of 35 dwellings per hectare would accommodate 425 affordable properties and approximately 1,105 people at average occupancy. It is feasible for developments to reach up to 45 dwellings per hectare which would give upper values of 547 dwellings and 1,423 occupants.

It should be noted that the figures for new properties up to 2025 include those that were under construction or had planning permission at the end of 2020, ie 625. The developments shown in the above plan would therefore represent the next ‘wave’ of developments after those with approval in late 2020. Further sites are clearly required if the 2025 target is to be met and the Bridging Island Plan acknowledges there is no certainty that sites will be available. It notes that demand for land will drive up prices which in turn will increase the cost of the properties themselves which obviously runs counter to creating more affordable homes. The Island Plan does, however, identify the North and West of Jersey as the preferred areas for house building as well as ongoing development in and around St Helier.

The final Bridging Island Plan also brings forward a proposal for a Five Oaks Master Plan and this is likely to be the basis for the first areas of development in the east of the Island after 2025. No detail of the Master Plan is currently available but a number of significant Planning Applications around the Five Oaks area are under review and it is clear that reinforcement of the sewer networks will be required.

Strategic Policy SP2 is the Spatial Strategy and the Island Plan uses this to consider where new development may be carried out as shown in Section 4.4. The timing is at least as important as the size and location of the new development when I&E are assessing which parts of the sewer network need upgrades and reinforcement. There is little or no capacity available in the existing network to accommodate large developments. To clarify, there may be capacity in the immediate vicinity of a proposed site but at some point between that location and Bellozanne STW there will be a restriction that has to be addressed. It is I&E’s view that some, if not all, of these upgrade works should be funded by the relevant developer and this is supported by Policy WER7. However, where such development is being driven to directly satisfy the Island Plan, especially in relation to affordable housing, it may be deemed appropriate for States funding to be made available

For large developments it is unlikely that such a restriction will be overcome by simple works such as upgrading the existing pumps and additional works will be required such as:

- sewer upsizing;
- addition of a surface water sewer;
- rising main replacement;
- additional PS storage or replacement of the pumping station as a whole; and,
- network storage tanks and flow attenuation.

Any given restriction may affect several locations and it is essential that any design is future proof for both confirmed and potential development in order to avoid the same issue recurring in the near future. In combination this means that the works required in the Liquid Waste system to accommodate this population growth will be both substantial and wide ranging. Furthermore, it should be noted that funding is not always the critical issue when major upgrades are required. A theoretical solution can usually be identified but the existing practical constraints on site can prevent it from being implemented.

I&E will be seeking a clearly defined sequence or prioritization of the development sites so that the network and treatment improvements can be optimised. Analysis of the information available to this Bridging LWS has identified a number of key strategic schemes that must be progressed immediately although the quantum cannot be defined without details of the development to take place, eg. a storage tank at St Peters has been identified but the required volume cannot be finalised.

This is discussed further in Section 9.

9. Liquid Waste Programme of Works

9.1. Introduction

In the absence of the new population growth models; and any certainty of size, location and timing of new housing developments it is difficult to set firm dates for many aspects of the expected Liquid Waste improvement works.

The studies discussed above have confirmed that reinforcement and expansion of the Liquid Waste network is required and where these improvements are likely to be best placed. However, there is little specific data available that would allow prioritisation of these works to efficiently meet demand as it grows.

Larger projects or programmes of work will generally go through a standard sequence of:

1. Feasibility
2. Design and Planning
3. Construction

Sufficient visibility of relevant data is essential in order to ensure that the full sequence can be properly completed in order to avoid abortive work or rushed development of inadequate or excessive solutions. Major schemes can be extremely disruptive to the public, subject to planning permission and expensive, all of which can extend the programme for their completion while the appropriate approvals are obtained. Furthermore, in some cases they will require land purchase, possibly via a compulsory purchase mechanism, which will further extend the time required to deliver the new asset.

Due consideration must be given to the fact that, in many cases, it will not be possible to have new large developments occupied until the relevant network improvements are in place so it is essential that the Liquid Waste works are sufficiently informed as to be kept ahead of the house building programme.

Given that this Bridging LWS is focussed on the period 2023-26, the projects to be constructed are largely driven by existing pressures in the system and are readily identified. These schemes are also relatively unaffected by uncertainty around population growth following the 2021 Census Bulletin. It is the projects that will need to be constructed early in the LWS period of 2025-35, and which should therefore be in the Feasibility and Design stages in 2023-26, that are difficult to identify, prioritise and/or properly assess from the currently available data.

The locations of the earliest housing development have been confirmed as being in the North and West of Jersey and around St Helier but the level of occupancy has not been confirmed. Assumptions have therefore been made in order to obtain an indicative scope of works but this will need to be confirmed in time for the relevant Feasibility Studies to be carried out.

This section identifies the works required in the short (2023-26), medium (2025-35) and long term (beyond 2035). Schemes in the latter part of medium term and long term will be fluid between the two periods but this will be clarified by the Full LWS.

9.2. Short term – ongoing and starting before 2026

A number of projects have been confirmed to start in 2022/23 or are under way having started in 2021. Also included here are rolling programmes that will continue beyond 2026.

9.2.1 West Park Surface Water Outfall

This is an ongoing project, currently in the Feasibility Stage as of early 2022. The Feasibility Stage includes an Environmental Impact Assessment (EIA) Scoping Report to assess whether an EIA is required.

Initially identified to provide Surface Water Separation in the local area to free capacity at First Tower PS and Bellozanne STW, it will also provide an outlet for future separation schemes in St Helier. Its route affects St Aubin's Road, Lower Park and Victoria Avenue and introduces a new surface water discharge into St Aubin's Bay.

The project has been reprioritised so that it can be completed in time to service the Our Hospital Project (OHP). The Minister for Environment has granted permission for the proposed development subject to certain conditions and Planning Obligation Agreements. The pipework to serve the OHP site will now be included as part of the scheme.

9.2.2 Bonne Nuit STW

Replacement of Bonne Nuit STW with a Pumping Station or full refit of life expired equipment are being considered.

The need for works at Bonne Nuit has been confirmed but is subject to a Feasibility Study to confirm whether a direct pumped solution is viable. If this is not viable, the full suite of STW equipment will be replaced.

In addition to these base options, a transfer pumping station solution may offer an opportunity to transfer a number of properties between Bonne Nuit and St John's Village off septic tanks and onto mains sewage. This would be consistent with I&E policy but would significantly increase the cost of the project.

Construction is likely to be phased with the rising main from Bonne Nuit to St Johns completed first so that a temporary pumping station can be installed. The Bonne Nuit STW will then be converted to the permanent Pumping Station within its existing footprint. It is expected that the initial feasibility study / concept design, detailed design and construction of both phases can be completed by the end of 2024.

Including a foul sewer extension to transfer the intervening properties on to mains sewage may extend the programme into 2025 simply because of the potential disruption to local roads.

Preliminary modelling has shown that discharge of flows from Bonne Nuit into the existing St John's sewer to Bellozanne STW should be acceptable but further review in conjunction with future housing development is required as this becomes clear. Only small greenfield developments have been identified so far and any larger developments that contribute to this catchment could be a key trigger for construction of additional treatment capacity away from Bellozanne.

9.2.3 Emerging Projects – overall for the LWS

In addition to the projects and programmes that have already been identified for construction within the period of the Bridging LWS there are longer term projects that will require Feasibility Studies and Outline or Concept Designs completed in order for them to be constructed in the early years of the 2025-35 LWS.

Based on the data available in early 2022, these projects are those that are particularly associated with providing capacity for the housing developments proposed in the Bridging Island Plan. The network as a whole is generally at its limit of capacity but is just coping with the existing population. As has been discussed in Section 8.5, the proposed housing is required to meet both an existing shortage and the forecast population growth. This means that the new homes will both increase demand on the network and redistribute the existing demand to new locations.

Given that the network has little spare capacity, both growth and redistribution can create problems that need to be addressed before the relevant developments can be occupied. To further complicate the position, the Bridging Island Plan states that not enough sites have yet been identified to accommodate all of the 4,300 properties that the Plan proposes to build by 2025.

For the period to 2025 the Bridging Island Plan indicates that the most likely areas for development will be around St Helier and in the North and West of the Island; namely St Peter, Les Quennevais/St Brelade. The Island Plan also brings forward a proposal to develop a master plan for Five Oaks and so this is anticipated to be one area of significant development in the east after 2025.

In addition, projects in the South and East of the Island have been identified that are needed to address known restrictions in the network that can currently cause problems in storm conditions and therefore preclude significant development.

All of these potential schemes have been identified as the ‘Emerging LWS Projects’ which reflects the fact they are known to be needed but are currently difficult to quantify and/or prioritise. Based on the indications in the Island Plan, for the purposes of the Bridging LWS, they have been divided as the North and West schemes in the short term to 2025 and the South and East schemes in the medium term 2025-35 although some preliminary work is expected in 2024, particularly around Five Oaks.

In addition to the Emerging Projects it is anticipated that the ongoing programme of foul and surface water sewer extensions will also support local housing development around the Island.

9.2.4 Emerging Projects – North and West

It is understood that the first major development away from St Helier is likely to be at St Peter but the Bridging Island Plan also refers to significant development at Les Quennevais which will affect the volume of storage required at St Brelade. Further details of these developments will be required for the assessment of storage volumes to be completed but the current issues can be summarised as:

- Balance flows from St Peter of ~80l/s, additional demand from new development(s) to be confirmed.
- Balance flows from St Brelade and Les Quennevais of ~270l/ s, additional demand from new development(s) to be confirmed.
- Balance flows from Beaumont of ~50l/s, additional demand from new development(s) to be confirmed.

The flow from the Beaumont catchment should be reduced by a Surface Water Separation scheme that has been identified for 2023. This is, however, a small proportion of the total flow that transits through the pumping station from the west of Jersey and will not reduce the need for the wider network improvements.

	Works at St Peters / Airport	Works in St Brelade area	Works at Beaumont PS	Comment
Option 1 Balance flows at three locations	Storage at Airport for St Peter, St Ouen and St Mary	Storage at St Brelade for St Brelade and Les Quennevais	Storage at Beaumont for Beaumont, remove return pipework	Providing some storage at Beaumont potentially reduces the volumes required at St Peters or St Brelade.
Option 2 Balance flows in two locations upstream so Beaumont is a free discharge	Storage at Airport for St Peter, St Ouen and St Mary	Storage at St Brelade for St Brelade and Les Quennevais	No storage at Beaumont, remove return pipework	Splits storage across locations most likely to be able to accommodate it.
Option 3 Balance at one location – St Brelade	Upsize sewer through Airport	Storage at St Brelade for St Peter, St Ouen, St Mary, St Brelade and Les Quennevais	No storage at Beaumont, remove return pipework	Single storage facility likely to be too big to be a practical solution.
Option 4 Balance at one location – Beaumont	Upsize sewer through Airport	Upsize sewers through Les Vaux and St Aubin	Storage at Beaumont, remove return pipework	Previously discounted as volume required cannot be accommodated close to Beaumont

Table 9.2.4-1: Emerging LWS Schemes and Options in the North and West of Jersey

9.2.5 Drainage Capacity Upgrades – Island Wide

9.2.5.1. Rising Mains Replacement Programme

Individual schemes will be prioritised to suit both currently identified issues and development priorities when these become clear. One such project at Fountain Lane PS is described in Appendix E and is programmed for 2022/23.

The rising main programme will be coordinated with the Pumping Station Asset Replacement and Minor Capital Programme to maximise efficiencies and minimise disruption to operations. Funding for this programme will be sought in addition to the Infrastructure Rolling Vote.

Work on the First Tower rising mains will be dealt with as a separate project due to the scale and complexity of the scheme compared with the majority of the replacement programme works.

9.2.5.2. Pumping Station Asset Replacement and Minor Capital Programme

A number of schemes are ongoing and will continue through to 2025. The sites programmed for 2022 can be found in Section 3.4.4 and the programme of sites for 2023 to 2025 will be developed from the preliminary condition survey discussed in Section 6.6 and the need to provide local storage where this has been identified.

The 2021 preliminary condition survey identified seven ‘key tasks’ which are widespread across the network as well as a range of more unique issues that need to be addressed. The seven key tasks were:

- Main access covers need replacing;
- Overspill/overflow access covers need replacing;
- Sump needs cleaning or modifying;
- Branchage – Trees/hedges require maintenance;
- Operating levels require adjustment to optimise efficiency;
- Ducting to be checked, cleaned or repaired; and,
- Infiltration identified and needs further investigation.

The replacement of covers can be a major Health & Safety issue and these will be prioritised where this is the case. In particular, there are sites where it is impossible for covers to be lifted by a single operator and/or do not have an integral safety grille. The other key tasks aim to improve operating efficiency at both the station and in the local network.

The works that apply to smaller numbers of sites are:

- Odour Control refurbishment or replacement;
- Concrete repairs due to acid attack; and,
- Saline intrusion.

As noted above, the 2022 programme has been fixed and the programme for each subsequent year will be confirmed on an annual basis. There are, however, some preliminary priority sites for 2023-2025 that have been identified already but are subject to confirmation are noted below.

- Milano – Infiltration improvements
- Gréve No.2 – Infiltration improvements
- Les Laveurs – Full refit (Appendix G)
- La Collette Power Station – Full refit (Appendices E d) and G)
- Petit Ponterin – Full refit (Appendix G)
- West of Albert – One pump is being refurbished in 2022 and the last one will be completed in 2023 (Appendix J3)
- St Ouen – Repairs to incoming manhole.
- Route Orange – Pump refurbishment (Appendix B1 vi))

9.2.6 First Tower Rising Main replacement

Given the findings of the repairs to the First Tower rising mains discussed in Section 6.7.2 and the fact that these mains are critical for transfer of 90% of Jersey’s sewage to Bellozanne STW, the replacement of the twin 600mm/24” diameter pipes is considered essential.

The mains were inspected in 2014 and investigations following the recent burst showed that the mains have continued to degrade and are in significantly worse condition than identified at that time and are at serious risk of further failure.

Some sections of the mains were relined in 2021 but since then there has been another major burst of one of the mains in December 2021. This resulted in the main having to be taken out of service for several weeks while the burst was located, investigated and repaired.

The two mains are laid close to each other and hence a major failure of one could result in the loss of both mains and it would then not be possible to treat any sewage. The only option at that point would be to discharge untreated sewage into St Aubin's Bay until repairs could be completed.

The mains were originally sized in 1954 for a considerably smaller population than present and hence lower flows. The current pipes are therefore undersized for the present and future flows and the full design flow cannot be delivered along a single main if one is taken out of service. Velocities in the pipes are therefore higher than standard design velocities for such mains and this accelerates the degradation of the pipe.

Relining the existing mains provides temporary security but is impractical due to the number of bends and would reduce the internal diameter, and therefore the pipes capacity, so replacement and upsizing is the only viable long term solution.

Following an initial assessment, the preferred solution would be a phased approach:

- Construct a new 800mm diameter pipeline from First Tower Pumping Station to Bellozanne STW along a new alignment to the north and west of the existing mains, largely along Mont Cochon, St Andrews Road and Bellozanne Valley Road.
- Following completion of the new pipeline, the existing mains would be decommissioned and a second 800mm diameter main constructed, largely along the route of the existing mains, while maintaining flows along the new main. The existing mains would be removed prior to laying the new main.
- Where the existing mains pass under the existing I&E buildings, the new mains would be routed around the buildings either into Bellozanne Valley Road or to the east of the workshops, as determined during design and/or to suit the revised Master Plan.

The main risk with this option is the feasibility of the route of the new main along Mont Cochon and St Andrews Road which needs to be confirmed by preliminary design and site investigations.

Relining of the most at risk sections is programmed for 2023 in conjunction with completion of the STW and design and investigations for the new mains will follow this in 2024. The first new rising main will be constructed in 2025 and the second in 2026. This project therefore spans between the Bridging LWS period and the 2025-35 LWS period.

As noted in Section 3.4.5, in the long term, First Tower PS will need to be replaced and incorporate storage to avoid the shock-loading at Bellozanne STW that is associated with the flow peaks which occur at First Tower. In the short to medium term this will be alleviated by surface water separation schemes at West Park and in St Aubin's Road, however these will not address the fundamental issues with the pumping station itself. A replacement can only be sited in land that would be reclaimed by the future 'advance the line' scheme so has not been considered further as part of the Bridging LWS. Further details of First Tower PS can be found in Appendix B.

9.2.7 Bellozanne STW

9.2.7.1. Bellozanne STW New STW – Feasibility

As discussed in Section 8, the current population forecasts suggest that Bellozanne STW will be adequate up to and possibly beyond its original design horizon of 2035. This is on the assumption that there is no change to the effluent discharge standard and that flow to the STW can be managed through a programme of works to install surface water separation and network storage to smooth out peaks. This conclusion is subject to many factors, not least the issuing of Statistics Jersey's population prediction models, tourism trends in 2023 and any change in discharge consent that comes into force in the future.

Notwithstanding the current uncertainty, it is known that the Bellozanne STW site cannot be further expanded in terms of the flow it receives. Space is available for additional treatment to achieve a higher quality effluent and a larger population could be served if significant surface water separation works are completed. However, the available data suggests that it is inevitable that the hydraulic capacity of Bellozanne STW will be exceeded at some point in the next 10 to 30 years, even if the treatment capacity is not reached, and this will require a further treatment site to be created.

Based on the ongoing Bellozanne STW project, the time required to complete the preliminary studies and enabling works required to deliver a new STW is fully recognised. This is complicated by the fact that there is no existing site available and that this could potentially mean land must be reclaimed or purchased.

It is therefore proposed to begin a Pre-feasibility/Needs study for a new STW as soon as the population models are released in 2023. This should provide a more defined timeline for treatment capacity on the Island. Depending on the findings of this study it may be necessary to immediately start detailed investigations such as site selection within the Bridging LWS period or this may be more appropriate within the 2025-35 LWS period.

Whenever it is required, the studies will consider all options for the future, namely:

1) Extend Bellozanne STW – Is new technology available that might make this possible?
2) Build an additional STW to share the load – How to split flows, and where to build?
3) Replace Bellozanne STW with a new STW in a new location – Is a large enough site available?

Any increase in population may not be limited to the resident population but can be increased by a change in the tourism industry and this will also have to be closely monitored.

The Pre-feasibility/Needs study will review if there is any public land that can be set aside to make sure the future needs are not compromised by alternative uses and developments. Preliminary options are discussed in section 9.3.4.

9.2.7.2. Biosolids Management Strategy and new facility

As discussed in Sections 4.6 and 6.3, biosolids (sludge) are a by-product of the processes at Bellozanne STW to treat sewage and produce methane gas for power and heat generation. The processes used qualify as enhanced treatment and this allows I&E to dispose of the biosolids as fertiliser on farmland in accordance with best practice and current UK and EU standards (Section 4.6). As an Island community, recycling biosolids to agricultural land is the most sustainable option available.

However, as agricultural land management restrictions concerning the receipt of biosolids tighten, there is an ever-greater need to secure the co-operation of the Jersey agricultural community to use biosolids within the agricultural rotation.

This is expected to continue in future but, in addition, further management steps are likely to be required so that a proportion (> 2000vg/year) of the agricultural landbank is used on a minimum 5-year rotation. This will avoid the routine use of the same fields for a single crop, i.e. potatoes.

This change of approach will require liaison with companies and farms to discuss implementing a managed crop rotation process utilising fields for alternate crops e.g. cattle forage, cattle grazing, flower bulbs, hemp and fruit.

Although the preferred route for the biosolids will continue to be recycling to land, subject to continued availability of a land bank, the direction of development of legislation suggests that the construction of a 'long term biosolids storage facility' will provide increased flexibility in the future .

The location and scale of this facility will be the subject of a Feasibility Study within the Bridging LWS period and will have these objectives:-

- Satisfy the Nitrate Vulnerable Zones (NVZ) regulatory requirements by making the provision for six months' sludge cake storage (3,400m^3) so that:
  - spreading on land does not occur during October to January (four months defined by legislation);
  - additional storage is available to give flexibility if conditions are not suitable for disposal to land in September and February and when the Energy Recovery Facility (ERF) is offline;
  - I&E is less reliant on local agreements with farmers; and,
  - the risk of a pollution incident is minimised.
- Minimise the distance that sludge cake must be transported for storage and avoid 'double handling'.
- The 'Biosolids Storage Facility' shall be designed to keep the sludge cake in a suitable condition for direct application to land at a later date.

The ERF is temporarily offline for maintenance for 5 – 7 weeks around November and March each year and therefore will not be available during this period. It should be noted that the sludge produced from liquid waste is a limited carbon source and is therefore not ideal for burning so disposal via the ERF is a last resort but must be taken into account.

Failing to provide long term biosolids storage facilities during winter months will result in an increased risk of significant environmental consequences. A purpose built, covered storage facility will offer environmental benefits and will provide a stockpile for when the agricultural users need it between crops. Furthermore, the construction of a new biosolids storage facility will relieve pressure on solid waste operations at the Energy Recovery Facility (ERF) to burn the biosolids and retain the product as a natural fertiliser.

The following locations have been considered for the Long Term Biosolids Storage Facility:

- Option 1: Area currently occupied by the existing final settlement tanks at Bellozanne STW, which will become available on completion of the New Bellozanne STW.
- Option 2: Redundant Scrap Metal Processing Yard at the north end of Bellozanne Valley, off Bellozanne Valley Road. The 'Scrap Metal Processing Yard' at La Ruelle Vaucluse is currently being used to provide an additional storage site facility for the ongoing construction of the New Bellozanne STW.
- Option 3: Land at La Collette, St Helier.
- Option 4: Hire or purchase of redundant agricultural barn(s).

Only the use of the existing Final Settlement Tanks (FSTs) area at Bellozanne STW meets the criteria of avoiding double handling and so this will be the preferred option for the Feasibility Study. However, the existing FST area had been identified for future treatment improvements. If the area is used for Biosolids Storage then alternate provisions must be made. These are discussed in the section on the Bellozanne STW Master Plan below.

An EIA Screening Report will be prepared in Q3/4 of 2022 to inform the Feasibility Study and Planning Application. Detailed Design is programmed for 2023 and construction is expected in 2023-24.

9.2.7.3. Bellozanne STW Master Plan Review

In conjunction with the above study regarding long term biosolids storage, it is proposed to review and update the 'Bellozanne STW Master Plan' that was developed to support the Planning Application for the new Bellozanne STW.

Following completion and commissioning of the new STW, it is planned to monitor performance of the STW for a period of up to 5 years. With commissioning of the full STW due in Q2/3 of 2023, the decision on additional treatment will not be made until late 2028.

The need for additional biosolids storage is therefore believed to be more urgent than the likelihood of requiring a higher sewage treatment standard and locating the new storage at Bellozanne minimises double-handling costs. On this basis, the Master Plan update will consider whether the area of the existing FSTs could be used in part or full for biosolids management. Clearly, this cannot be at the expense of losing the future treatment provision but a number of factors are coming to the fore in the Bridging LWS period which mean that this is an appropriate time to carry out a review, namely:

- The sludge thickening and dewatering plant is approaching a major maintenance milestone as it nears 15 years old. This is not expected to require a wholesale replacement but will be a major overhaul, including removal and replacement or refurbishment of key components. Relocating the plant at the same time will be easier and avoid additional disruption at a later date.
- The Workshops building at Gate 3 is in need of major investment to repair the fabric of the building. The cost of these building repairs may be better spent on a purpose built facility elsewhere.
- The existing FSTs will be decommissioned in mid to late 2023 and there may be opportunities to tailor the design of a new biosolids facility around the existing structures to minimise the cost of decommissioning and landscaping.

During the development of the initial Bellozanne Master Plan, the Workshops area was identified as one of the potential locations for the STW. The discussions at that time involved the potential relocation of the Vehicle Workshop to La Collette and finding a suitable location for purpose-built Mechanical & Electrical Workshops but ultimately this option was not adopted due to timing constraints.

Significant investment would be required to maintain the Workshops building in its current form and this provides us with a timely opportunity to review the long-term requirements and rationalise the service locations as follows:

- Vehicle Workshop at La Collette. A separate Mechanical Workshop for the La Collette Mechanical Team within the new Vehicle Workshop may also be considered appropriate.
- Mechanical Workshop at a location to the north of the proposed Sludge Dewatering and Biosolids Storage Facility at Bellozanne.
- Storage Facility and Electrical Workshop within the 'converted' Biosolids Storage Building at the Sludge Platform.

In view of the above considerations, the Bellozanne Master Plan is to be reviewed with a view to updating it for the short-, medium- and long-term works.

9.2.7.4. Overall Strategy for Bellozanne STW

It is clear that the feasibility studies for a new STW, Biosolids Management Strategy and the Master Plan Review are closely intertwined and will need to progress simultaneously to ensure there is a coherent plan for the 2025-35 LWS. The issues at play are understood but the priorities will only be defined as the population forecasts become available.

Bellozanne STW Outfall Rehabilitation

CCTV surveys carried out during the design phase of the STW project determined that rehabilitation was not urgent at that time so a decision was taken to defer these works until 2024. However, further delay is not considered to be acceptable as deterioration will have taken place in the intervening years and, therefore, £1m has been allocated in 2024 to carry out this work to prevent worsening infiltration and leakage issues and possible sewer collapse.

Rehabilitating the culvert, either by in-situ re-lining or repair, as opposed to pipe re-laying, will be by far the most economical way of restoring the integrity of the culvert and this is the preferred solution. However, the temporary works required to maintain the outlet flow could be prohibitive and constructability as a whole will be assessed as part of the feasibility study.

The study of St Aubin's Bay (Section 3.3) found that there was no benefit in extending the outfall but this will be kept under review as the monitoring of the new Bellozanne STW is carried out (Section 5.3).

9.2.8 Telemetry Upgrades

The telemetry network has been continuously expanded and improved since 2013 to gather data both from operational assets and monitoring. Installation of the latest upgrade was completed in July 2022 and this system can now be extended and tailored to suit the Department's needs and automatically advise on maintenance programmes and predict potential failures by adding elements of Artificial Intelligence (AI) software. Examples of such products are EcoStruxure Asset Advisor and Aveva Insight.

EcoStruxure Asset Advisor is focused on the electrical energy used by fixed, motorised assets, while Aveva Insight looks at all the data available from our assets and uses automated analytics and machine learning to enable the most efficient use of them.

EcoStruxure Asset Advisor uses condition based monitoring to perform predictive maintenance analysis. It is made up of different modules and the Motor Current Signature Analysis (MCSA) one has been identified as potentially relevant to I&E operations. This module uses AI to analyse a motor's 'signature' so, instead of analysing the usual parameters of vibration, temperature or oil pressure, the MCSA system analyses AC current and voltage which increases sensitivity and accuracy. This module was specifically designed for motors in hard to reach areas, such as submerged pumps where no other predictive maintenance sensors, such as vibration and temperature can easily be fitted.

The fault detection covers failure modes such as:

Application	Failure Mode	How far in advance can a problem be detected?
Supply	Voltage/Current imbalance	Months
	Harmonics Distortion	Months
	Voltage drops/overvoltage	Months
Motors	Stator shorts (interturn/turn to turn)	Weeks
	Stator winding looseness	Weeks
	Electrical Imbalance	Months
	Broken/Loose rotor bars	Months
	Rotor eccentricities	Months
	Misalignment	Weeks
	Bearing degradation	Weeks
	Soft foot	Weeks
	Mechanical unbalance	Weeks
Pumps	Cavitation	Months
	Unbalance	Months
	Impellor damage	Months
	Bearing degradation	Weeks

Aveva Insight is a cloud based platform made up of over 30 modules that can be selected as appropriate to the system's needs. It combines operations management and asset performance technology enabling operational teams to collaboratively manage operations and assets from anywhere, at any time. It would enable a digital twin of I&E's operations to be constructed and would monitor the available data to generate a bespoke set of Key Performance Indicators (KPI's). This enables efficiency testing to be carried out safely and provides total transparency of data in that all relevant parties are working from the same base data whatever their responsibilities. This gives consistency to the outputs which can include, but is not limited to:

- Process Graphics
- Automated Analytics
- Asset Efficiency Analysis
- Condition Management Alerts and Notifications
- Customisable Dashboards
- Condition Based Rules
- Asset Life Predictions Based on Operational Data

Aveva Insight is also part of another Aveva product, which is the Unified Operations Center for Water. This is based upon a system of systems approach in which Operations Technology (OT), Information Technology (IT), and Engineering Technology (ET) are brought together to create an intelligent operations centre. It makes the various content available through a single software environment that has been developed specifically for water and wastewater organizations.

Adopting this type of system can develop greater operational awareness and improve crisis response. It is proposed to assess the various available systems and review them for compatibility and relevance to I&E's operation as part of a cost/benefit assessment before a system is selected.

9.2.9 Other Feasibility Studies

The studies listed above will take place during the period 2022-2025 with a view to further investigations, design and/or construction being programmed in the full LWS period 2025-2035.

There is also potential for further feasibility studies to be identified during the Bridging LWS period for specific sites as work on the Emerging Projects, key pumping stations and the networks progresses.

9.3. Medium term to 2025-2035

The Medium Term has been defined to match the period of the next 'Full LWS' which also coincides with the original design horizon of Bellozanne STW. I&E's intent has always been to carry out a review of the LWS every 5 years, however, given that this would have timed a review for 2018 when construction of the STW began, it was not considered appropriate at that time.

As was discussed in Section 2.3, with the STW due for completion in 2023 the time is now ideal for a new LWS but the uncertainties stemming from the pandemic, Brexit and population trends mean that identifying a robust long term strategy is impractical. Consideration was given to using 2025-30 as the medium term in this document but it was dismissed for the following reasons.

- The need to meet a higher effluent quality at Bellozanne STW will not be determined until 2028.
- The potential need to address the long term sewage treatment capacity for population growth at Bellozanne STW, or elsewhere, is likely to be delayed following the 2021 Census result and the development of the population forecast model.
- The development of the 2025-35 LWS will begin as soon as the population models associated with the 2021 Census data are released.

It is anticipated that the 2025-35 LWS will consider 2025-30 as its short term and 2030-35 as the medium term.

Therefore, the projects discussed below for the Bridging LWS Medium Term have been restricted to those that are expected to 'rollover' from the short term either as ongoing projects/programmes of work or arising from feasibility studies taking place in the Bridging LWS period.

9.3.1 Confirmed Projects

As can be seen from the Long Term Funding Plan in Sections 11.2 and 11.3, a number of the currently confirmed projects will extend into the early years of the 2025-35 LWS such as the First Tower Rising Mains replacement scheme.

The Emerging Projects, as discussed in Section 9.2, are not yet quantified but are certain to be required to accommodate the Bridging Island Plan's housing targets in 2025 and 2030.

In the North and West of the Island these schemes are planned to be complete by 2025 but there is currently insufficient confirmed detail on the new housing locations to allow design to start. Design is currently programmed for 2023 but is reliant on suitable details being made available. There is therefore potential for some of these schemes to be delayed in the interests of ensuring the investment is made in the right locations.

Similarly the Emerging Projects in the South and East of the Island are identified for feasibility studies in 2024 with design starting in 2025 for construction in late 2025 and 2026. These projects are also reliant on development sites.

The various studies to be completed in 2023-26, as discussed above, will also identify programmes of work to upgrade, replace and extend both the sewage and surface water networks but there is little other detail that can be added at this time. A notional budget of £7-10m per year is likely to be required to meet the Island's needs in this area but it is not currently clear whether delivery, i.e. construction, on this scale is practical in terms of contractor availability, local disruption and supply of materials in conjunction with the other non-I&E projects across the Island.

There is a significant danger that trying to deliver housing and infrastructure upgrades simultaneously will mean that neither can proceed satisfactorily, notwithstanding other commercial developments and the OHP.

9.3.2 Effluent Quality at Bellozanne

The challenges within St Aubin's Bay have been discussed and assessed many times over the years. The ongoing monitoring of the status of the bay and the effluent quality of the new Bellozanne STW will give a better understanding of the bay and its condition.

From a Jersey perspective, the majority of the Island's land mass drains into the bay. The application of the recommendations within the Jersey Integrated Water Management Plan and the new Bellozanne STW will have a positive effect on the bay and its environmental health.

The studies discussed in Section 3.3 showed that there would be no detrimental effect from the new Bellozanne STW but provision has been made for future works to achieve a higher quality effluent if required.

Following completion and commissioning of the new STW, performance monitoring will be carried out for up to 5 years. This is therefore expected to start in Q3 2023 and run through to Q2 2028. A decision on the need for additional treatment will then be made and hence the provision of enhanced treatment has been included in the medium term.

Details of the options available to achieve a higher effluent standard have been discussed in detail in Section 6.3 and the implications for the Bellozanne STW Master Plan have been described in Section 9.2.

In summary, the original provisions included for up to eight additional aeration lanes, similar to the four lanes in the new STW so that nitrification/ denitrification can be achieved to remove ammonia compounds if a higher effluent quality in terms of nitrogen is required. Expanding the secondary treatment phase in this way is considered the worst case in terms of physical footprint but other options, including a tertiary treatment phase (ie. treating the final effluent) could also be considered depending on the issues identified. As design and construction of the New Bellozanne STW has progressed it has become apparent that transferring large flows around the site for enhanced treatment will be difficult and could constrain the options for expanding secondary treatment. This is discussed in detail in Section 9.3.4 including the possibility that the need for enhanced treatment at Bellozanne STW could become an additional driver for the need to construct a second STW.

The scale and scope of the works required cannot be further defined at this time, and it should be noted that there may in fact be no need to enhance the standard of effluent at the Bellozanne STW.

9.3.3 Emerging Schemes – South and East

The emerging schemes to the East and South of Jersey have been identified to address existing restrictions in the existing network but each one could be significantly affected by development upstream of their location. Furthermore, each of these potential projects could support or drive the need for additional treatment capacity to the east, potentially at La Collette.

For example, upgrading Le Dicq PS is likely to necessitate upgrades to the downstream system which will bring Bellozanne STW to its design capacity sooner than planned. In the case of an additional STW at La Collette it may then be appropriate for Le Dicq to pump sewage to it directly which would negate the upgrades to the downstream network resulting in abortive work.

Furthermore, as the Five Oaks Master Plan is developed by the Minister for the Environment, this could introduce an additional scheme in the vicinity of Five Oaks or change the parameters of the schemes identified below at Maufant and around the east of St Helier.

<table>
<tr><th></th><th>Project</th><th>Description /Comment</th></tr>
<tr><td>Scheme 1</td><td>Upsize sewer at Grouville</td><td>Note: also requires upgrades to downstream capacity (Le Dicq etc)</td></tr>
<tr><td>Scheme 2</td><td>Upgrade Le Dicq PS and RM. Local catchment also has capacity for surface water separation schemes that can outfall to sea near the PS.</td><td>Note: downstream capacity needs assessment</td></tr>
<tr><td>Scheme 3</td><td>Storage at Maufant. In conjunction with addressing infiltration and separation if necessary. Note no easy discharge for surface water.</td><td rowspan="3">Schemes 3 to 5 will reduce pressure in St Helier and hence facilitate upgrades at Le Dicq in Scheme 2</td></tr>
<tr><td>Scheme 4</td><td>East of St Helier – separation schemes, possibly with increased impounding capacity</td></tr>
<tr><td>Scheme 5</td><td>Storage at Le Hocq. Possibly in conjunction with separation schemes discharging to sea, similar to work around Le Dicq.</td></tr>
<tr><td>Scheme 6</td><td>Five Oaks</td><td>Several Planning Applications around Five Oaks are ongoing and works (eg a new PS) have been identified to suit. Designs will also make provision for additional development in the catchment but the full scope is unknown at this stage; this will be defined by the forthcoming Master Plan.</td></tr>
</table>

Table 9.3.3-1: Potential projects in the South and East of Jersey

The lack of details of future development is particularly critical for the South and East as increasing demand on this side of the Island is likely to drive the need for separate treatment capacity.

9.3.4 Additional Treatment Capacity

When the population models associated with the 2021 Census are released, a better understanding of the time horizon and actions required on population will be developed. It has been assumed that the Pre-Feasibility/Needs Study identified in the short term programme will become a full programme of detailed Feasibility Studies and other investigations at some point in the Medium Term programme to suit projected demand.

The STW has been designed and constructed for the 2035 design horizon + 20%, i.e. a Population Equivalent (PE) of 141,600 and a treated flow of 813 l/s. The treated flow was based on the original 2035 design PE of 118,000 assuming that the network would remain largely a combined system. It was also assumed that as PE increased beyond 118,000 the increasing sewage flow would be offset by surface water separation projects so that the flow to Bellozanne remains constant but the influent sewage becomes less dilute over time.

If separation does not keep pace with population growth, then the ability to treat 20% extra load becomes redundant. Even if adequate separation is achieved, then the network will have to be improved and reinforced to mirror housing development across the Island and thus ensure that sewage can reach the STW to be treated.

As discussed in Sections 8 and 9.2, it is currently considered unlikely that the STW will reach its design capacity in terms of load from the growing population before the original horizon of 2035. However climate change and the difficulties of achieving surface water separation through St Helier mean that the treated flow capacity of Bellozanne STW will be increasingly at risk which could result in more frequent spills from the Cavern and the STW Storm Tanks.

The need for additional treatment capacity is therefore not only determined by the number of people on the Island but also by their location and how this affects the sewer network. Providing more treatment capacity away from Bellozanne will have the added benefit of relieving pressure at critical points in the network as well as providing security in the long term.

9.3.4.1. Possible locations

On the basis that Bellozanne cannot be further expanded, La Collette is an obvious location for an additional STW and would comply with Policies UI1 and UI2 in terms of keeping new infrastructure in existing zones

Policy UI1 – Strategic infrastructure delivery
Development proposals for strategically significant infrastructure will be supported where: 1. the development is proven to meet a strategic need, in the interests of the community; 2. the development will be in the built-up area; 3. in the case of the development outside the built-up area, sufficient work has been undertaken to consider reasonable alternative sites for the development, and that the selected site represents the most appropriate and sustainable option; 4. its landscape and amenity impact will be acceptable; and 5. its environmental impact has been appropriately identified and mitigated against, where possible, and compensated for, where necessary. Proposals that do not appropriately meet these criteria will not be supported.

Policy UI2 – Utilities infrastructure facilities
Proposals for the development of new, extended or altered utility infrastructure facilities will be supported where it is: 1. within the built-up area; 2. on the site of existing utility infrastructure. Proposals for the development of new utility infrastructure facilities outside the built-up area or a site of existing utility infrastructure facilities will only be supported in exceptional circumstances, where: 1. the proposed development is required to meet a proven island need; and 2. it can be demonstrated that the development is essential to the delivery and continuation of services and cannot reasonably be met through alternative sites, service delivery arrangements, or co-location with other services. The alternative development of utility infrastructure facilities will only be supported where it can be demonstrated that they are no longer required for utility infrastructure purposes.

The key disadvantages to La Collette as a site for a second STW are:

- The effluent will be discharged into the same body of water as Bellozanne,
- Proximity to the shellfish beds and RAMSAR site (See Figure 9.3.4A)
- Little reduction in the distance that sewage is transported around the Island, thus it does not release capacity in most of the existing network but would significantly improve conditions at First Tower.

The western limit of the RAMSAR site is formed by Grève d’Azette and, of particular relevance, the La Collette peninsula.

The final effluent outfall from an STW at La Collette would have to take this into account as well as being careful to avoid creating any hazard to shipping entering and leaving the Harbour throughout the tide cycle.

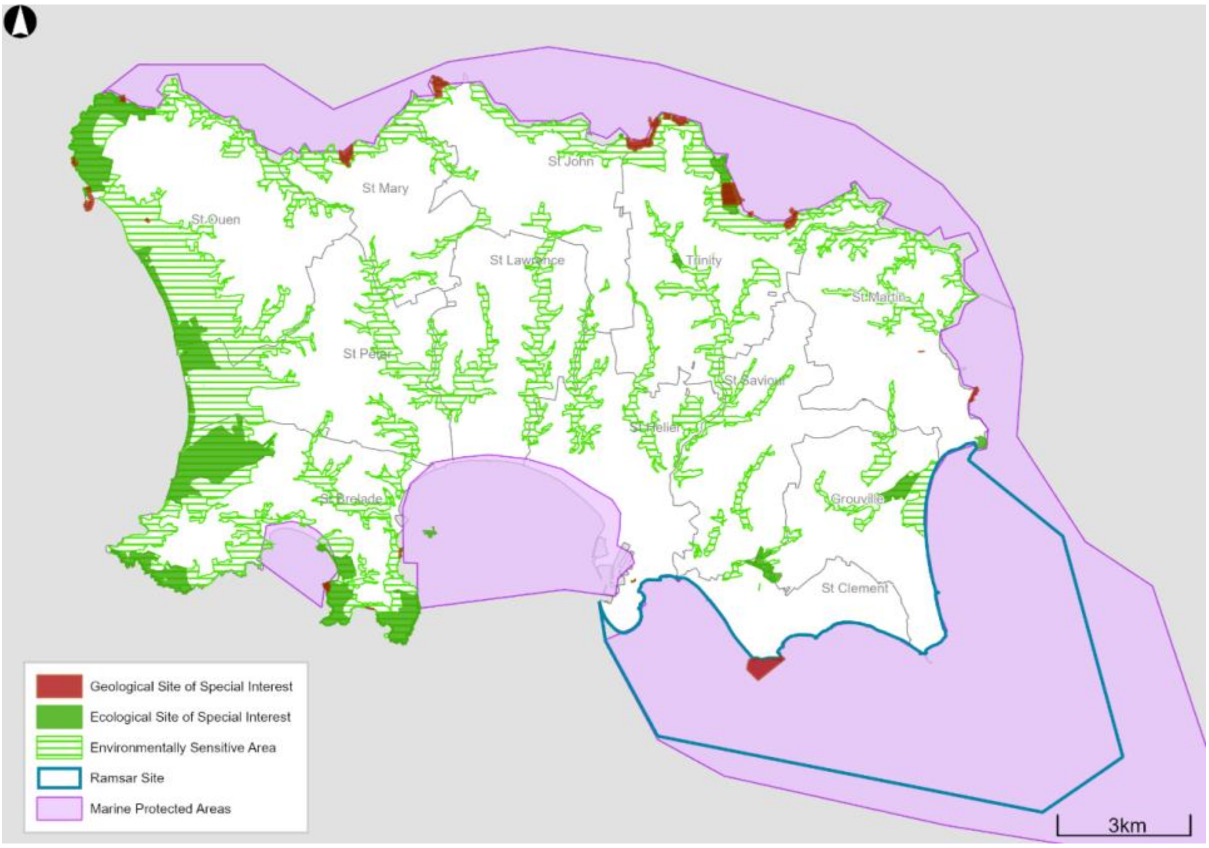


Figure 9.3.4-A53: Extract from Bridging Island Plan. Biodiversity and geodiversity designations and defined areas.

Any alternative site on the north, east or west coasts would go against the above policies UI1 and UI2 but could be more efficient in meeting the demands from expanding population and new housing developments. In addition it should be noted that, as well as the 'Marine Protected Areas' on the North, East and South coasts shown above, virtually the whole coastline is classified in the Bridging Island Plan as either part of the Coastal National Park or a new 'Protected Coastal Area'.

Jersey's Coastal National Park was originally established in the 2011 Island Plan, as a designation in policy terms only, to protect those parts of the island of highly sensitive landscape quality. In approving the Bridging Island Plan, the States Assembly have resolved to explore whether the establishment and operation of a national park in Jersey requires a statutory basis.

[53] Bridging Island Plan – Volume 3 Natural Environment – Figure NE1

Proposal 6 – National park legislation

The Minister for Economic Development, Tourism, Sport and Culture will work with the Council of Ministers to bring forward, for approval by the States Assembly, proposals for the establishment of a national park in law, with appropriate provisions and mechanisms to:

a. define the purposes of a national park in Jersey;
b. determine its appropriate governance, in order to secure the purposes of the park;
c. determine the spatial extent of the park;
d. manage land and activities within the park in accord with its purposes; and
e. ensure public and stakeholder engagement and consultation on all matters associated with the national park.

Furthermore the States Assembly resolved to create the new planning policy zone, the Protected Coastal Area, to provide the highest level of protection for the most valuable areas of landscape and seascape character.

Figure 9.3.4-B54: Extract from Bridging Island Plan. Protected Coastal Area and Coastal National Park

Clearly, a new STW can be constructed a distance inland, as Bellozanne STW is, to protect coastal views and the like, but even a cursory review of Figures 9.3.4A and B suggests that La Collette is the most appropriate location to minimise Environmental and Marine impacts.

[54] Bridging Island Plan – Volume 3 Natural Environment – Figure NE8

No sites other than La Collette have been identified at this stage and no consideration will be given to this issue before the locations and timing of the large housing developments are confirmed.

9.3.4.2. Programme

The Pre-feasibility/Needs study will determine a likely programme for the additional STW based on the latest population growth models. As an example, based on the current Bellozanne STW project, and disregarding the issues it has experienced due to the pandemic and collapse of the Principal Contractor, an outline programme can be estimated as noted below. The estimated durations are used to work backwards from the assumption that the new STW is required to suit the original Bellozanne design horizon of 2035.

- Construction complete and fully commissioned – 2035
- Start construction (3-4 years) – 2031
- Tendering and Detailed design (1-2 years) – 2030
- Outline design, Early Contractor Involvement (optional), Planning Approval (2-3 years) – 2027
- Concept design, confirm site and land purchase if required (1-2 years) – 2025

Each step has been given a range of duration and overall this gives a likely project duration of 7-10 years.

From Section 8.4, the need for an additional STW on the basis of load from population growth is unlikely before 2045. If this was to be the key driver then initial investigations would need to start around 2035, i.e. at the end of the 2025-35 LWS period or start of the next strategy period 2035-45. However, if hydraulic capacity in the network or at the STW becomes the driver then completion before 2035 becomes more likely.

9.3.5 Pumping Station Programme

The rolling programme of Asset Replacement and Minor Capital Works will continue and be supplemented by individual projects as they are identified.

It is anticipated that some of these schemes will be directly driven by the programme of house building identified in the Bridging Island Plan and also to supplement the Emerging Schemes as they are developed.

9.4. Long term - 2035 and beyond

The only stand-alone project specifically identified in the Bridging LWS for the long term is to address treatment capacity beyond the Bellozanne STW design horizon, if required, and as discussed above. The timing of this project is uncertain but is expected to be clarified when the latest population projection models become available.

A number of the medium term projects may extend beyond 2035 but it is not possible to suggest which ones at this stage.

Similarly, rolling maintenance and management programmes of work will be ongoing beyond 2035 but no further specific issues have been considered for this Bridging LWS.

10.Operational Issues

10.1. Introduction

Many, if not all, of the operational issues identified in the 2013 WWS are still active in 2022. This is not due to a lack of action or intervention but simply because they are a natural part of the work that I&E do in dealing with the Liquid Waste.

However, as time moves on, new techniques and technologies are developed which improve efficiency and simplify operations. Unfortunately, issues like climate change are simultaneously exacerbating existing problems which can negate benefits gained elsewhere.

Construction of Surface Water Separation Schemes and other network improvements that have been discussed in earlier sections will ease pressure in the system but there are also improvements that can be made in day to day operations that will drive overall efficiencies for the system.

Furthermore, Government of Jersey are in the process of adopting the SAP[55] asset management system which integrates many aspects of daily operations and long term maintenance planning for all Departments. This process is currently in its early stages and will be happening over the course of the Bridging LWS period. The impact and benefits of the new system will be drawn on for the 2025-35 LWS after it has been embedded.

10.2. Adopting a Proactive Maintenance approach

Where existing assets have not reached the end of their lives a programme of planned preventative maintenance will keep them operating as efficiently as possible. The span and complexity of the network can lead to a tendency to 'fit and forget' equipment until a problem occurs and I&E intend to introduce an island-wide programme to deliver proactive maintenance in the form of:

1) Active monitoring of asset lives to identify key maintenance and replacement milestones. Currently this is partly a manual system and partly in JD Edwards. The new SAP system should support this in the future.
2) Carrying out a five-yearly independent principal inspection on all assets. This will complement the asset life tracking by identifying if individual assets are in better or worse condition than the standard measures would predict.

This approach requires investment in equipment and people but results in a more reliable and efficient system overall. Some examples are discussed below.

10.2.1 Ice pigging

Currently I&E operates a cleaning program in known trouble spots around Jersey to help maintain system capacity and avoid blockages. Continuation of this programme is considered essential. However, in taking a more proactive approach, this programme needs to be expanded beyond trouble spots.

Planned preventative ice pigging is a system whereby ice slush is pumped through a rising main to clean it. It has proved very effective in clearing and preventing blockages across the EU and in the UK.

A patented method using the application of an ice brine solution has recently been developed by Suez and has generated huge benefits for the UK water companies. Suez have carried out a number of trials

[55] SAP company website

on Island in 2021 and these have also been successful, showing significant increases in flow rates following ice pigging.

The biggest improvements occurred on the small diameter rising mains connected to progressive cavity positive displacement pumps. During the trials it became evident that these mains had become very constricted and that the pumps had continued to pump but over time at a higher back pressure and lower flow. The ice pigging restored the mains to their original state and the flows increased accordingly.

The results of the trial are included at Appendix H.

Allowing pumps and rising mains to operate at the intended duty point will maximise energy efficiency and reduce running costs from those caused by pumping at higher pressures.

Further trials are planned for 2022 on larger diameter rising mains and then a review will be completed to assess the relative cost-benefit ratio of either purchasing a set of equipment or continuing to contract out these works.

10.2.2 Dealing with Salinity and Septicity in Coastal Pumping Stations

If sewage is left to stand for any length of time it will go septic and this effect is more pronounced in sewage with high levels of saline. In small pumping stations with low flows, particularly in drier periods of the year, the retention time either in the pumping station or the rising main can be long enough for septicity to occur. Septicity causes the release of Hydrogen Sulphide gas and a number of issues arise from this including odour and chemical attack of concrete.

As discussed in Section 6.6, some ingress of salinity in coastal locations is virtually inevitable. Therefore, to avoid a high residence time for the saline mixture, we propose that in dry and summer conditions surface or raw water is introduced into the pumping station to make sure that the individual system has a proper turnover. In short, each rising main will pass at least one total pipe volume of material forwards every day thus avoiding extended residence times within the network.

A trial is proposed at Gréve De Lecq No.1 pumping station and monitor the presence of hydrogen sulphide at the downstream Gréve De Lecq No.2 before, during and after the trial to prove the concept prior to rolling out to the stations blighted by this issue.

It is noted that, in principle, this runs contrary to the policy of surface water separation to drive efficiency in the network as a whole. This process will only be introduced at small pumping stations with poor flow turnover so the volumes of surface water required will be small and should be outweighed by the local benefits.

10.2.3 Emergency repair strategy and stock

No matter how good any proactive inspection and maintenance regime is, unexpected failures can and will occur. To minimise the disruption these can cause, an immediate action for 2022 is to review and consolidate all of the current strategic emergency repair stock as follows:

a) For each rising main size and type establish what pipework size and change pieces are needed. e.g. it may be easier to repair uPVC with DI pipework for example.
b) Establish what will be kept as a strategic storage on Island, e.g. sizes, straight lengths, bends, fittings etc.
c) Consolidate and catalogue the items in one location and control the access and utilisation to a key Operational Manager. Most appropriate storage location to be identified.

d) Review the stock and usage as part of the maintenance cycle.

The same exercise will be carried out for gravity pipes, pumps and other equipment as far as is reasonably practicable.

It is anticipated that the adoption of the SAP system will support the management of repair stocks but the details of this need to be established.

10.3. Staff challenges

Liquid Waste, and I&E as a whole, have struggled for many years to recruit and retain staff. The pool of workers with the required skills on the Island is relatively small and it is often difficult to attract staff from the mainland UK given the challenges of residency rules, property prices and the cost of living on Jersey.

It is essential to maintain and develop a team of people of sufficient size to adequately support the assets particularly with the additional challenges that will come from the proactive maintenance approach. This is an issue across the Liquid Waste team, including operational, design and management expertise.

As well as recruiting and retaining staff to deliver day to day operations it is important that they have development opportunities which will naturally provide a succession plan if individuals do leave or retire.

This has been a challenge for many years and no simple solutions have been identified. I&E's ongoing recruitment programme will continue.

10.3.1 Use of Consultants

I&E have used consultants to support the team with specialist services for many years. This has partly been driven by recruitment difficulties for core skills but is also a strategic decision in that it is not economically viable to have an in-house team that covers all of the relevant disciplines when they are not consistently required.

The current Technical Consultant Framework was won by Sweco UK Ltd in 2014 and was originally intended to be for 3 to 5 years to cover delivery of the Bellozanne STW project. The scope was expanded to include Infrastructure support in 2018 and the framework as a whole has been extended to provide continuity of support as the STW project has extended for various reasons.

I&E have supplemented input from Sweco with local consultants where appropriate, particularly if a presence on site was critical, long term or at short notice.

A new Professional Services Framework for Infrastructure support is to be tendered in mid-2022 for a start in January 2023 and may consist of three packages:

- Small projects and minor upgrades (nominally up to £1m).
- Large Capital Projects (nominally greater than £1m or unusually complex).
- Network modelling services.

The use of separate packages is intended to make the framework more attractive to local consultants and others who may be put off by a long-term incumbent and/or do not have specialist skills such as the network modelling. The new framework is currently planned to be for five years, potentially with an option to extend or terminate early based on performance.

Sweco's current framework ends on 31st December 2022 for Infrastructure work and 31st December 2023 for support to the STW project.

11. Funding

11.1. Introduction

The current Long Term Capital Programme for I&E covers the period 2022-2026, with a small number of projects having funding from previous years 2021 that has rolled over to this period.

For the purposes of this Bridging LWS the summary tables below cover the current and ongoing programme of works and funding is divided into six distinct streams for Liquid Waste:

- Liquid Waste Strategy - Sewage Treatment Works
- Liquid Waste Strategy – STW Projects
- Liquid Waste Strategy - Infrastructure
- Replacement Assets and Minor Capital Works
- Foul Sewer Extensions
- Drainage Infrastructure – Infrastructure Rolling Vote

All funding is derived from the Treasury as there are currently no Liquid Waste service charges in place on Jersey as there are in the UK and elsewhere. This arrangement is kept under review by the States Assembly but the Policy Team has confirmed that it will not change within the period of the Bridging LWS and so will not have a bearing on I&E's investment strategy.

11.1.1 Funding network improvements to service new developments

Policies WER6 and 7 both state that the developer will be expected to fund sewer network improvements and this may be enforced using planning obligation agreements. These policies are consistent with previous equivalent policies. In recent times, the connection is typically constructed by the developer as part of the development and subject to inspection by Building Control and work to upgrade the wider network is carried out by I&E with funding provided in part or in full by the developer.

One example of this is the Bel Royal Surface Water Pumping Station which was constructed in 2011 at a cost of approximately £1m. In this case the new asset was specific to the development but in cases where there is some betterment of the network as a whole the developer will only be required to make a contribution.

The Emerging Projects identified in Section 9.2 and 9.3 present something of a dilemma, particularly in relation to the affordable homes. Construction of these developments at the sites identified will have significant detriment on the network and improvement works to accommodate them will cost several million pounds. However, these houses are being built to meet the needs of the Island as set out in the policies of the Bridging Island Plan and any costs passed to the developer will increase the cost of the homes themselves.

Where the development is on the sites covered by Policy H5 (States owned land brought forward for affordable homes) it is considered unlikely that such costs can reasonably be passed to the developer and so funding in full is being sought from the Treasury. For clarity, making the connections to the public networks will still be part of the developer's scope.

Other new housing proposed by the Bridging Island Plan is intended for the open market, albeit such developments will be required to include a proportion of affordable homes, 15% under Policy H6. These developments will again be satisfying the Island Plan's policies but will also benefit the developer. Funding of improvement works for such developments will have to be considered on a case by case basis depending on the proportion of affordable homes.

I&E have an option to charge developers for works required within the network to accommodate their development either in part or full depending on the specific circumstances where it is not practical for the developer to carry out the works themselves, for example where works are remote from the connection point. In rural locations this has not always been appropriate as the new property may well have to be on a septic tank and in built up areas this may only be a nominal connection charge which can fall short of the actual costs involved.

In cases where there is no existing surface water drainage and no new scheme is planned, the department can calculate the charge to the developer for connecting surface water to a combined sewer based on the estimated runoff from the site and the cost of processing a cubic metre of liquid waste at Bellozanne STW. Hence, the charge can be minimised by the developer managing flow on site as far as possible.

Connection charges also apply to individual homeowners whether they are connecting a new build or an existing property. This is normally the full cost of any connection works but may be reduced to a fixed fee when it is a first connection to a newly extended sewer and they had previously used a septic tank or similar. The fixed fee will only apply if the connection is made at the time the sewer is installed, connection at a later date will attract the full cost.

I&E are reviewing the implications of introducing a more structured ‘developer pays’ model similar to that used in the UK. Under this model the charges to the developer are calculated using fixed rates and sums for the works required to connect the development to a point in the network where the Service Provider is happy it can be accepted, noting that this may be some way away from the development itself. The developer can install the connection themselves but it must be accepted by the Service Provider as being to the appropriate standard.

In the UK, any increase in treatment capacity at the local STW or other assets is funded by the Provider on the basis that they will receive monies from the future occupants through water bills. Given the absence of charges for Liquid Waste services on Jersey, this part of the model cannot currently be applied and so a full review of developer contributions is to be carried out during the Bridging LWS period.

11.2. Short term - 2022-2025

The current programme of works within the period of the Bridging LWS is included in the following tables.

11.2.1 Liquid Waste Strategy – Bellozanne STW

Funding for the STW itself has been secured and confirmed following nmcn plc going into administration in October 2021. I&E are now acting as Principal Contractor to deliver the project in Q3/Q4 of 2023. As of April 2022 the total out-turn forecast for the STW Project is £83,269,000, including for costs associated with disruption due to the pandemic and failure of nmcn plc. The total budget allocation for the STW project is £81,352,000 with an additional £1,917,000 expected through the Performance Bond.

The scope of works and programme are under ongoing review by the I&E Project Team with the project expected to be delivered before the end of 2023 as planned and in line with the budget allocation in the Government Plan 2022-2025. However, a Business Justification Case has been submitted in relation to the impact of inflation on the STW project since October 2021.

Project Title	Status	Year 1	Year 2	Year 3	Year 4	Year 5
		2022	2023	2024	2025	2026
		9,840,000	4,000,000	0	0	0
STW D&B Contract	Design					
	Construction	9,840,000	4,000,000			

Table 11.2.1-1: LWS – Bellozanne STW Replacement funding

11.2.2 Liquid Waste Strategy – STW Projects

These projects relate to ongoing improvement and expansion of existing assets associated with the Bellozanne STW site.

Project Title	Status	Year 1	Year 2	Year 3	Year 4	Year 5
		2022	2023	2024	2025	2026
		500,000	300,000	1,500,000	200,000	
STW Odour Mitigation P.115/2017.	Design					
	Construction	500,000	300,000	500,000	200,000	
Bellozanne STW Outfall Rehabilitation	Design					
	Construction			1,000,000		

Table11.2.2-1 : LWS – STW Funded projects funding

The projects below also fall under the STW funding umbrella but collectively make up the Biosolids Management Strategy update.

Project Title	Status	Year 1	Year 2	Year 3	Year 4	Year 5
		2022	2023	2024	2025	2026
		400,000	250,000	3,000,000	1,150,000	100,000
Biosolids Storage Facilities	Design		250,000			
	Construction	400,000		1,233,000	500,000	
Additional Funding for combined Biosolids Dewatering and Storage at Bellozanne STW	Design					
	Construction			1,767,0	650,000	100,000

Table 11.2.2-2: LWS – STW Funded projects – Biosolids Management funding

The £400,000 construction cost in 2022 is associated with an additional sludge storage tank that is being constructed as part of the ongoing works at Bellozanne STW.

The table below gives the total funding requirement for all of the STW related projects.

Project Title	Status	Year 1	Year 2	Year 3	Year 4	Year 5
		2022	2023	2024	2025	2026
		900,000	550,000	4,500,000	1,350,000	100,000
Other works	All works	500,000	300,000	1,500,000	200,000	
Biosolids Management	All works	400,000	250,000	3,000,000	1,150,000	100,000

Table 11.2.2-3: LWS – Total for STW Funded projects funding

11.2.3 Liquid Waste Strategy – Infrastructure Projects

The schemes below have been identified as strategic projects in relation to the challenges facing the wastewater network and the Bridging Island Plan. As such they fall outside of the Infrastructure Rolling Vote.

The future satellite STW has been discussed in detail in sections 8 and 9 above. Funding for initial Feasibility Study work has been identified in 2025-2026 but this will be kept under review in conjunction with an assessment of Statistics Jersey's population forecasts when they are released.

Project Title	Status	Year 1	Year 2	Year 3	Year 4	Year 5
		2022	2023	2024	2025	2026
		472,417	8,574,593	9,557,364	10,150,000	9,900,000
First Tower Rising Main Replacement	Design			250,000		
	Construction		250,000		4,000,000	4,000,000
Replacement of Bonne Nuit STW with a Pumping Station	Design		20,000	30,000		
	Construction		480,000	570,000		
West Park SW Outfall	Design	169,000				
	Construction	303,417	3,324,593	957,364		
North and West Network Upgrades	Design		200,000			
	Construction		3,800,000	6,000,000	4,000,000	
Other Emerging Projects (South and East)	Design			50,000	200,000	
	Construction				1,100,000	5,700,000
Le Dicq Rising Mains	All Works		500,000	1,700,000	800,000	
Future Sewage Treatment Capacity	Design				50,000	200,000
	Construction					

Table 11.2.3-1: LWS – Infrastructure Projects funding

11.2.4 Replacement Assets and Minor Capital Works

The table below combines costs associated with Replacement Assets and Minor Capital Works at the STW and on pumping stations in the network. These are both largely Mechanical and Electrical works, including ongoing telemetry upgrades, and therefore have a great deal of commonality. Much of the work is also carried out by the same teams on the ground.

Works at the STW have been estimated between £350,000 and £600,000 per year while construction of the STW is underway and new assets are being installed. After commissioning, the costs are estimated at between £500,000 and £750,000 per year and this variation is due to the range of asset lives for different pieces of equipment.

For the same reasons the costs for work on the Pumping Stations will vary between £1.15m and £1.6m and a typical figure of £1.35m has been included.

Project Title	Status	Year 1	Year 2	Year 3	Year 4	Year 5
		2022	2023	2024	2025	2026
		1,508,000	2,040,000	1,950,000	1,875,000	1,885,000
STW	All works	355,000	455,000	600,000	525,000	535,000
Pumping Stations	All works	1,153,000	1,585,000	1,350,000	1,350,000	1,350,000

Table 11.2.4-1: Replacement Assets and Minor Capital works funding

As discussed in Section 9.2.5, the Pumping Station Minor Capital programme of works will be co-ordinated with the Rising Main Replacement programme to maximise efficiency and operational optimisation.

The Rising Main Replacement programme will also be co-ordinated with similar schemes within the Emerging Projects portfolio such as the Le Dicq Rising Mains. This should help to provide continuity of work for contractors.

Project Title	Status	Year 1	Year 2	Year 3	Year 4	Year 5
		2022	2023	2024	2025	2026
		0	0	800,000	1,000,000	1,000,000
Rising Main Replacements	All works			800,000	1,000,000	1,000,000

Table 11.2.4-2: Rising Main Replacement funding

11.2.5 Foul Sewer Extensions

Two Foul Sewer Extension schemes have been identified in 2022 and, while schemes through the rest of the Bridging LWS period have not yet been confirmed, a similar level of spend is anticipated each year. It is expected that some of these schemes will be associated with new housing developments as they are confirmed.

Project Title	Status	Year 1	Year 2	Year 3	Year 4	Year 5
		2022	2023	2024	2025	2026
		878,247	1,000,000	1,000,000	1,000,000	1,000,000
Ville au Bas	All works	216,574				
Les Friquettes	All works	661,673				
Other schemes to be confirmed annually	All works		1,000,000	1,000,000	1,000,000	1,150,000

Table 11.2.5-1: Foul Sewer Extension schemes funding

11.2.6 Drainage Infrastructure (Infrastructure Rolling Vote)

The Infrastructure Rolling Vote (IRV) covers a wide range of projects across the Island and these can range in value from £25,000 to £1m. The full list of ongoing projects has therefore not been included.

Two recently completed projects have been included with the overall funding to arrive at the total for 2022.

The programme of works is set annually and the 2023 programme will be finalised in Q4 of 2022. Overall spend is expected to be similar to 2022 plus an allowance for additional works associated with meeting the demands from the extensive housing development in the Bridging Island Plan.

Project Title	Status	Year 1	Year 2	Year 3	Year 4	Year 5
		2022	2023	2024	2025	2026
		5,324,972	6,560,000	6,530,000	6,180,000	6,000,000
La Chatelaine	All works	88,922				
La Frontieres	All works	132,385				
Ongoing and upcoming schemes	All works	5,103,665				
Schemes to be confirmed annually	All Works		6,560,000	6,530,000	6,180,000	6,000,000

Table 11.2.6-1: Drainage Infrastructure Projects funding (Infrastructure Rolling Vote)

The 'ongoing and upcoming schemes' include Surface Water Separation projects for St Aubin's Road, Beach Road, Dicq Road and Beaumont that have been identified for the 2022/23 period. The Telemetry upgrades discussed in Section 9.2.8 are also intended to be funded via the Infrastructure Rolling Vote although this will be kept under review as the studies proceed.

11.3. Medium term - 2025-2035

A number of projects are identified above as taking place in 2022-26:

- First Tower Rising Main Replacement
- Biosolids Dewatering and Storage facilities
- Emerging projects (South and East)
- Future Sewage Treatment Capacity – Feasibility and preliminary investigations.

In addition to these projects the ongoing programmes will continue, ie:

- Replacement Assets and Minor Capital works – STW
- Replacement Assets and Minor Capital works – Pumping Stations
- Replacement Assets and Minor Capital works – Telemetry and Asset Management

Funding has also been identified for Foul Sewer Extension and Drainage Infrastructure (IRV) projects but these will only be established over the course of the Bridging LWS period.

11.4. Long term for 2035 and beyond

Funding for projects beyond 2035 has not been considered as part of this Bridging LWS.

12.Conclusions

12.1. Short Term 2023-26

The works required within the period of this Bridging LWS have been identified and are well understood. This includes rolling maintenance and inspection programmes as well as major projects.

The current position with population data and growth projections means that, unfortunately, the projects that have been identified as the 'LWS Emerging Projects' are only understood in principle and are currently difficult to quantify and/or prioritise due to lack of detail. Funding has been identified for these projects to align with the aims of the Bridging Island Plan but further details are required as soon as possible if the relevant targets are to be achieved.

The release of the population models associated with the 2021 Census data by Statistics Jersey in conjunction with details of the proposed housing developments across the Island are critical to defining these projects in terms of scope, programme and priority. If large housing estates are to be available for occupation by 2025 a number of these large network upgrades are effectively already behind programme.

While it is possible to progress the relevant Feasibility Studies and Concept Design to a degree without the relevant information it is impossible to finalise site selection, detailed design and planning approval without full details of the changes in the sewerage catchment. It is hoped that sufficient clarity can be obtained before the end of 2022 to allow these projects to move through the necessary steps in 2023 and allow construction in 2024/25 for the North and West schemes and in 2025/26 for the East and South schemes. The funding provisions made in this LWS for the Emerging Projects are therefore only indicative to reflect this uncertainty.

The 2021 Census result means that it is unlikely that investigations for an additional STW need to be planned before 2025. A Pre-feasibility/Needs Study will be carried out as soon as the population models are released by Statistics Jersey and it is anticipated that this will establish the relative priority of making provision for an additional STW in the medium term and 2025-35 LWS period.

Dealing with changing biosolids regulations has prompted a review of the original Master Plan for Bellozanne STW which may affect the location of future treatment provisions as required by the STW planning conditions. The Master Plan review will be completed in 2022/3 to suit the biosolids driver but the decision on the need for additional treatment will not be made until 2027 as discussed below.

12.2. Medium Term 2025-2035

This period will be the next 'full' Liquid Waste Strategy period and will also coincide with the next Island Plan period.

Rolling programmes of maintenance and upgrades will continue having been informed by investigations carried out in 2023-26. In addition these programmes will be linked to the new SAP system which should be in place by 2026.

It is anticipated that a number of 'stand-alone' projects from the Short Term period will be completed in the early years of this period, for example the First Tower Rising Main replacement, in conjunction with other major projects that have been developed during 2023-26 such as the South and East Emerging Projects. Definition of these early years projects will be carried out during 2023-26 based on the population and housing data received.

Monitoring of final effluent quality at Bellozanne STW will start in mid-2023 when the new works are commissioned and run up to five years before a decision is made on the need for additional treatment at the STW. If upgrades are required then the preliminary work is likely to start in 2028 with a view to completion within the Medium Term.

The analysis of the 2021 Census data and population models will further inform the Medium Term programme in conjunction with the development of the Island and Government Plans by 2025. The results of this analysis cannot be predicted at this stage; however, it is currently expected that development of a plan for a new STW will be required. This may involve one or more of the project delivery steps of feasibility, design, planning, tendering and construction before 2035.

12.3. Long Term beyond 2035

Beyond normal operational programmes, the only major project identified for 2035 and beyond is the additional STW which remains to be confirmed.

The 2025-35 LWS should expand on this programme as it is developed.

Appendices

A. Strategic Proposals, Policies and supporting Planning Policies

- A1 – Strategic Proposal 3 – Marine Spatial Plan and ILSCA
- A2 – Strategic Proposal 5 – Infrastructure Road Map
- A3 – GoJ Strategic Policies

B. Stations and Rising Mains over 50 years old

B1 – 50 year old Large pumping stations with cast/spun iron mains

- i. First Tower
- ii. Le Dicq
- iii. Beaumont
- iv. St Brelade 1 and 2
- v. Maupertuis
- vi. Route Orange
- vii. Rue Des Pres
- viii. Le Hocq
- ix. Pontac

B2 – 50 year old Pumping stations with uPVC rising mains

C. Pumping stations with small rising mains

D. Pumping stations with saline intrusion

E. Summary of Condition Survey

F. Pumping stations with Surge suppression equipment

G. Pumping Station Mechanical Full Refit Scope

H. Ice Pigging Report

I. Not used

J. Miscellaneous Key Installations

- J1 – Bonne Nuit
- J2 – Weighbridge
- J3 – West of Albert Pumping Station

Appendix A – Strategic Proposals, Policies and supporting Planning Policies

A1 Strategic Proposal 3 – Additional Notes on the ILSCA

Pending release of the Marine Spatial Plan in 2025, the existing Jersey Integrated Landscape and Seascape Character Assessment (ILSCA)[56] is the key reference document.

The ILSCA sets out ten distinctive natural character types that describe the terrestrial, intertidal and marine environments found across the entire Bailiwick of Jersey.

Number	Coastal unit name	Number	Coastal unit name
A	Cliffs and Headlands	F	Rocky Shores and Bays
B	Coastal Plain	G	Bays with Intertidal Flats and Reefs
C	Escarpment	H	Offshore Reefs and Islands
D	Enclosed Valleys	I	Shallow Sea
E	Interior Agricultural Plateau	J	Deep Sea
Other	Urban areas, not specifically defined.		

Table A1-1 : ILSCA Character Types

[56] Jersey Integrated Landscape and Seascape Character Assessment

The ILSCA then identifies 34 character areas around the island, each of which has been classified as one of the ten types as shown in the figure below:

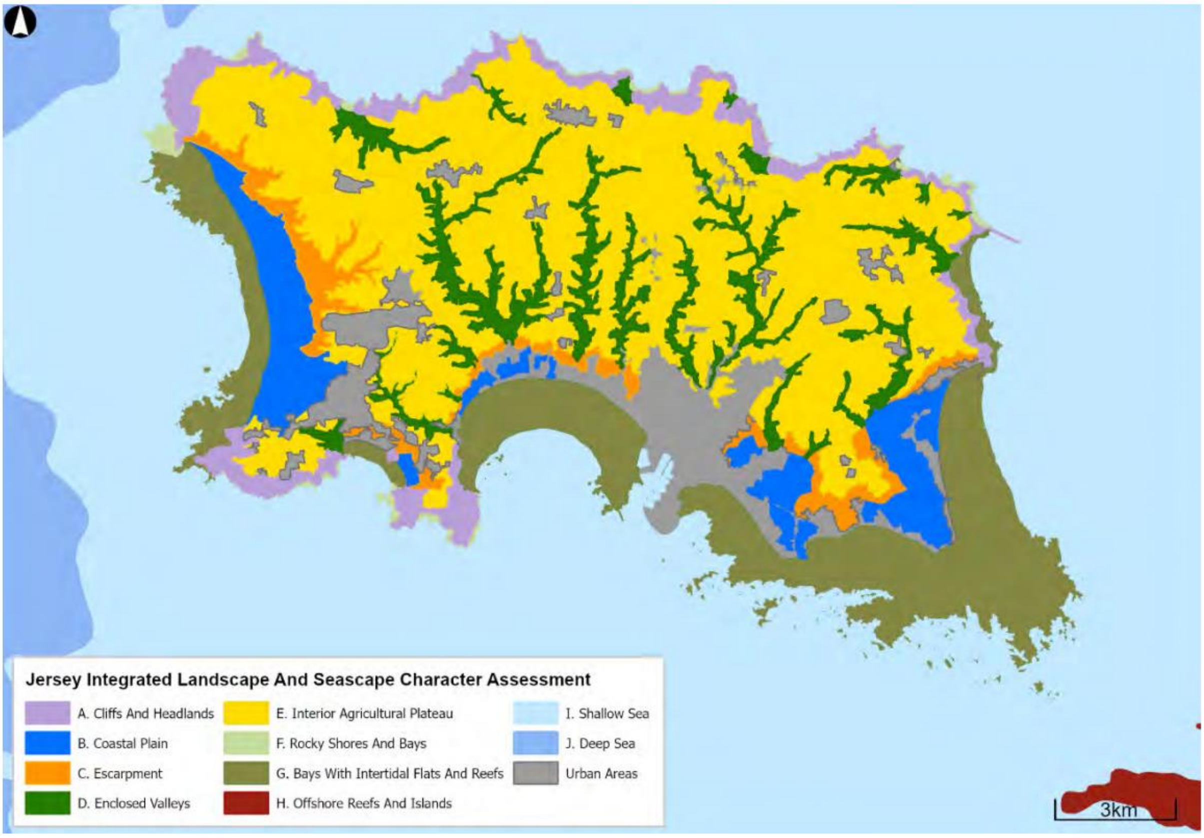


Figure A1.1 : Extract[57] from Bridging Island Plan / ILSCA showing landscape character areas

[57] Bridging Island Plan – Volume 3 Natural Environment – Figure NE5

The ILSCA also divides the coastline into fourteen coastal units as shown in the figure below:

Figure A1.2 : Extract from Bridging Island Plan / ILSCA showing Coastal units

Number	Coastal unit name	Number	Coastal unit name
1	St Ouen's Bay	8	Royal Bay of Grouville
2	Grosnez	9	St Clement's Bay
3	Grève de Lecq	10	Grève D'Azette
4	Bonne Nuit	11	St Aubin's Bay
5	Bouley Bay	12	Portelet
6	Rozel	13	St Brélade's Bay
7	St Catherine's Bay	14	Corbière

Table A1-2 : Coastal Unit names

Each Coastal Unit has been assessed and allocated a proposed policy implementation response as follows:

- **no active intervention**: the shoreline will be left to naturally evolve without intervention.
- **maintain the defence line**: existing coastal defences are maintained. The level of flood protection may decrease over time due to sea levels rising as a result of climate change.
- **adaptive management**: proactive management and mitigation of coastal flood or erosion risk. This could include improving the standard of flood protection for an existing sea defence, constructing new defences, raising awareness of flood risk to local communities or recommending flood protection for individual properties.
- **advance the line**: new sea defences are built seaward of existing defences. This approach will only be implemented in areas where there is currently a significant risk of coastal flooding or

erosion, or where it will deliver additional benefits for the community, environment and economy, such as creating a new amenity space or other development opportunity.

The single most significant marine interaction is the final effluent discharge from Bellozanne STW into St Aubin's Bay this has already been fully assessed as discussed above in Section 3.3. The Jersey Shoreline Management Plan[58] gives St Aubin's Bay (zone 11) a two stage policy approach:

3. 20-50 years – Advance the Line.
4. 50-100 years – Maintain the Defence.

There will be significant amenity gains from advancing the line around the bay, including creating space for a new First Tower PS.

The small satellite STW located at Bonne Nuit discharges final effluent to zone 4 on the north coast. This is not an ideal arrangement but has been the only viable solution to providing appropriate liquid waste treatment for the local area.

The majority of the north coast of Jersey has been determined as 'no active intervention' but the immediate vicinity of Bonne Nuit has been classified as 'maintain the defence' given the proximity of properties to the coastline.

The preferred arrangement for Bonne Nuit is to replace the STW with a transfer pumping station and treatment taking place at Bellozanne STW, however this not been economically viable to date. The fact that Bonne Nuit STW is approaching the end of its life and pump technologies are continually improving mean it is an appropriate time to reassess the available options and this has been included as part of the Bridging LWS. See Section 6.3 for a full discussion.

In addition to Bellozanne and Bonne Nuit STWs, there are a number of small discharge points across the Island that spill to the sea or watercourse. These include:

- surface water discharges (highway drainage or similar)
- Combined sewer storm overflows
- Foul sewer overflows.
- Known locations of inundation in extreme tide events. Influx of seawater is the greater issue but can result in some outlet of foul or combined water. These inundation points are part of the ongoing infiltration programme of works.

The inland landscape types will also be considered as part of the Surface Water Management Plans.

[58] Jersey Shoreline Management Plan 2020

A2 Strategic Proposal 5 – Additional Notes on the Infrastructure Road Map

Strategic proposal 5 will be developed from the Infrastructure Capacity Study (ICS) which :

- assesses existing infrastructure provision, its current capacity, and expected lifespan;
- identifies planned / known enhancement of the capacity of existing or new infrastructure;
- considers the impacts of relevant external drivers and mega trends, including technological developments, demand management; and
- establishes, in the form of an Infrastructure Delivery Schedule, what infrastructure is required, when, and who will be responsible to deliver it.

For infrastructure needs beyond the Bridging Island Plan period, the Infrastructure Capacity Study will be considered alongside the findings of the 2021 Census, future economic and population policies, and technological developments.

This will be the basis of the long-term infrastructure roadmap for Jersey, as described in Strategic Policy 5, which would be used to inform future Island Plans and other strategic planning workstreams across Government of Jersey.

The ICS includes a review of Liquid Waste infrastructure on Jersey but the recommendations are limited to saying the Bridging Island Plan should consider:

- Making a long term commitment to additional sewage treatment capacity.
- Exploring options to reduce demand on the sewer and surface water systems through adoption/enforcement of building bye-laws regarding water use and efficiency.
- Retaining policies to discourage the use of septic tanks.
- Including Flood Risk as a key consideration in the selection of strategic growth/housing locations.

Generally, the policies that have been derived from the ICS and the Strategic Proposal do not directly address Liquid Waste specifically. The Bridging Island Plan discusses each policy in the chapters on *Utilities and Strategic Infrastructure* and *Minimising Waste and Environmental Risk* within Volume 3: Managing Development. The most directly relevant policies are:

- Policy UI1 – Strategic infrastructure delivery
- Policy UI2 – Utilities infrastructure facilities
- Policy UI3 – Supply and use of water
- Policy WER2 – Managing flood risk
- Policy WER3 – Flood infrastructure

A2.1 Policies UI1 and UI2 – Strategic Infrastructure

The Bridging Island Plan policies for Utilities and Infrastructure are discussed with a focus on providing services to the population, eg. water, gas and electricity and do not specifically discuss infrastructure associated with dealing with waste.

However, both policies UI1 and UI2 will have implications for the siting of any new satellite STW should it be required.

A2.2 Policy UI3 – Water Use

Policy UI3 is again focussed on ensuring developments can receive an adequate water supply but is relevant to the LWS in that it deals with part of the larger water cycle and clearly if demand for water can be managed then this will benefit the requirements for treatment and disposal of the subsequent liquid waste. Jersey Water have produced the Water Resources and Drought Management Plan[59] (WRDMP) which lays out the constraints and issues facing the island from increasing population and climate change.

The WRDMP considers a programme of improvements for the period 2020-45 with the following works being identified for completion by 2025:

- Consumer efficiency measures to reduce demand.
- Leakage reduction works.
- Catchment protection initiatives (protecting raw water quality and increase resilience to pollution).
- Increase the capacity of La Rosière desalination plant by 5Ml/day.

These early works are clearly intended to drive efficiencies and meet immediate demand which is broadly similar to the aims of this Bridging LWS. In the medium to long term there will be benefits from taking a combined holistic approach which will take account of the whole water cycle. This is not something that can realistically be addressed within the scope of this Bridging LWS, however it is clear from the WRDMP that Jersey Water have similar aspirations and that the 2025-35 LWS will need to consider these issues.

A2.3 Policies WER2 and WER3 – Flood management

These policies intend to manage the risk of flooding either at or caused by a new development. Both will underpin the assessment of new developments by I&E with a view to their impact on foul, surface water and combined sewers. While primarily aimed at protecting property they will also act to protect watercourses and thereby inter-relate with the ongoing work I&E are doing to prepare a Surface Water Management Plan.

[59] Jersey Water – Water Resources and Drought Management Plan

A3 GoJ Strategic Policies

There are seven main Strategic Policies, each of which is supported by various specific planning policies. Many of the planning policies are not directly relevant to the provision of Liquid Waste services but where they are anticipated to have an impact either directly or indirectly they are discussed below under the relevant Strategic Policy.

Further to Section 4.3 of the Bridging LWS, the lists below align each planning policy to the relevant Strategic Policy but only relevant policies have been discussed.

The key to policy numbering is:.

- **CI : Community Infrastructure**
- **EI/EO/ER/ERE/EV : Economy**
- **GD : General Development**
- **H : Housing**
- **HE : Historic Environment**
- **ME : Managing emissions**
- **MW : Minerals extraction and solid waste disposal**
- **NE : Natural Environment**
- **PL : Places**
- **WER : Minimising waste and environmental risk**
- **TT : Travel and Transport**
- **UI : Utilities and strategic infrastructure**
- **WER : Minimising waste and environmental risk**

A3.1 Policy SP1 – Responding to climate change

ME : Managing emissions

- Policy ME1 – 20% reduction in target energy rate for large-scale developments
- Policy ME2 – Passivhaus standards for affordable homes and major development outside the built-up area
- Policy ME3 – BREEAM rating for new larger-scale non-residential buildings
- Policy ME4 – Air quality and increased emissions
- Policy ME5 – Carbon sequestration schemes
- Policy ME6 – Offshore utility-scale renewable energy proposals
- Policy ME7 - Larger-scale terrestrial renewable energy developments

The policies ME1/3/4 may impact on new developments carried out by I&E and this will be assessed on a case by case basis. However, they are consistent with I&E's own policies and in those terms are not considered to have an impact.

WER : Minimising waste and environmental risk

- Policy WER1 – Waste minimisation (Solid Construction Waste)
- Policy WER2 – Managing flood risk
- Policy WER3 – Flood infrastructure
- Policy WER6 – Surface water drainage

WER1 affects all I&E construction projects in that it requires a site waste management plan to be developed and promotes reuse and recycling of materials where possible. However, it is no more onerous than existing requirements and is consistent with I&E's own policies.

WER2 and 3 will act to protect against flooding either by making provision within a new development or by protecting existing defences. They are not expected to have any negative impact on I&E's operations.

WER6 specifies the use of separated drainage and SUDS within new developments and requires discharges to watercourse to be of suitably high quality. In broad terms these considerations will help to manage the flow of surface water into the existing network but there is no reference to how the existing capacity in the system will be considered or affect the planning decision.

A3.2 Policy SP2 – Spatial strategy

GD : General Development

- Policy GD1 – Managing the health and wellbeing impact of new development
- Policy GD2 – Community participation in large-scale development proposals
- Policy GD3 – Planning Obligation Agreements
- Policy GD4 – Enabling or linked development
- Policy GD5 – Demolition and replacement of buildings
- Policy GD6 – Design quality
- Policy GD7 – Tall Buildings
- Policy GD8 – Green backdrop zone
- Policy GD9 – Skyline, views and vistas
- Policy GD10 – Percent for art

Policies GD3 and 6 may impact on LWS projects but no more than would be expected currently.

GD4,5,7 aim to limit these types of development which should support minimising additional pressure on the existing network, eg. tall buildings tend to have high occupancy for the footprint.

GD8 may also help to support surface water management and use in SUDS as discussed in WER6.

HE : Historic Environment

- Policy HE1 – Protecting listed buildings and places, and their settings
- Policy HE3 – Protection or improvement of conservation areas
- Policy HE4 – Demolition in conservation areas
- Policy HE5 – Conservation of archaeological heritage

Policies HE1/3/5 can be relevant to I&E projects in some areas, in particular the sea wall is listed in some locations, and there is potential for pipelines to cross conservation areas. Policy HE4 could also be relevant to I&E's proposals to modify or replace existing assets.

In all cases no more impact than would be expected currently is anticipated from the HE policies.

EI/EO/ER/ERE/EV : Economy

- Policy EO1 – Existing and new office accommodation
- Policy EO2 – Business run from home
- Policy EV1 – Visitor accommodation
- Policy EI1 – Existing and new industrial sites and premises
- Policy ERE1 – Protection of agricultural land
- Policy ERE3 – Conversion or re-use of traditional farm buildings
- Policy ERE4 – Re-use of modern farm buildings
- Policy ERE6 – Derelict and redundant glasshouses
- Policy ERE7 – Equine development
- Policy ERE8 – Fishing and aquaculture

EO1, EV1 and EI1 policies link to concerns with placemaking whereby they will concentrate development in existing settlements, results in more load on existing liquid waste assets and network.

ERE1/3/4/5/6 aim to prevent residential development away from existing settlements at the same time that the above policies and SP3 drive development to be in existing settlements. This creates a "Push-Pull" towards the same result of concentrating population in existing settlements with the associated issues this creates for the existing liquid waste network.

ERE6/7/8 also aim to limit industrial development outside of designated areas

H : Housing

- Policy H1 – Housing quality and design
- Policy H2 – Housing density
- Policy H3 – Provision of homes
- Policy H4 – Meeting housing needs
- Policy H5 – Provision of affordable homes
- Policy H6 – Supported housing
- Policy H7 – Key worker accommodation
- Policy H8 – Housing outside the built-up area
- Policy H9 – Rural workers' accommodation

H2/3/4/5/8/9 specifically aim to prevent residential development away from existing settlements

CI : Community Infrastructure

- Policy CI1 – Education facilities
- Policy CI2 – Healthcare facilities
- Policy CI3 – Our Hospital and associated sites and infrastructure
- Policy CI4 – Community facilities and community support infrastructure
- Policy CI5 – Sports, leisure and cultural facilities
- Policy CI7 – Protected open space

CI1/2/4/5 have similar intent to the policies relating to housing and industry in that they aim to keep similar uses together. Education and Healthcare will typically result in significantly higher load than residential development with consequently higher impact on the existing network.

Conversely, CI3 is more concerned with mitigating the impact of the OHP on its surroundings including local infrastructure.

WER : Minimising waste and environmental risk

- Policy WER2 – Managing flood risk
- Policy WER3 – Flood infrastructure
- Policy WER7 – Foul sewerage

A3.3 Policy SP3 – Placemaking

PL : Places

- Policy PL1 - Development in Town
- Policy PL2 - Les Quennevais
- Policy PL3 - Local centres
- Policy PL4 - Smaller Settlements

These policies are consistent with the other policies which direct new development towards existing settlements. The implications for the liquid waste system have been discussed above.

EI/EO/ER/ERE/EV : Economy

- Policy EI1 – Existing and new industrial sites and premises

Economy policies relevant to I&E and the Bridging LWS under SP3 are discussed in section 4.4.2.

H : Housing

- Policy H2 – Housing density
- Policy H3 – Provision of homes
- Policy H4 – Meeting housing needs
- Policy H8 – Housing outside the built-up area
- Policy H9 – Rural workers' accommodation

In addition to the policies discussed in A3.2, policies H8 and H9 aim to limit development away from established settlements. H8 particularly deals with expansion of, or conversion of business buildings to, domestic property while H9 considers development of accommodation for agricultural and tourism workers. Both will act to increase load on the existing network albeit the specific impact is expected to be minor compared with that from the relevant Housing and Places policies.

CI : Community Infrastructure

- Policy CI7 – Protected open space
- Policy CI8 – Space for children and play
- Policy CI9 – Countryside access and awareness

Community Infrastructure policies relevant to I&E and the Bridging LWS under SP3 are discussed in section A3.2.

WER : Minimising waste and environmental risk

- Policy WER2 – Managing flood risk
- Policy WER10 – Aircraft noise zones

Waste and Environment policies relevant to I&E and the Bridging LWS under SP3 are discussed in sections 4.4.1 and 4.4.2.

A3.4 Policy SP4 – Protecting and promoting island identity

GD : General Development

- Policy GD10 – Percent for art

HE : Historic Environment

- Policy HE1 – Protecting listed buildings and places, and their settings
- Policy HE2 – Protection of historic windows and doors
- Policy HE3 – Protection or improvement of conservation areas
- Policy HE4 – Demolition in conservation areas
- Policy HE5 – Conservation of archaeological heritage

Historic Environment policies relevant to I&E and the Bridging LWS under SP4 are discussed in section 4.4.2.

EI/EO/ER/ERE/EV : Economy

- Policy ER1 – Retail and town centre uses
- Policy ER2 – Large-scale retail
- Policy ERE1 – Protection of agricultural land
- Policy ERE8 – Fishing and aquaculture

In addition the Economy policies discussed above ER1 and ER2 will act to keep retail development in established areas, particularly St Helier. The impact on the sewerage system from retail development is not considered to be significant, however surface water run-off from large roofs or car parks may be an issue in built up areas.

H : Housing

- Policy H2 – Housing density

Housing policies relevant to I&E and the Bridging LWS under SP4 are discussed in section 4.4.8.

A3.5 Policy SP5 - Protecting and improving the natural environment

In addition to SP1 – Responding to Climate Change

PL : Places

- Policy PL5 - Countryside, coast and marine environment

Similar to many other policies, PL5 is intended to push new developments towards existing settlements but supports new developments where there is an associated improvement in the natural environment. This will therefore potentially support new or improved installations on the liquid waste network, for example, installation of surface water outfalls that reduce the risk of a foul spill in the same location or elsewhere.

GD : General Development

- Policy GD8 – Green backdrop zone
- Policy GD9 – Skyline, views and vistas

General Development policies relevant to I&E and the Bridging LWS under SP5 are discussed in sections A3.2.

NE : Natural Environment

- Policy NE1 – Protection and improvement of biodiversity and geodiversity
- Policy NE2 – Green infrastructure and networks
- Policy NE3 – Landscape and seascape character

Policies NE1 and NE2 may apply to I&E projects but are not considered to increase the associated responsibilities. As an example, Planning Approval for the Bellozanne STW Accommodation Works included a planning condition for additional planting to create a wildlife corridor around the site.

Policy NE3 has similar implications to Policy PL5 as discussed above.

EI/EO/ER/ERE/EV : Economy

- Policy ERE1 – Protection of agricultural land
- Policy ERE3 – Conversion or re-use of traditional farm buildings
- Policy ERE4 – Re-use of modern farm buildings
- Policy ERE5 – New or extended agricultural buildings
- Policy ERE6 – Derelict and redundant glasshouses
- Policy ERE7 – Equine development
- Policy ERE8 – Fishing and aquaculture

Economy policies relevant to I&E and the Bridging LWS under SP5 are discussed in section A3.2.

H : Housing

- Policy H2 – Housing density
- Policy H8 – Housing outside the built-up area
- Policy H9 – Rural workers’ accommodation

Housing policies relevant to I&E and the Bridging LWS under SP5 are discussed in sections A3.2 and A3.3.

CI : Community Infrastructure

- Policy CI6 – Provision and enhancement of open space
- Policy CI7 – Protected open space
- Policy CI10 – Allotments

TT : Travel and Transport

- Sustainable Transport Policy – Policies TT1 to TT5.

The Sustainable Transport Policy supports the broader policies and strategies which impact the LWS, such as the spatial strategy, but is not considered to directly affect the LWS as such.

WER : Minimising waste and environmental risk

- Policy WER1 – Waste minimisation (Solid Construction Waste)
- Policy WER2 – Managing flood risk
- Policy WER3 – Flood infrastructure
- Policy WER5 – Water pollution safeguard area
- Policy WER6 – Surface water drainage
- Policy WER7 – Foul sewerage
- Policy WER8 – Safety zones for hazardous installations
- Policy WER10 – Aircraft noise zones

Waste and Environment policies relevant to I&E and the Bridging LWS under SP5 are discussed in sections A3.1 and A3.2.

A3.6 Policy SP6 – Sustainable island economy

Economy policies relevant to I&E and the Bridging LWS under SP6 have been discussed in A3.2. Other relevant policies relating to the location of new businesses and industry, population growth and housing have also been discussed above.

EI/EO/ER/ERE/EV : Economy

- Policy ER1 – Retail and town centre uses
- Policy ER2 – Large-scale retail
- Policy ER3 – Local retail
- Policy ER4 – Daytime and evening economy uses
- Policy ER5 – Meanwhile retail and town centre uses
- Policy EO1 – Existing and new office accommodation
- Policy EO2 – Business run from home
- Policy EV1 – Visitor accommodation
- Policy EI1 – Existing and new industrial sites and premises
- Policy ERE1 – Protection of agricultural land
- Policy ERE2 – Diversification of the rural economy
- Policy ERE3 – Conversion or re-use of traditional farm buildings
- Policy ERE4 – Re-use of modern farm buildings
- Policy ERE5 – New or extended agricultural buildings
- Policy ERE6 – Derelict and redundant glasshouses
- Policy ERE7 – Equine development
- Policy ERE8 – Fishing and aquaculture

A3.7 Policy SP7 – Planning for community needs

GD : General Development

- Policy GD2 – Community participation in large-scale development proposals

Policy GD2 requires the submission of a community participation statement as part of the planning application for large developments. This will apply to I&E's major projects but is consistent with our current practices.

EI/EO/ER/ERE/EV : Economy

- Policy ERE1 – Protection of agricultural land
- Policy ERE3 – Conversion or re-use of traditional farm buildings
- Policy ERE4 – Re-use of modern farm buildings
- Policy ERE5 – New or extended agricultural buildings

H : Housing

- Policy H1 – Housing quality and design
- Policy H2 – Housing density
- Policy H3 – Provision of homes
- Policy H4 – Meeting housing needs
- Policy H5 – Provision of affordable homes
- Policy H6 – Supported housing
- Policy H7 – Key worker accommodation
- Policy H9 – Rural workers' accommodation

ME : Managing emissions

- Policy ME2 – Passivhaus standards for affordable homes and major development outside the built-up area
- Policy ME4 – Air quality and increased emissions
- Policy ME6 – Offshore utility-scale renewable energy proposals
- Policy ME7 - Larger-scale terrestrial renewable energy developments

CI : Community Infrastructure

- Policy CI1 – Education facilities
- Policy CI2 – Healthcare facilities
- Policy CI3 – Our Hospital and associated sites and infrastructure
- Policy CI4 – Community facilities and community support infrastructure
- Policy CI5 – Sports, leisure and cultural facilities
- Policy CI6 – Provision and enhancement of open space
- Policy CI7 – Protected open space

WER : Minimising waste and environmental risk

- Policy WER2 – Managing flood risk
- Policy WER3 – Flood infrastructure
- Policy WER4 – Land reclamation
- Policy WER6 – Surface water drainage

- Policy WER7 – Foul sewerage
- Policy WER8 – Safety zones for hazardous installations
- Policy WER9 – new, extended or altered hazardous installations
- Policy WER11 – Airport public safety zones

UI : Utilities and strategic infrastructure

- Policy UI1 – Strategic infrastructure delivery
- Policy UI2 – Utilities infrastructure facilities
- Policy UI3 – Supply and use of water
- Policy UI4 – Telecoms and other masts and equipment

Utilities and Infrastructure policies relevant to I&E and the Bridging LWS under SP7 are discussed in A2.

MW : Minerals extraction and solid waste disposal

- Policy MW1 – Provision of minerals
- Policy MW2 – Safeguarded inert waste management or disposal sites
- Policy MW3 – New, extended and existing waste management sites

These policies relate to solid materials and as such are not strictly relevant to this Bridging LWS. However, MW1 is linked to construction materials such as aggregate and concrete and MW2 also links to construction through the disposal of related wastes. As such they do have a bearing on liquid waste operations but are not expected to actually affect them.

In addition, while MW3 overtly relates to solid waste management facilities, it is anticipated that the principles would apply equally to any new or extended sewage treatment facility.

Appendix B – Pumping Stations and Rising Mains over 50 years old

B1 - 50 year old Large pumping stations with cast/spun iron mains

i. First Tower
ii. Le Dicq
iii. Beaumont
iv. St Brelade 1 and 2
v. Maupertuis
vi. Route Orange
vii. Rue Des Pres
viii. Le Hocq
ix. Pontac

B2 - 50 year old Pumping stations with uPVC rising mains

B1 50 year old Large pumping stations with cast/spun iron mains

B1 i) First Tower Pumping Station

Description

First Tower pumping station is the main feed for the Bellozanne Sewage treatment works. Only a small quantity of sewage is fed to the works by gravity from the St john catchment.

First Tower was built in conjunction with the new STW in the 1950's and has been refurbished and enhanced over the past 60 years.

Photo B1.1.1 : First Tower above ground structure

The most recent refurbishment has refreshed and enhanced the mechanical and Electrical installation with larger variable speed drive pumps with associated new valves and pipework within the valve chamber and enhanced odour control equipment.

The challenge with First Tower pumping station is defining what is its priority, in dry conditions its function is to feed the sewage treatment works in a balanced and consistent manner. In wet conditions its function is to empty the sewerage system as quickly as possible avoiding backing up the system.

These two extreme conditions are becoming more common as climate change becomes the normal.

The mechanical and electrical assets have been successfully updated but the civil works and infrastructure has shown some worrying failures in 2021/22. One of the twin rising mains from First Tower to the Sewage works failed due to rags blocking the non-return valve and the main dewatering. Then, on pump start up the pressures and mass oscillation of air caused a pipe burst. The subsequent investigation found a catastrophic corrosion / wear line on the pipe invert where the main has worn to the point where holes had formed. See Section 6.7 for further details.

As a matter of urgency this section of main was replaced and a further section of the main was relined as protection. The twin main will require a similar fix.

In addition the wet well volume at First Tower is very limited and causes significant issues with the control philosophy and the hydraulics from Beaumont and the Weighbridge. Looking at the wet well and the issues of ragging we should be reviewing whether an inline macerator can be installed upstream of the wet well.

The small wet well volume can also result in shock-loading at Bellozanne STW when flow peaks occur at First Tower. In the short to medium term this will be alleviated by surface water separation schemes at West Park and in St Aubin's Road, however these will not address the fundamental issues with the pumping station itself.

Over the longer term it should be a priority to plan for the replacement of First Tower with a new wet well and new rising mains. The lack of space available at the existing site means that a new pumping stationtis likely to be tied into the 'extend the line' project which will provide adequate space to develop a new station whilst keeping the existing one operational.

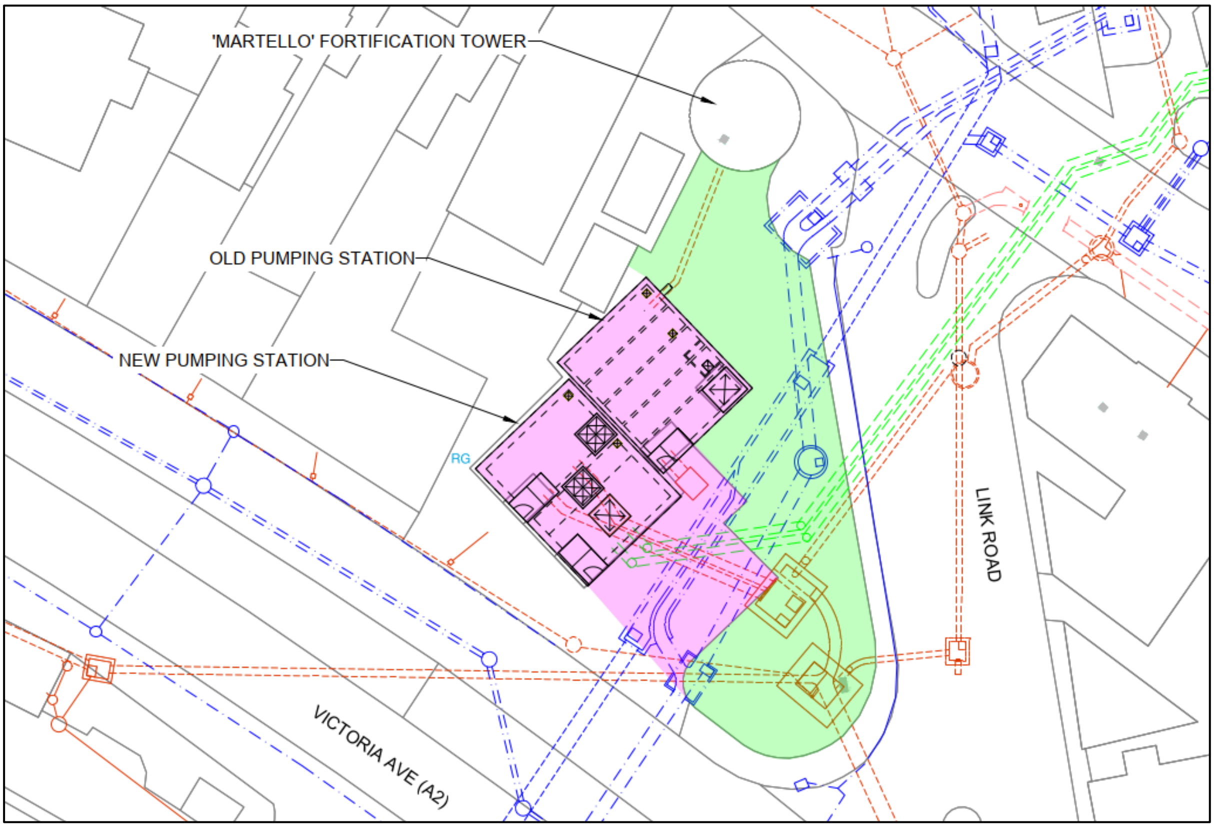


Figure B1.1.2 First Tower site layout

The rising main replacement project is programmed to take place within the Bridging LWS period but will be challenging and alternative routes will be looked into. The section of pipework within the environs of the new STW is new and will not require replacement but the other sections will all need to be replaced.

Due to the failure modes it is critical that a robust solution to the pipework is found, either a cement lined pipe or a MDPE pipe of adequate pressure rating.

Actions and recommendations

1) Conduct feasibility study to assess the rising main and pumping station including a check on capacity, condition and efficiency
2) Conduct a full feasibility to replace the pumping station and the 2 parallel rising mains.
3) Develop a business case for the necessary works based on the outcomes of actions 1 and 2

B1 ii) Le Dicq pumping station

Description

Le Dicq pumping station is the last station in the chain which transfers flow from the east of the island, it is of key strategic importance and has a maximum design capacity of 500 litres per second of sewage flow with all pumps operating.

The Le Dicq site includes two pumping stations, Le DIcq itself pumps foul/combined sewage towards First Tower and Baudrette Brook pumps surface water to sea during hightides.

Photo B1.2.1 : Baudrette Brook (left) and Le Dicq (right) Pumping Stations

The Le Dicq pumping station has origins dating back to Victorian times as this is in the heart of the combined sewer area. In 1957 the sewer pumping station and rising mains were installed to transfer the sewage to the new Bellozanne Sewage Treatment Works. The rising mains are parallel12 inch and 18 inch mains and are just short of 1000 metres in length.

In combination, the pumping station site houses pumps which fulfil three different functions:

Baudrette Brook PS

1) Surface water pumping with Archimedean screw pumps
The surface water pumps were replaced and updated in terms of flow and condition in 2019 and will not require upgrading for another 15 years.

Le Dicq PS

2) Storm emergency discharge pumps for last resort pumping to sea via the long sea outfall
The storm emergency discharge pumps are designed to operate as a last resort only if the combined seage pumping system is at its maximum output.
The pumps only operate at times of emergency and the hours run are low, however the risk is the pumps are old. The ongoing strategy is to refurbish the pumps on a rolling programme.
The long-term strategy is to update the foul pumping station to make sure that this part of the pumping station is redundant except in times of catastrophic failure.

3) Sewage pumping station transferring the east coast flows into the weighbridge area gravity network, then First Tower.

The site has been refurbished on a number of occasions, Baudrette Brook PS had a full mechanical and electrical refurbishment of the Archimedes pumps, a new set of panels and Le Dicq has new Hydrostal sewage pumps. The Allen Gwynnes storm sewage overflow pumps date back to 1984.

The Le Dicq station is generally in good condition, the relocation of the control panels away from the sewage wet wells will assist in minimising the degradation due to hydrogen sulphide attack. The key concern however with this pumping station is the discharge manifold and the rising mains. Recent test results show thinning within the discharge manifold with a reading in one point of a thickness of 6.53mm (other readings showed wall thicknesses of 15.66mm).

The four submersible sewage pumps in Le Dicq PS pump via two rising mains into the downstream gravity system. Three of the pumps discharge via the 18" main and the fourth discharges via the 12". Both mains were installed in 1957 and as a matter of urgency should be inspected and planned to be replaced or refurbished.

This pumping station is the bottle neck for the east coast, and this is being exacerbated by problems in the downstream system which mean it cannot pump at full capacity without causing flooding. A project to provide relief in the system at the west end of the tunnel is programmed for Q4 of 2022. Surface Water Separation schemes have also been identified in Beach Road and Dicq Road which will divert flow from the combined network feeding Le Dicq into the adjacent system feeding Baudrette Brook PS, thus releasing capacity in the foul pumping station.

In the medium to long term it is imperative to provide for the anticipated future population demand by replacing the rising mains and potentially upgrading the pumping station itself.

As can be seen from the site layout below, there is no space available between the slipway, beach and La Greve D'Azette to expand Le Dicq PS itself.

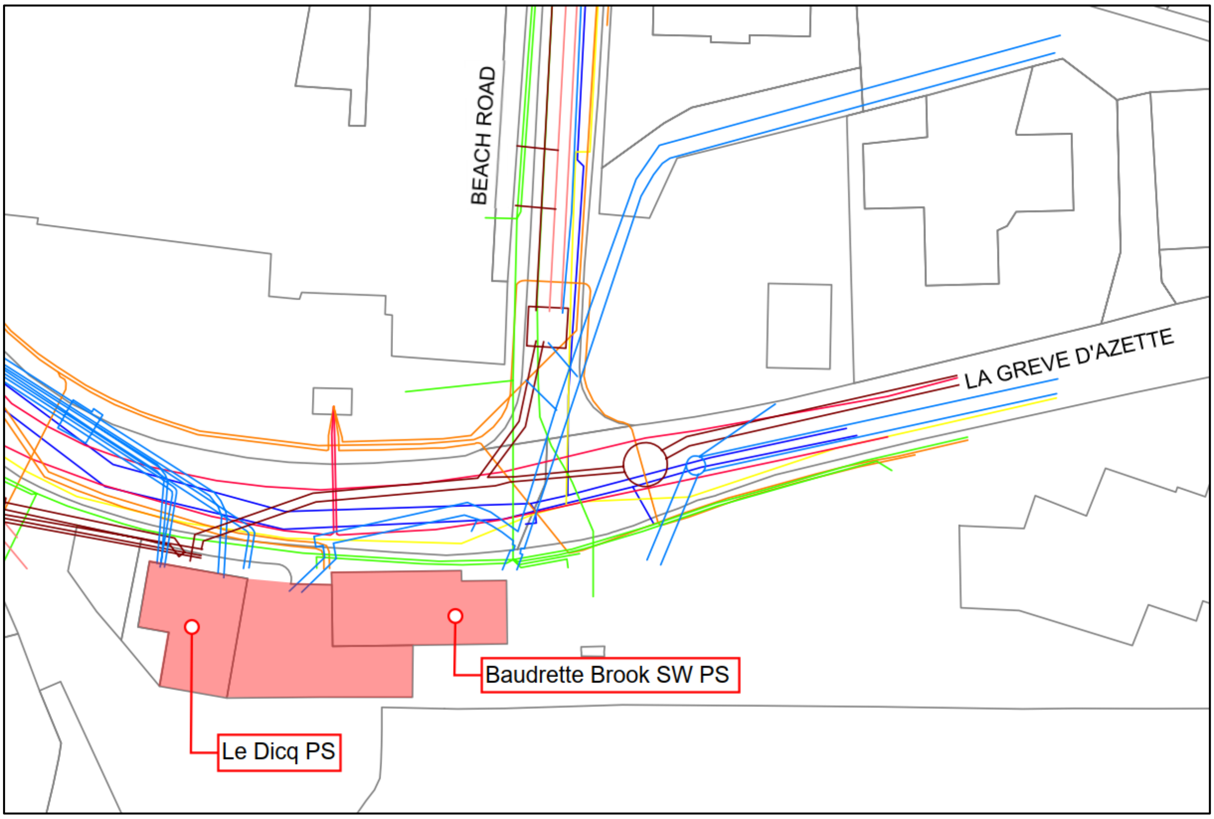


Figure B1.2.2 : Site layout – coloured lines are buried utilities

In the long term, if a new STW is required then the most likely location for it would be at La Collette reclamation site and the east coast system could then pump directly to the new works. For this reason and to avoid major disruption the new rising main could be routed via the la Collette coast path.

A feasibility study shall be undertaken to ascertain the capital plan and options for this strategic pumping station which shall include pumping station alternate locations and rising main routing, sizes etc.

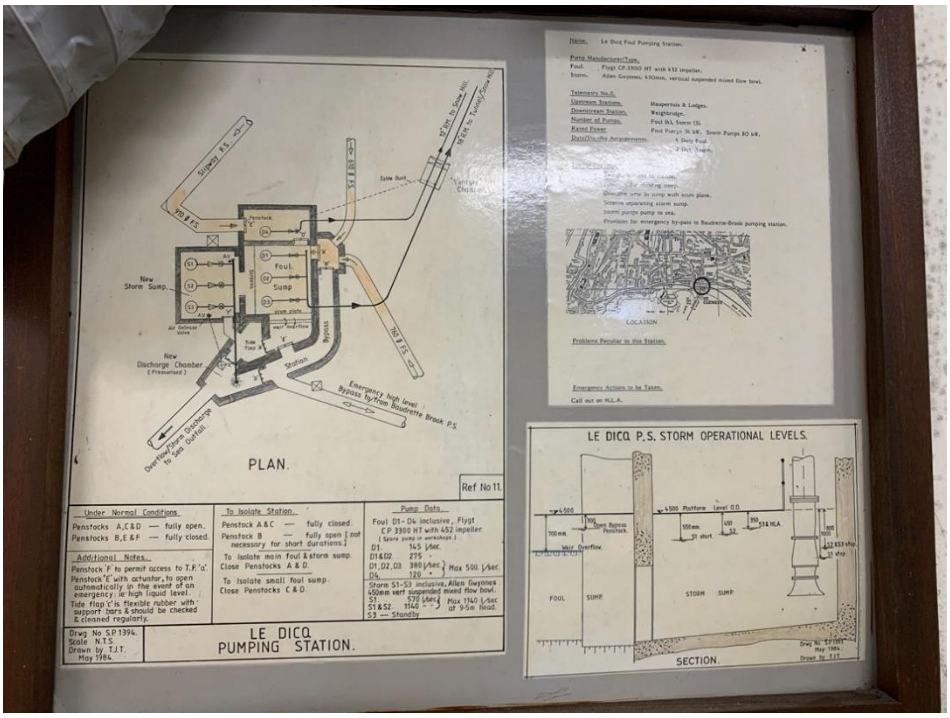


Photo B1.2.2 : Le Dicq configuration of Sewage pumping elements

Actions and recommendations

1) Complete local surface water separation schemes to release capacity.
2) Conduct feasibility study to assess the rising mains and pumping station including a check on capacity, condition and efficiency
3) Replace the discharge manifold as a matter of urgency
4) Investigate the condition of the rising mains as a matter of urgency
5) Develop a business case for the necessary remedial works based on the outcomes of actions 1 and 3

B1 iii) Beaumont pumping station

Description

Sewage from the west of the island passes through Beaumont pumping station before it reached First Tower. This station is strategically pivotal, and any failure would lead to a significant pollution incident. The west of the island and Beaumont pumping station does not have any attenuation or storm capacity beyond upstream wet well storage, and this leaves the station vulnerable.

In terms of capacity the pumping station requires all four pumps to operate in times of high flow and, has no back up beyond the operational maintenance team and the ability to fix it.

Beaumont pumping station is one of the original stations and dates from 1958, a second rising main was installed in 1987. The pumping station lifts the sewage from the west of the island to a point where it can gravitate to First Tower, the rising mains are short (29m and 40m) and the static head is less than 5m.

Photo B1.3.1 : Beaumont pumping station above ground structures

This station is reliable and has been refurbished as required throughout its life. The challenge with Beaumont pumping station is due to its location and the lack of space for expansion and growth. The site is within a few metres of the sea wall and has very little capacity for storage.

The pumping stations has 4 number of pumps mounted in a dry well configuration.

Photo B1.3.2 : Beaumont pumping station dry well configuration

Actions and recommendations

1) Conduct a feasibility study to confirm the capacity, condition and efficiency of the pumping station and how to replace it
2) Investigate the condition and capacity of the rising main as a matter of urgency
3) Develop a business case for the works based on the conclusions of items 1 and 2

B1 iv) St Brelade 1 and 2

Description

St Brelades bay started to pump its sewage to the new treatment works at Bellozanne in 1959, via 2 pumping stations operating in series, St Brelades one and two.

Photo B1.4.1 : St Brelades No 1 Above ground structure

Photo B1.4.2 : St Brelades 2 above ground structure

The stations have operated successfully since this time. The mechanical and electrical equipment has been updated on a regular basis and the stations are generally reliable.

The biggest concern is the status of the rising mains which are Cast Iron, and very likely to be approaching the end of their life. Part of the St Brelade1 rising main was replaced in 2005 and a short section of St Brelade 2 rising main was replaced/diverted in 2015 to accommodate the reconstruction of a property.

A condition survey needs to be undertaken on the remaining original sections of the two rising mains to assess the remaining life of the pipes as a matter of urgency. A capacity review also needs to be undertaken based on the drainage survey currently getting updated.

Photo B1.4.3 : St Brelades no 1 wet well pump installation

Photo B1.4.4 : St Brelades no 2 dry well configuration

It may be possible to replace the two pumping stations with one to simplify the system and minimise the capital and operational expenditure, a feasibility study will review all options.

Both stations show signs of significant H_2S attack although the Mechanical and Electrical plant and equipment is in good general condition the sumps, covers and ancillaries are showing quite severe signs of decay and degradation.

Actions and recommendations:

1) Conduct a feasibility study to confirm the capacity, condition and efficiency of the pumping station and how to replace it
2) Investigate the condition and capacity of the rising mains as a matter of urgency
3) Develop a business case for the works based on the conclusions of items 1 and 2

B1 v) Maupertuis

Description

Maupertuis is part of the east coast series of pumping stations and pumps sewage to Le Dicq. The station has two key components, three submersible pumps in a wet well configuration dealing with normal day to day flows and an adjacent structure which houses storm pumps and significant storm water storage.

Photo B1.5.1 : Maupertuis pumping station above ground structure

Photo B1.5.2 : Maupertuis Overflow pumping station

The station is generally in good condition, the mechanical and electrical installation is well within its asset life.

Photo B1.5.3 : Maupertuis Sewage pumping station wet well

Photo B1.5.4 : Maupertuis Overflow sump pumps

The challenge is the design of the station and the complexity of the overflow storage. This station has significant storage which is not utilised and may be an opportunity to utilise more effectively in the future.

The accessibility and safety case for maintenance needs to be reviewed as the access points are limited and the covers require external powered lifting equipment to remove.

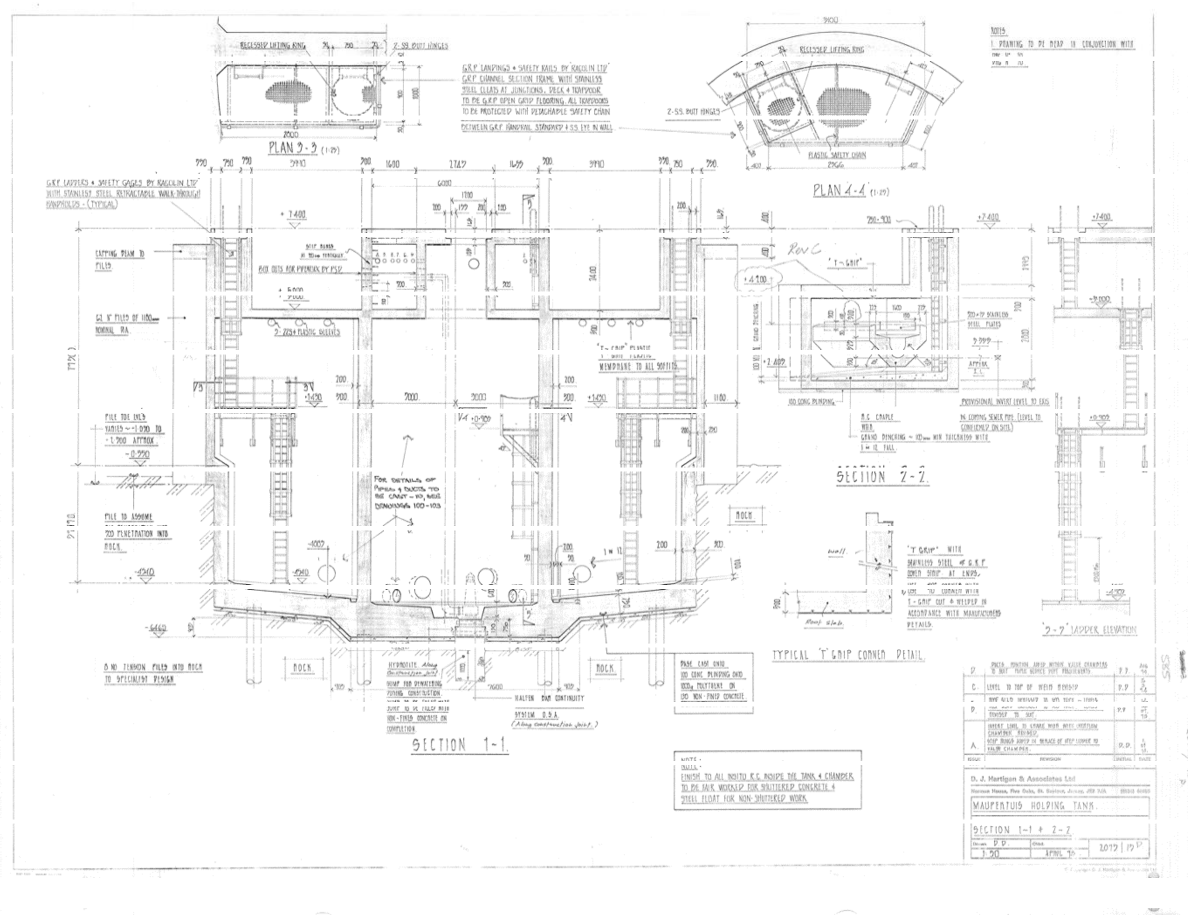


Figure B1.5.6 : Maupertuis Overflow sump GA

Actions and recommendations:

1) Conduct a feasibility study to confirm the capacity, condition and efficiency of the pumping station.
2) Investigate the condition and capacity of the rising main as a matter of urgency. Noting that the existing pipes run through private property, including a school, so any replacement may have to be on a new route.
3) Review the storage capacity and whether the asset could service more areas and provide enhanced protection for the east coast network.
4) Develop a business case for the works based on the conclusions of items 1,2 and 3.

B1 vi) Route Orange

Description

Route Orange pumping station is located adjacent to housing on the west of the island.

The pumping station and cast iron rising main dates from 1962. The station is a dry well configuration with most of the structure below ground.

Photo B1.6.1 : Route Orange Above Ground

The station houses 3 dry well mounted Allen Gwynn pumps which discharge into an 8 inch cast iron rising main.

The electrical control panel (recently replaced) is located below ground on a mezzanine deck above the pumps.

The station is in excellent condition and although the mechanical and civil assets are some of the oldest the reliability is high.

Photo B1.6.2 : Route Orange Station access and Panel

Photo B1.6.3 : Route Orange Dry well pump configuration

Actions and recommendations:

1) Conduct a feasibility study to confirm the capacity, condition and efficiency of the pumping station
2) Investigate the condition and capacity of the rising main as a matter of urgency
3) Review the spares availability for the pump type
4) Develop a business case for the works based on the conclusions of items 1,2 and 3

B1 vii) Rue Des Pres

Description

Rue Des Pres pumping station is located adjacent to the large trading estate on the East of the island.

The pumping station and cast iron rising main dates from 1965. The station is a dry well configuration with the wet well constructed as a concentric ring around the dry well.

Photo B1.7.1 : Rue Des Pres above ground structure

The station houses 2 dry well mounted pumps which discharge into a 12 inch cast iron rising main.

The electrical control panel is located above ground.

The station is in good condition and although the mechanical and civil assets are some of the oldest the reliability is high.

Photo B1.7.2 : Dry well mounted pumps

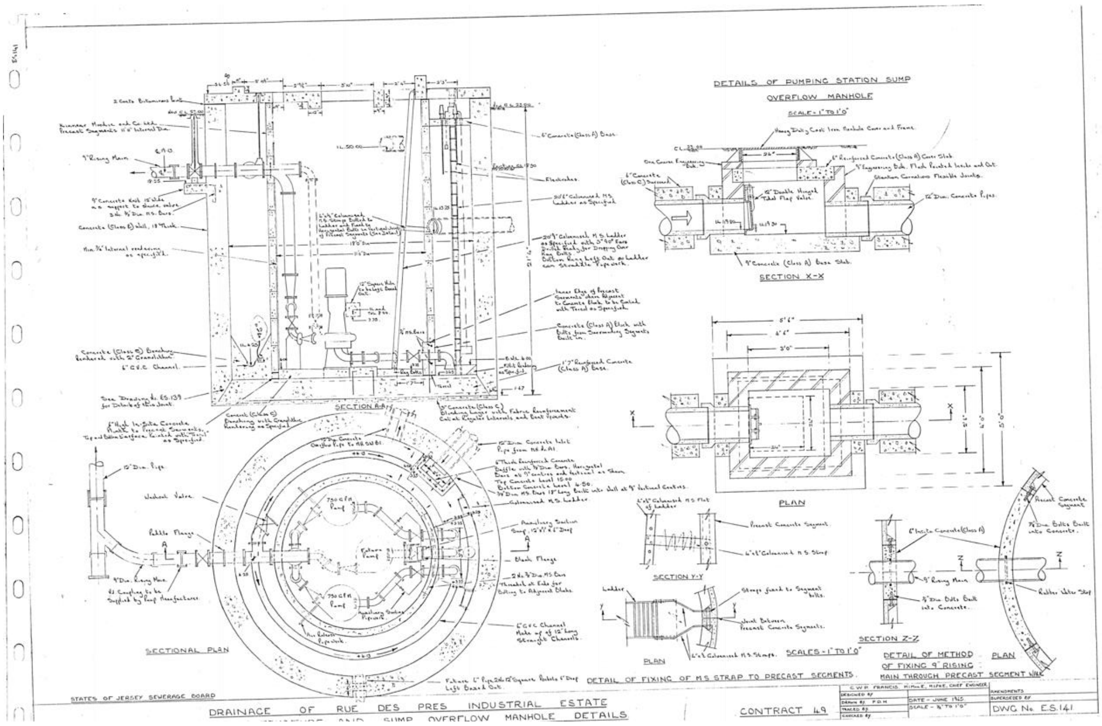


Figure B1.7.3 : Station configuration

Actions and recommendations:

1) Conduct a feasibility study to confirm the capacity, condition and efficiency of the pumping station
2) Investigate the condition and capacity of the rising main as a matter of urgency
3) Review the spares availability for the pump type
4) Develop a business case for the works based on the conclusions of items 1,2 and 3

B1 viii) Le Hocq

Description

Le Hocq pumping station was built in 1968 and is a key station in the east coast line.

The station has 3 submersible pumps pumping into a 20” main and a storm pump located in an adjacent storm wet well.

Photo B1.8.1 : Le Hocq Above ground structures

This station has traditionally suffered from significant odour issues and has recently had a new odour control system installed.

Photo B1.8.2 : Le Hocq odour control system

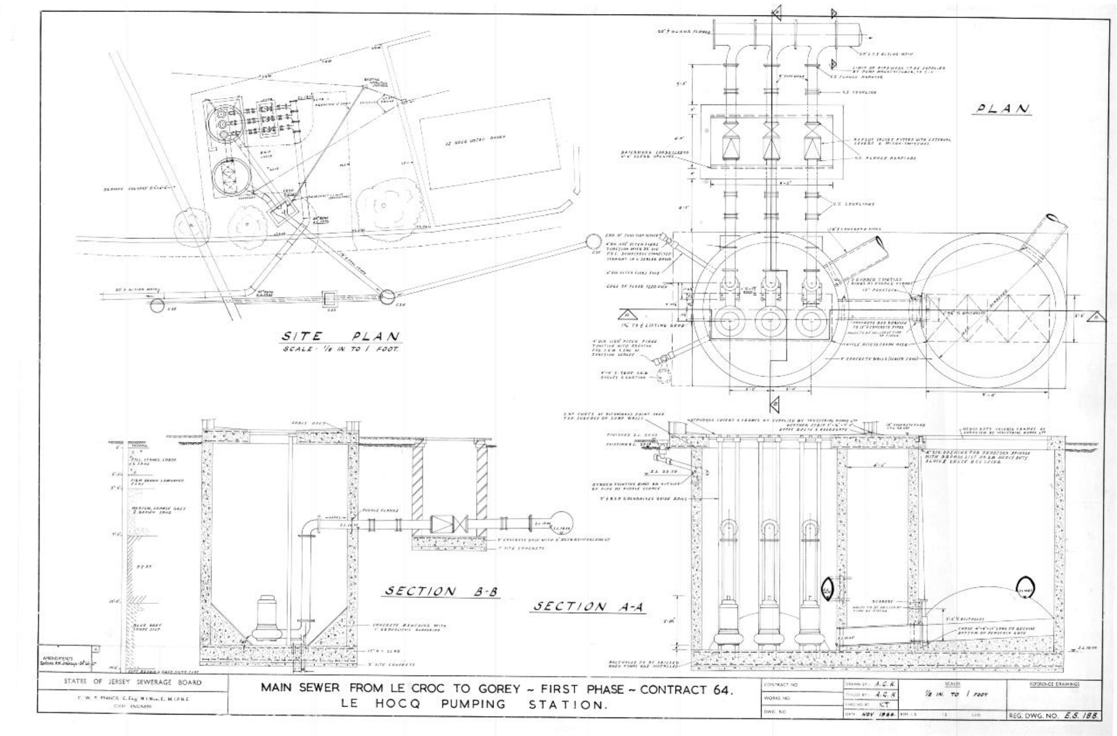


Figure B1.8.3 : Le Hocq station configuration

The station generally operates well and is reliable. The overflow sump is significant but is rarely utilised and this could be optimised in the future.

Photo B1.8.4 : Le Hocq main pump wet well

Photo B1.8.5 : Le Hocq interface with the rising main

As can be seen by the recent survey information the Cast Iron rising main is showing signs of significant decay and required urgent attention to avoid a significant failure.

Actions and recommendations:

1) Conduct a feasibility study to confirm the capacity, condition and efficiency of the pumping station
2) Investigate the condition and capacity of the rising main as a matter of urgency
3) Develop a business case for the works based on the conclusions of items 1 and 2

B1 ix) Pontac

Description

Pontac pumping station was built in 1968 and is a key station in the east coast line. The original station design is very similar to Le Hocq.

The station has 3 submersible pumps pumping into a 15” main and a storm pump located in an adjacent storm wet well. The design differs as the overflow sump has been replaced with a significantly larger and deeper sump increasing the storage capacity of the pumping station.

Photo B1.9.1 : Pontac above ground structure

Photo B1.9.2 : Pontac Odour Control equipment

Pontac has traditionally suffered from significant odour issues and has recently had a new odour control system installed.

Photo B1.9.3 : Pontac main pumping station wet well

Photo B1.9.4 : Pontac overflow wet well

Photo B1.9.5 : Pontac connection to rising main

As can be seen by the recent survey information the Cast Iron rising main is showing signs of significant decay and required urgent attention to avoid a significant failure.

Actions and recommendations:

1) Conduct a feasibility study to confirm the capacity, condition and efficiency of the pumping station
2) Investigate the condition and capacity of the rising main as a matter of urgency
3) Develop a business case for the works based on the conclusions of items 1 and 2

B2 50 year old Pumping stations with uPVC rising mains

Two thirds of the islands pumping station rising mains are constructed from uPVC (67 pumping stations). Of these 11 pumping stations have uPVC rising mains in excess of 50 years old.

This material has generally served the island well. The utilisation of Class b uPVC has previously been highlighted and the stations have been monitored to make sure the fatigue failures have not occurred. What has come to light is the original surge suppression recommendations may be out of date or not acted upon and a review of the duty flows relative to the original design flows should be conducted.

In addition, any surge suppression equipment needs to be operational and maintained.

The following stations have uPVC rising mains and are in excess of 50 years old:

1)	St Peters Arsenal	1.5”	uPVC
2)	La Collette Power Station	2”	uPVC
3)	Field 206	1.25”	uPVC
4)	Route Du Sud	4”	uPVC
5)	Le Dicq (tunnel main)	15”	uPVC
6)	Atlantic	200mm	uPVC
7)	Le Hurel (GR)	4”	uPVC
8)	Rue Du Pont	4”	uPVC

The stations with rising mains less than 100mm will require a deeper investigation and eventually main replacement. For the Progressive cavity pumping stations, (St Peters Arsenal and Field 206) the application of Ice Pigging cleared the rising mains and increased the flows by more than 100%.

Actions and Recommendations

1) Conduct a feasibility study to confirm the capacity, condition and efficiency of the pumping stations
2) Investigate the condition and capacity of the rising mains as a matter of urgency
3) Ice pig all the mains in this category as a matter of urgency
4) Review the surge protection equipment and pumping station operation to minimise the pressure excursion fatigue failure risk
5) Develop a business case for the works based on the conclusions of items 1 to 4

Appendix C – Pumping stations with small rising mains

Description

The 23 pumping stations tabled below have centrifugal pumps and rising mains less than 100mm diameter. The pumping stations have been designed from the outset as separate systems and should only pump sewage. As discussed in the main document infiltration has caused significant problems with these pumping stations.

No.	PUMPING STATION	Diameter (mm)
14A	CHESTNUT GROVE	50
49A	RUE DE DIELAMENT	50
26A	RUE DE LA HOCQ (BROADLANDS)	50
14	ST JOHN	63
60	BECQUET VINCENT	75
10A	CORBIERE	75
68	GROUVILLE	75
59	LA RETRAITE	75
46	LE RONDIN	75
108	PORTINFER	75
52	AIRPORT ROAD	80
53	FOUNTAIN LANE	80
49	JERSEY ZOO	80
50	LA CHASSE	80
56	LA PULENTE	80
65	LES LAVEURS	80
63	MILANO	80
55	MONT MADO	80
57	RUE DE LA HAMBYE	80
45A	RUE DE TRAVERS	80
11A	OUAISNE	89
41	LA COLLETTE MARINA	3"
	WINDMILL INN - ST PETER	3"

Table C-1: Pumping stations with small rising mains

Despite a major programme of infiltration reduction, the gravity network (and private connections) is not sufficiently robust to eliminate all of the ingress. Our strategy will be to replace on along-term programme all mains with an internal diameter less than 100mm (except ones with macerator pumps and PC pumps) with mains of 100mm then operate a smart system with invertor drives, flow meters and periodic ice pigging. This will provide:

- Additional storm pumping capacity when required
- Minimal power consumption under normal conditions
- Lower normal operating pressures (extending the life of all equipment)
- Be future proof if more connections and capacity is required

- Better ability to handle solids and minimise pump chokes
- Allow wet well levels to vary avoiding build up of fats on the surface and rags and grit on the invert

The negative to this is a normal velocity within the rising main of less than 0.75m/s. It is recommended that a velocity of 0.3m/s is adopted as a minimum design velocity as long as the station is on a regular ice pigging regime.

Actions and recommendations

1) Conduct a desk top exercise to review the performance of each pumping station in this category and document the issues relating to surface water ingress, pump reliability, and future demand to generate a prioritisation list.
2) Continue with the programme if reducing infiltration within the public and private gravity network.
3) Develop and prioritise the issues and develop a programme for improvement
4) Develop a business case for the necessary remedial works based on the outcomes of actions 1 and 2

Appendix D – Pumping stations with saline intrusion

Description

Due to the cafes, buildings and houses close to the Sea in a variety of bays, pumping stations have been located to deal with the foul sewage from these properties.

This invariably puts the sewerage network within proximity of the Sea. Add to this the effect of a large tidal range and coastal storms and the sewerage network will have Saline ingress.

Saline intrusion increases the chloride concentration within the sewerage, causes septicity and generates Hydrogen Sulphide Gas.

Over time the Hydrogen Sulphide corrodes metals, concrete and destroys the fabric of the sewer network. In addition the characteristic rotten egg smell causes nuisance complaints and the treatment at the Sewage Works is problematic. The issues are exacerbated by long retention times and high temperatures.

As discussed above it is essential that we minimise the ingress of sea water and make sure that the coastal pumping stations and downstream stations have sufficiently short retention times. In dry conditions the flows from the coastal pumping stations are modest and the retention times within the rising mains can be significant.

A good example of this is found at the St Ouen Pumping station which has suffered significant degradation of the chambers, pipework and control panel due to Hydrogen Sulphide attack as well as causing significant nuisance odour complaints from local residents. This pumping station is fed by a number of other stations which start at coastal locations which compounds the problem.

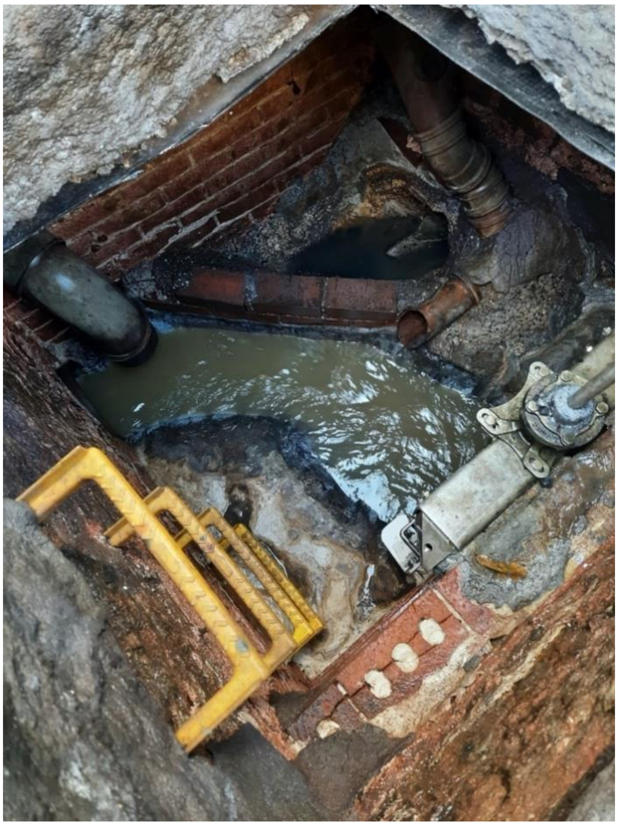


Photo D1 : St Ouen incoming manhole showing Hydrogen Sulphide degradation

The discharge chamber at St Ouen was found to have similar issues and was successfully repaired and relined in 2021.

In the past the department has experimented with a variety of dosing chemicals and organisms, none of which proved to be effective either on performance or value for money criteria, although some could be reassessed for use at small stations with low chemical consumption. Within this strategy we are advocating a different approach of :

1) Make good all the legacy damage at the pumping stations, chambers and manholes
2) Minimise the saline intrusion as much as practicable
3) Re engineer where necessary any electrical control panels to avoid Hydrogen Sulphide damage to the Electrical Contactors
4) Minimise the dry weather retention period by introducing a water feed into the coastal pumping stations, sufficient to avoid hydrogen sulphide generation

This strategy, particularly item 4, is counter intuitive to our objective to minimise ingress and run times of pumping stations. However, the coastal pumping stations are generally modest in size and the total flow of water is only marginally increased. (Remembering that a significant proportion of the island and system is a combined system so the capacity is significant). This small sacrifice to pumping efficiency will be far outweighed by the treatment efficiencies and the ability to avoid long retention times and thus septicity within the system.

Appendix E – Summary of 2021 Condition Survey

In 2021 Operations visited every one of the pumping stations to carry out a preliminary condition assessment. This was completed by an experienced Operational Manager with a detailed knowledge of the network and system. The advantage of having the same person do each inspection was the certainty that the evaluation at each site was consistent but this was also a disadvantage that the survey could only be high level.

The brief was as follows:

- To review the operation of the stations
- To review the general condition of the station
- To document any works needed and prioritise
- To give a general status of the asset base and the risks associated with its operation

The detailed information pertaining to each station has not been included in this report but the common themes and issues have been highlighted to show trends, risks and work items as follows:

Infiltration

Evidence of infiltration from ground water was noticed and logged at **22No.** pumping stations. As described in this strategy this is a major area of concern and one which will require continued funding to address.

Access Covers

Access cover design and philosophy has changed over the past 50 years, modern spring assisted covers with safety grills have transformed the operation and accessibility of the chambers and structures. The survey has highlighted cover replacements and enhancements on **69No.** pumping stations.

Of these:

- 26No. require replacement of both the main access covers and secondary covers to access the overflow etc.
- 33No. require replacement of just the main access covers.
- 10No. require replacement of just the secondary access covers.

Each access will typically consist of multiple covers depending on the size of the opening and arrangement of equipment and can number anywhere between 1 and 5.

Grounds and Branchage

The maintenance of the pumping station compounds, trees and grassed areas is generally good, this requires some remediation at **15No.** pumping stations, mainly trimming of trees and hedges to maintain safe access.

Monitoring of overgrowth at chambers across the sewer networks is also required. Air valves on rising mains in particular require regular checks and maintenance so safe access is essential. In rural areas air valves are located at the edge of fields to avoid causing an obstruction to the farmer wherever possible, they are therefore often in or adjacent to hedgelines.

Wet well Level Adjustment

A very common fault noted on the survey was incorrect, or at least not ideal, levels on the pump start and stop levels. This was noted on **56No.** pumping stations. Although this is not an issue with condition, it has a significant effect on the operation of the network as the stations are not optimised.

High stop levels result in significant volumes of sewage being retained within the wet well, leading to a build-up of floating debris, fat and consequently septicity issues. Low stop levels are preferred as they give better turnover of the contents and keep capacity in the wet well available to receive a sudden inflow, eg. as a storm starts. However, a very low stop level can cause damage if it means air and debris are frequently drawn through the pump. This is known as a ‘snore’ cycle and is a useful tool to clear floating debris and fat but would usually be included in the operating controls no more than once a day.

High start levels can increase the risk of upstream flooding as well as overly long retention time between runs. Low start levels will mean the stations starts too often which can be inefficient.

Sub optimal stations

From the survey, four pumping stations were noted as requiring significant works that did not fall into any of the other identified key categories, namely:

a) **Atlantic Pumping Station**

Showed significant degradation due to Hydrogen Sulphide attack, affecting the Civil Structure and the Electrical infrastructure

Photo E1 : Atlantic Pumping Station signs of Hydrogen Sulphite Attack

b) **Corbiére Pumping Station**

The station has been included in the 2022 programme and the works have been identified.

c) Fountain Lane Pumping station

The main issue with this pumping station is the precarious installation of the rising main. This is located above a water course on sheet piling which is collapsing. As such it has been identified for replacement as part of the Rising Main programme in late 2022.

Work on the rising main is to be combined with culverting of the watercourse to manage flow and protect the adjacent properties.

Photo E2 : Fountain Lane rising main

d) La Collette Power Station Pumping station

This station is located within the old Jersey Electricity power station which may in the future be decommissioned.

Due to the sensitivity of the location the access at times of emergency is difficult for duty officers and maintenance teams

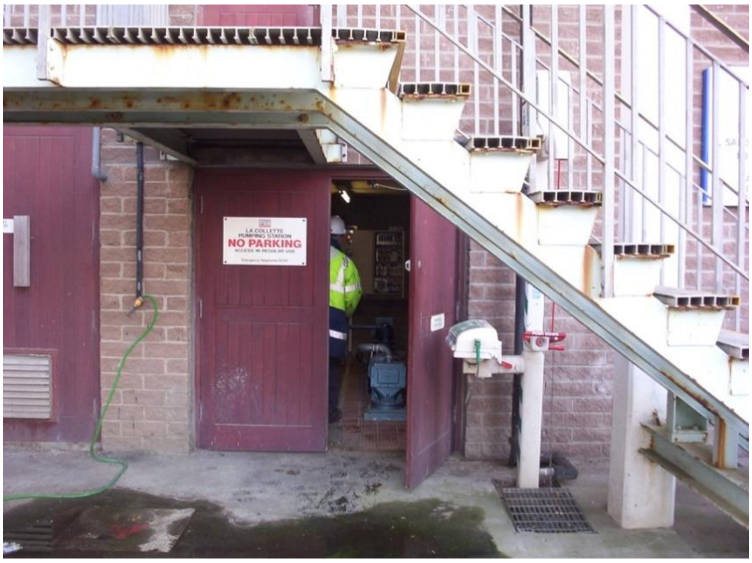


Photo E3 : La Collette Power Station PS location

Photo E4 : La Collette Power Station PS Pump installation

Operation of the station is not a concern only access. The ease of relocation in the immediate vicinity will depend on how the site is repurposed if and when the Power Station is decommissioned. This will require a review to ascertain the replacement strategy when plans become available.

Appendix F – Pumping stations with Surge suppression equipment

Description

The pumping station design team have, as a matter of course, taken specialist advice on surge suppression equipment from consultants and suppliers.

Surge within pumping systems (or water hammer) can have a catastrophic impact on a pumping system and generally occurs when the velocity within the system changes abruptly. This could be due to equipment or power supply failure but can also be caused simply by how the pumps turn on and off in normal operation.

Velocity in the pipe changes on every pump start and pump stop and this requires analysis to ensure there are no negative implications for the assets. On some occasions devices need to be installed to attenuate the effects of the surge pressures.

The most common methods of surge suppression are as follows:

1) Increasing the inertia of the pump (adding fly wheels). This is only viable on dry well mounted pumps.
2) Installation of a pressure vessel.
3) Installation of specialist air valves at intermediate pipeline peaks.
4) Installation of fast acting non return valves.
5) Installation of additional fast acting non return valves along the rising main.
6) Application of a soft start and soft stop device on fixed speed pumps, if this is not sufficient then the pumps can be changed to more expensive variable speed drive (VSD) units.
7) A combination of the above options

As well as protecting the infrastructure against high pressures, surge suppression equipment has been used extensively to avoid a large pressure excursion on a pump cycle, whereby repeated surge pressures flex uPVC pipework causing premature failure due to fatigue cracking.

Unfortunately, despite the original design and installation the condition survey found that some surge equipment has not been kept up to date and in rare cases has been isolated. In addition, it is clear that when a pumping station has had larger pumps fitted the surge equipment has generally not been reviewed.

It is also noted that the maintenance of air valves is minimal and if the surge suppression is reliant on a particular device it may well have failed over time.

As an example, the surge vessel at Rozel No.2, as shown below, is well maintained and operational. Over time the pumps and duties have changed but the vessel has not. This should be reviewed and referenced back to the original surge analysis to clarify. This vessel was installed when the pumping station was built in 1982.

Photo F1 : Rozel 2 surge vessel

Photo F2 : Greve No.1 surge vessel

An example of abandoned equipment has been found on the recent survey at Greve No.1. A small bladder type pressure vessel installed on the uPVC rising main has been isolated and, from the condition of the valve, this was a number of years ago.

This does not cause an immediate problem as the pumping system and expected surge pressures are within the rising main pressure rating. However, this vessel was installed to avoid extreme pressure excursions that lead to fatigue failures on uPVC and there is, therefore, a question over the remaining life of the rising main.

Actions and recommendations

1) Conduct a desk top exercise to review the historical surge analysis reports and catalogue what equipment is installed.
2) Review the status and operation of the surge equipment in the field.
3) Transfer the PPM of air valves to the pumping station team then survey and document the valves and develop a maintenance schedule.
4) Review the Capacity and flow changes which may require the equipment to change.
5) Review whether electronic and software modifications can replace physical hardware. Noting that VSD's and soft start/stop devices were not available when many of the stations were designed.
6) Develop and prioritise the issues and develop a programme for improvement.
7) Develop a business case for the necessary remedial works based on the outcomes of actions 1 to 5.

Appendix G – Pumping Station Mechanical Full Refit Scope

An inspection of the whole pump system from the pump fluid input mouth/pipe through to the connection into the rising main is carried out. This includes all associated parts and pipework in the wet well, valve chamber and control kiosk or the equivalent depending on design.

Other items to be considered:

1) Lifting chains from T Allen need to be included in the refit.
2) Pumps and stools along with associated manufacturers recommended benching angles need to be included in the refit.
3) Replacement of all through structure/chamber/walls pipework needs to be thickness tested if any doubt of condition is suspected, otherwise scope includes this replacement. As these are harder to replace these should be denso wrapped to provide external corrosion protection.
4) Standardisation of all VJ's, Reflux Valves, Lifting Chains, Gate Valves/Penstocks, Pipework, Guide bars, etc, etc, etc is paramount so we do not have bespoke one offs in the network, manufacturers from the stocking within stores or pumping stations stock to be used.
5) Covers are to be assessed and included in the refit if required, there is a separate scope for this but needs adjusting for pulling points for tankers on the overspill sumps, not all covers require replacing if multiple for the same chamber are in place (case and point Rue du Sud) then consult with the drainage tanker team to choose the best cover for replacement.
6) Surge suppression equipment to be inspected (if fitted) and reviewed if pump duty is to be changed.
7) Sump condition survey needs to be completed prior to the mechanical refit project being drawn up.
8) Review need/benefits of installing a flow meter if not already present.
9) Check Multismart unit functionality if installed. Can any functionality of these controllers that is not being utilised be brought on line to improve efficiency?

Project Delivery

1) A project plan needs to be formatted prior to the refit being undertaken, dependant on the scope of works. All departments need prior knowledge of what is expected and when. Sign off on the proposed dates and skillsets needs to be obtained from the relevant managers. Formulate a hand back/completion of works document to be used on all projects.
2) A single point of contact as the project lead is to be appointed and responsible for the project along with any changes required. The asset owner has final say.
3) A single job is to be raised from the business unit including work order for this aspect of works. Just providing a business unit is not sufficient to engage the install team.
4) Odour control systems need to be assessed for being fit for purpose and working.
5) Ducting of pump cables needs to be sealed either in the sump or in the panel housing area, this must be signed off by the installing technician.
6) All maintenance requirements must be relayed to the asset owner as part of the project handover paperwork.

Appendix H – Ice Pigging Report

Operational Report – Waste Water – Jersey Trials 2021

ice pigging SUEZ

Summary

SUEZ are extremely pleased with the results of this trial and the consistency of flow rate improvements seen across the range of pipes cleaned.

The site operations went smoothly and it was evident that a good deal of planning and preparation had been undertaken by the PS team.

The table below shows aggregated flow improvement for each site, generally each operation took around half a day to complete. For some sites such as Paul Mill where two operations were scheduled on the same day, further improvements could have been achieved with further Ice Pigging passes.

Pipe info			Improvement measures				
Site	Pipe Dia (mm)	Length (m)	SUEZ onsite	PS Flow meter	Drop test Pump1	Drop test Pump2	Aggregated improvement
Thistlegrove	63	1160	0%				0%
Thistlegrove	80	1160	20%		43%	24%	29%
Route du Port	63	1974			52%	36%	44%
Field 206	32	121	144%				144%
St Peters Arsenal	40	560	13%				13%
Paul Mill	50	190	104%		*-17%	30%	67%
Rue a la Dame	80	124			15%	10%	13%
Becquet Vincent	75	670	32%	38%			35%
Coal Yard	50	300	13%				13%
St Saviours Hospital	100	541			28%	44%	36%
Project Average							**39%**

We believe that this trial has demonstrated the potential benefits of Ice Pigging for rising sewer mains on the island of Jersey, and SUEZ are keen to work closely with the Government to develop the process further.

SUEZ
Tel: 44 (0) 1454 804 040- www.ice-pigging.com
Head office – 290 Aztec West Bristol BS32 4SY Registered in England No 5687775

ice pigging

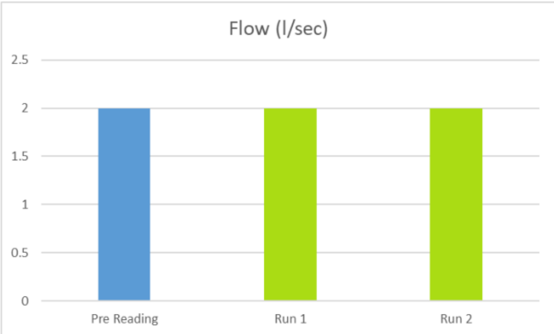
SUEZ

Run Details

Client:	Govt of Jersey	**Pipe Length:**	1160m
Date:	16 June 2021	**Pipe Diameter:**	63mm
Location:	Thistlegrove SPS	**Material:**	MDPE
Usage:	Wastewater Rising Main	**Volume of ice:**	1 m^3

Operational Data

	Ice Quantity (litres)	Pressure (bar)	Flow (l/sec)	Cumulative improvement (%)
Pre Reading	n/a	4.5	2	-
Run 1	300	4.5	2	0
Run 2	700	4.5	2	0



Notes

- Pipework successfully ice pigged with 2 x passes totalling 1,000 litres of ice slurry.
- Despite discoloured ice being seen at the discharge manhole, no direct flow improvement was observed.
- This rising main is twinned with the adjacent 80mm main, it is possible that velocities are high enough in this smaller main to prevent sediment accumulating.
- Some scaling issues were experienced with the flow meter which may also have affected the readings.

SUEZ
Tel: 44 (0) 1454 804 040- www.ice-pigging.com
Head office – 290 Aztec West Bristol BS32 4SY Registered in England No 5687775

ice pigging

suez

Run Details

Client:	Govt of Jersey	**Pipe Length:**	1160m
Date:	16 & 23 June 2021	**Pipe Diameter:**	80mm
Location:	Thistlegrove SPS	**Material:**	MDPE
Usage:	Wastewater Rising Main	**Volume of ice:**	3.2m^3

Operational Data

	Ice Quantity (litres)	Pressure (bar)	Flow (l/sec)	Cumulative improvement (%)
Pre Reading	n/a	4	3.2	-
Run 1 (16/06)	1000	4	3.4	6
Run 2 (23/06)	400	4	3.4	6
Run 3 (23/06)	750	4	3.6	13
Run 4 (23/08)	300+ 350+ 400(1050)	4	3.85	20

Notes

- Pipework successfully ice pigged with 4 x separate passes totalling 3,200 litres of ice slurry.
- The first pass was undertaken using leftover ice from cleaning the adjacent 63mm main, the remaining passes were on a separate day.
- The final pigging pass included 3 x separate ice pigs, each separated by a quantity of water.
- Total flow improvement across both days totalled **20%.**

SUEZ
Tel: 44 (0) 1454 804 040- www.ice-pigging.com
Head office – 290 Aztec West Bristol BS32 4SY Registered in England No 5687775

ice pigging

suez

Run Details

Client:	Govt of Jersey	**Pipe Length:**	1974m
Date:	17 June 2021	**Pipe Diameter:**	63mm
Location:	Route Du Port	**Material:**	MDPE
Usage:	Wastewater Rising Main	**Volume of ice:**	2.2m^3

Operational Data

	Ice Quantity (litres)
Run 1	700
Run 2	700
Run 3	400
Run 4	400

Jersey Infra data							
SPS	**Pipe ID**	**Pipe Vol/M**	**Flow Test**	**Pump set**	**Flow M/S**	**Ltr/Sec**	**Performance Increase**
La Route Du Porte	140mm	15.386L	Pre	1	0.21	3.231	
				2	0.22	3.385	
			Post	1	0.32	4.924	+52.4%
				2	0.30	4.616	+36.37%

Notes

- Pressure during ice slurry insertion was between 8.2-9BAR, which is at the upper working limit of our ice delivery unit. These pressures were outside the working limits of our auxiliary water pump, so the SPS pumps were used to push the ice pigs. Unfortunately, this meant that pre and post flow readings could not be collected on the day of the operation.
- Despite the high operating pressures, the pipework was successfully ice pigged with 4 x separate passes totalling 2,200 Litres of ice slurry.
- Very good flow improvement was observed at manhole.
- Drop test readings confirm improvement with average of **44%**

SUEZ
Tel: 44 (0) 1454 804 040- www.ice-pigging.com
Head office – 290 Aztec West Bristol BS32 4SY Registered in England No 5687775

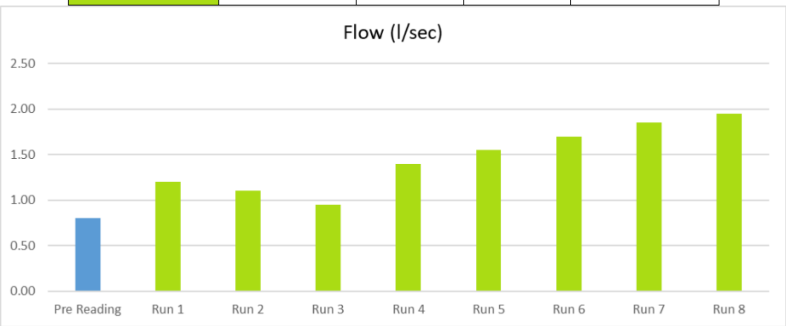
ice pigging SUEZ

Run Details

Client:	Govt of Jersey	**Pipe Length:**	121m
Date:	18 June 2021	**Pipe Diameter:**	32mm
Location:	Field 206	**Material:**	uPVC
Usage:	Wastewater Rising Main	**Volume of ice:**	1.1m^3

Operational Data

	Ice Quantity (litres)	Pressure (bar)	Flow (l/sec)	Cumulative improvement (%)
Pre Reading	n/a	1.8	0.80	
Run 1	75	1.2	1.20	50
Run 2	90	2.0	1.10	38
Run 3	130	2.0	0.95	19
Run 4	150	2.0	1.40	75
Run 5	150	2.0	1.55	94
Run 6	155	2.0	1.70	113
Run 7	200	2.0	1.85	131
Run 8	150	2.0	1.95	144



Notes

- Pipework successfully ice pigged with 8 x separate passes totalling 1,100 litres of ice slurry.
- An excellent flow rate improvement of **144%** was achieved.

SUEZ
Tel: 44 (0) 1454 804 040- www.ice-pigging.com
Head office – 290 Aztec West Bristol BS32 4SY Registered in England No 5687775

ice pigging

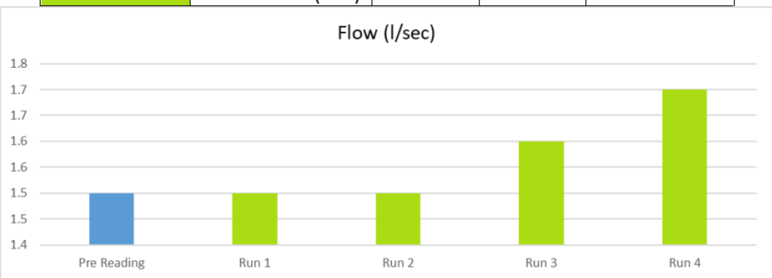
suez

Run Details

Client:	Govt of Jersey	**Pipe Length:**	560
Date:	18 June 2021	**Pipe Diameter:**	40mm
Location:	St Peters Arsenal	**Material:**	uPVC
Usage:	Wastewater Rising Main	**Volume of ice:**	1.1m^3

Operational Data

	Ice Quantity (litres)	Pressure (bar)	Flow (l/sec)	Cumulative improvement (%)
Pre Reading	n/a	2.0	1.5	
Run 1	145	2.0	1.5	0
Run 2	230	2.0	1.5	0
Run 3	250	2.0	1.6	7
Run 4	200+200+75(475)	2.0	1.7	13



Notes

- Pipework successfully ice pigged with 4 x passes totalling 1,100 litres of ice slurry.
- The final pigging pass included 3 x separate ice pigs, each separated by a quantity of water.
- A flow rate improvement of **13%** was achieved.

SUEZ
Tel: 44 (0) 1454 804 040- www.ice-pigging.com
Head office – 290 Aztec West Bristol BS32 4SY Registered in England No 5687775

Page 6 of 11

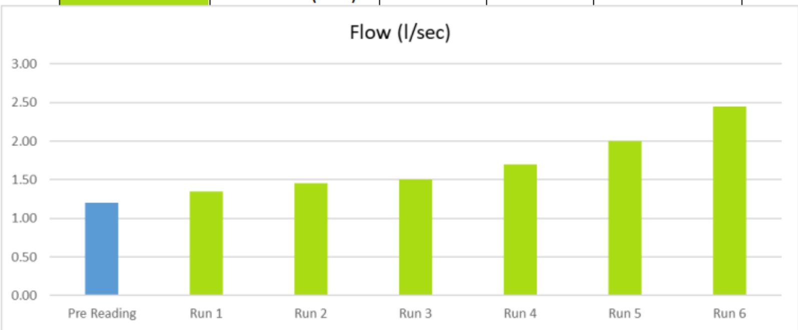
ice pigging

Run Details

Client:	Govt of Jersey	Pipe Length:	190
Date:	21 June 2021	Pipe Diameter:	50mm
Location:	Paul Mill	Material:	MDPE
Usage:	Wastewater Rising Main	Volume of ice:	$0.64m^3$

Operational Data

	Ice Quantity (litres)	Pressure (bar)	Flow (l/sec)	Cumulative improvement (%)
Pre Reading	n/a	2.0	1.20	
Run 1	50	2.0	1.35	13
Run 2	85	2.0	1.45	21
Run 3	100	2.0	1.50	25
Run 4	100	2.0	1.70	42
Run 5	110	2.0	2.00	67
Run 6	60+60+75(195)	2.0	2.45	104



Notes

- Pipework successfully ice pigged with 6 x passes totalling 640 litres of ice slurry.
- The final pigging pass included 3 x separate ice pigs, each separated by a quantity of water.
- Only limited ice volume was used as their was another operation scheduled on the same day, with more ice used further improvement could have been achieved.
- A flow rate improvement of **104%** was achieved.

SUEZ
Tel: 44 (0) 1454 804 040- www.ice-pigging.com
Head office – 290 Aztec West Bristol BS32 4SY Registered in England No 5687775

ice pigging

suez

Run Details

Client:	Govt of Jersey	**Pipe Length:**	124m
Date:	21 June 2021	**Pipe Diameter:**	80mm
Location:	Rue a la dam	**Material:**	Cement lined DI
Usage:	Wastewater Rising Main	**Volume of ice:**	1.56m^3

Operational Data

	Ice Quantity (litres)	Pressure (bar)	Flow (l/sec)
Pre Reading	n/a	0.7	6.0
Run 1	300	n/a	n/a
Run 2	400	n/a	n/a
Run 3	400	n/a	n/a
Run 4	350	n/a	n/a
Run 5	110	0.6	6.0

Jersey Infra data

SPS	Date	Run Time	Pump	Start	Stop	mm Drop	Performance Increase
Rue A La Dame	2/6/2021	4 Min 25%	1	4160	4820	660	
			2	4160	4820	660	
	26/6/2021	4 min 25%	1	4160	4920	760	+15.2%
			2	4920	4890	730	+10.6%

Notes

- Pipework successfully ice pigged with 5 x passes totalling 1,560 litres of ice slurry.
- Auxiliary water pump which was used to conduct the pre pigging readings has a maximum flow rate of **6 l/s**. This meant that it was not possible to observe the flow rate improvement with our pump.
- Drop test readings confirm improvement with average of **13%**

SUEZ
Tel: 44 (0) 1454 804 040- www.ice-pigging.com
Head office – 290 Aztec West Bristol BS32 4SY Registered in England No 5687775

Run Details

Client:	Govt of Jersey	**Pipe Length:**	670m
Date:	22 June 2021	**Pipe Diameter:**	75mm
Location:	Becquet Vincent	**Material:**	uPVC
Usage:	Wastewater Rising Main	**Volume of ice:**	2.2m^3

Operational Data

	Ice Quantity (litres)	Pressure (bar)	Flow (l/sec)	Cumulative improvement (%)
Pre Reading	n/a	3.0	3.8	
Run 1	320	3.0	4.5	18
Run 2	450	n/a	n/a	-
Run 3	500	n/a	n/a	-
Run 4	500	n/a	n/a	-
Run 5	300+130(430)	2.7	5	32

Notes

- Pipework successfully ice pigged with 5 x passes totalling 2,200 litres of ice slurry.
- The final pigging pass included 2 x separate ice pigs, each separated by a quantity of water.
- SPS pumps were used to push pigs 2-4 to conserve water of the final post clean flow test.
- A flow rate improvement of **32%** was observed.
- **5l/s @ 2.7BAR** was the final flow reading, however, this was at the maximum speed of our pump. Actual flow rate improvement at 3BAR is likely be even higher.

SUEZ
Tel: 44 (0) 1454 804 040- www.ice-pigging.com
Head office – 290 Aztec West Bristol BS32 4SY Registered in England No 5687775

ice pigging

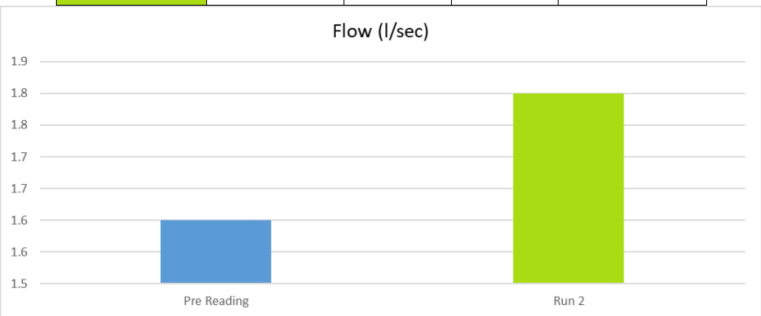
suez

Run Details

Client:	Govt of Jersey	**Pipe Length:**	300m
Date:	24 June 2021	**Pipe Diameter:**	50mm
Location:	Coal Yard		
Usage:	Wastewater Rising Main	**Volume of ice:**	0.5m^3

Operational Data

	Ice Quantity (litres)	Pressure (bar)	Flow (l/sec)	Cumulative improvement (%)
Pre Reading	n/a	2.0	1.6	
Run 1	200	n/a	n/a	-
Run 2	300	2.0	1.8	13



Notes

- Pipework successfully ice pigged with 2 x passes totalling 500 litres of ice slurry.
- The manhole for this main received a high volume of wastewater from other locations, which meant that it was not possible to observe exactly when the ice had excited the rising main. This meant that we were not able to confirm the exact pipe volume.
- Post clean readings were not taken after run 1, as it was likely that a section of the pig was still in the main.
- A flow rate improvement of **13%** was achieved.

SUEZ
Tel: 44 (0) 1454 804 040- www.ice-pigging.com
Head office – 290 Aztec West Bristol BS32 4SY Registered in England No 5687775

ice pigging SUEZ

Run Details

Client:	Govt of Jersey	Pipe Length:	241m
Date:	24 June 2021	Pipe Diameter:	100mm
Location:	St Saviours Hospital	Material:	uPVC
Usage:	Wastewater Rising Main	Volume of ice:	1.7m^3

Operational Data

	Ice Quantity (litres)
Run 1	500
Run 2	600
Run 3	600

Jersey Infra data							
SPS	Date	Run Time	Pump	Start	Stop	mm Drop	Performance Increase
St Saviour's Hospital	19/3/2019	3 min 21%	1	3490	4180	690	
			2	3490	4120	630	
	29/6/2021	3 min 21%	1	3520	4400	880	+27.5%
			2	3520	4430	910	+44.4%

Notes

- Observed flow rate from the SPS pumps was seen to be much higher than the maximum flow rate of 6l/s of our auxiliary water pump. For this reason, it was not possible to obtain pre and post clean flow rates on the day of this operation.
- Pipework successfully ice pigged with 3 x passes totalling 1,700 litres of ice slurry.
- Highly discoloured ice was observed at the manhole.
- Drop test readings confirm improvement with average of **36%**

SUEZ
Tel: 44 (0) 1454 804 040- www.ice-pigging.com
Head office – 290 Aztec West Bristol BS32 4SY Registered in England No 5687775

Appendix J – Miscellaneous Key Installations

This section refers to several liquid waste assets that do not fit within a more general classification, namely

- Bonne Nuit
- Weighbridge
- West of Albert

J1 Bonne Nuit

Description

Bonne Nuit is a small bay on the north of the Island. The bay is accessed via two steep and narrow roads. The properties within the bay were not connected to the mains drainage system and it was decided to install a package treatment plant as an alternative to a pumping station. This has operated for in excess of 25 years and is coming towards the end of its service life and will require significant work and asset replacement.

Throughout its operation the plant has struggled to maintain a reliable effluent standard as the plant has a variable load (summer / winter) and the developments it was designed to cater for did not come to fruition.

Photo J1.1 : Bonne Nuit treatment plant

The operational cost of maintenance and monitoring suggests that a simpler and more sustainable decision is to replace the treatment plant with a pumping station and connect the bay to the mains drainage system.

The challenge is the access, rising main routing and pump selection. The Static head from the bay will be approximately 13 bar yet the flow rate will be modest as the number of dwellings is small.

This suggests that a positive displacement pump option would be the most likely to overcome the static head and provide a flowrate which is adequate for the needs of the bay.

A similar concept has been adopted at La Route Du Port pumping from St Ouens Bay to the Airport

Photo J1.2 : Progressive cavity pump installation at La Route Du Port

This station operates at a higher flow rate and lower head but is similar in concept to what would work at Bonne Nuit.

This application will allow the islands treatment to be centralised around the new sewage treatment works and will significantly reduce the maintenance, management, and regulatory costs of the current facility.

Actions and recommendations

1) Undertake a full feasibility study to review the options, rising main routes and all issues around the asset replacement of the treatment works i.e. upgrade the treatment or replace with a pumping station.
2) Develop a business case for the necessary works based on the outcomes of action 1.

J2 Weighbridge

Description

The Weighbridge is a pivotal structure within the drainage network. This is the chamber where the gravity flows from the east coast and town consolidate and pass in a variety of directions depending on the loading.

In dry weather conditions the flows consolidate and then continue to First Tower.

In heavy rainfall, if First Tower is at capacity then storm flows will flow into the Cavern before returning when the storm has abated.

Finally, if the Cavern is full, First Tower is at capacity then flow will have to be spilt to sea to protect property either via gravity or the West of Albert pumping station (depending on tidal levels)

This labyrinth of chambers and weirs is below ground and located adjacent to Liberation Square.

Photo J2.1 : Weighbridge Location

This area was updated and configured in the 1990's as part of the Cavern project and requires a review of the mechanical and electrical assets. In storm conditions the flows and loads in this area are significant. This can be challenging as the storm systems are only operated on an infrequent basis which has led to some reliability issues and a lack of confidence in how the system operates.

Generally, in storm conditions the Duty officer must closely monitor the operation of the various penstocks and plant.

The whole operation and logic was recently reviewed when the local control panel was replaced in 2021. In addition, the penstocks and actuators were replaced in 2015 but there can still be problems with reliability as they will generally only be required to operate when heavily loaded due to storm flows. The complexity of the system means that any small delay in reaction or a failure can have significant repercussions for the local network.

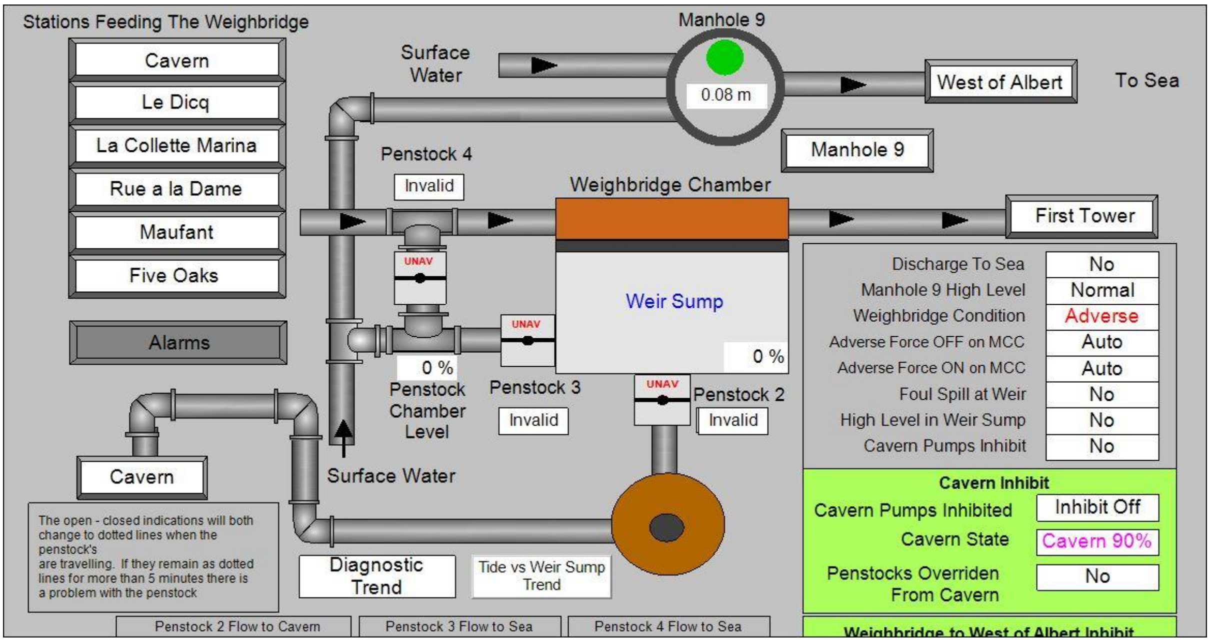


Photo J2.2 : Weighbridge Schematic

As the Telemetry and Control systems are developed, it is anticipated that the control philosophy can be refined to improve coordination between the Weighbridge, the Cavern, First Tower PS and West of Albert PS to better protect the network with less input from the Duty Officer.

Actions and recommendations

1) Undertake a full review of the Weighbridge operating regime, review the asset condition and develop a full feasibility study to make sure the logic and operation prioritises the environmental protection of the Island.
2) Develop a business case for the necessary works based on the outcomes of action 1.

J3 West of Albert

Description

Photo J3.1 : West of Albert Pumping Station

The West of Albert station protects the network from flooding and is controlled by two main factors, these being tidal conditions and storm water flow.

When the tide is out surface water flows through the station via tideflex valves and on out to sea. As the tide comes in the tideflex valves close and the water backs up in the feed culvert. During periods of low flow, the culvert has capacity to hold water until the tide goes out again and it can flow to sea. When there is a higher flow, water will back up in the culvert until a level sensor in manhole No.9 is tripped and this starts the storm pumps.

The four pumps are driven by individual diesel engines and operate without mains power. This is to safeguard St Helier in the event of a power failure as West of Albert is the last link in the sewer system to allow storm flows to be relieved from land.

As can be deduced by the operating description, the West of Albert pumping station works in anger on a very infrequent basis. Due to the infrequent operation, the testing and maintenance has proved to be problematic in that the machinery is regularly tested but not tested under full load.

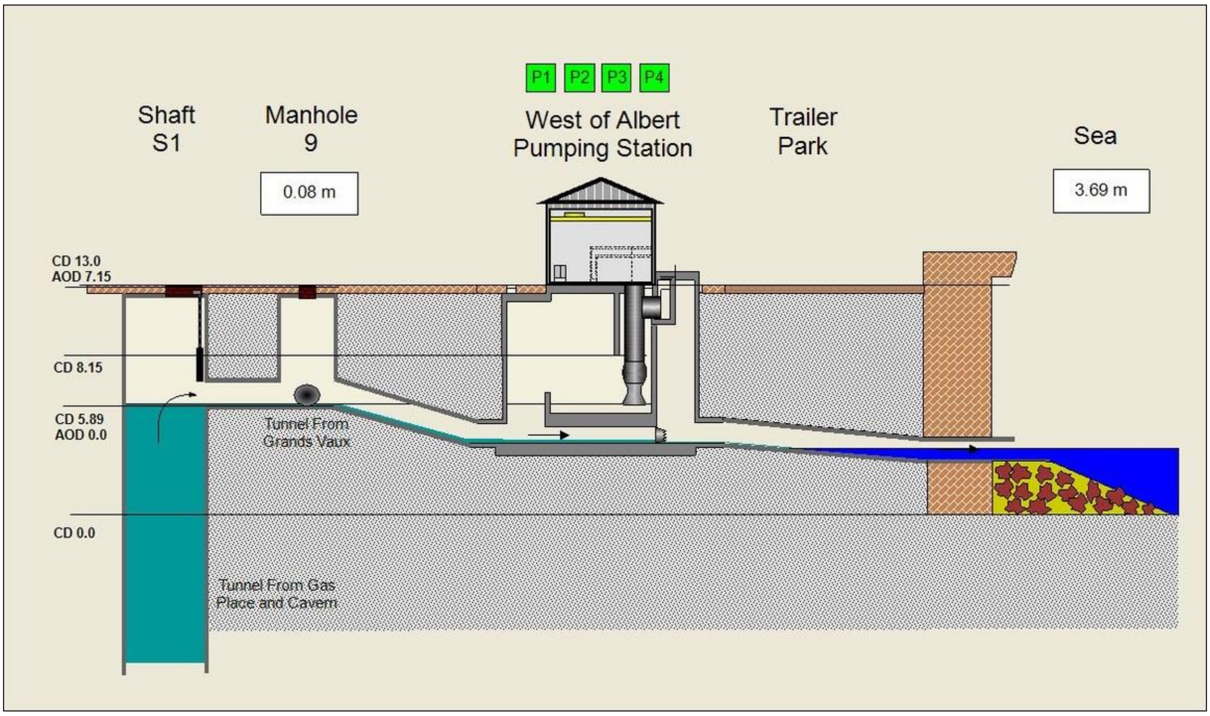


Photo J3.2 : West of Albert Schematic

Photo J3.3 : West of Albert Pump 1 and 2 Engines

The Station was completed in 1998 and the original pump assets are still present. There is a rolling maintenance programme that carries out a full pump strip and refurbishment of one pump each year. This keeps the engines well maintained but the age of the assets raises the concern that spares and parts may become unavailable. The equipment is not often required so the maintenance programme has kept the original equipment serviceable far longer than the normal duty assets within the network.

The station control panels were recently replaced but, as noted for the Weighbridge in J2, it is anticipated that the control philosophy can be refined to improve coordination with the Weighbridge, the Cavern and First Tower PS as the Telemetry and Control systems are developed in the short term.

Actions and recommendations

1) Undertake a full review of the West of Albert operating regime, review the asset condition and develop a full feasibility study to make sure the logic and operation prioritises the environmental protection of the Island.
2) Develop a test protocol and modify the structure to allow pump testing with surface water on full load.
3) Develop a business case for the necessary works based on the outcomes of action 1 and 2.