



Australian Government

Department of Infrastructure, Transport,
Regional Development, Communications and the Arts

Kingston and Arthur's Vale Historic Area Sewerage Scheme: Stage 2

Environmental Impact Statement

March 2024

(This page has been left blank intentionally)

Kingston and Arthur's Vale Historic Area Sewerage Scheme: Stage 2

Environmental Impact Statement

March 2024

Prepared for

Department of Infrastructure, Transport, Regional Development, Communications and
the Arts

Prepared by

Planning Assist
PO Box 795, Norfolk Island
ABN: 25 481 546 476

© Unless otherwise noted, copyright (and any other intellectual property rights, if any) in this publication is owned by the Commonwealth of Australia.

(This page has been left blank intentionally)

Executive summary

The Project

The Department of Infrastructure, Transport, Regional Development, Communications and the Arts (DITRDCA) has proposed the development of a reticulated sewerage scheme in the Kingston and Arthur's Vale Heritage Area (KAVHA) and surrounds (the Project) on Norfolk Island.

The Project would be delivered in three stages. Stage 1 is currently under construction. Stage 2 is in the pre-development application phase and Stage 3 is in the planning and design phase.

Stage 1 – Sewerage infrastructure to collect, transfer and store (in holding tanks¹) sewage from buildings on Crown land in Kingston on the KAVHA valley floor including the Golf Club, Emily Bay Bathing Shed, Quality Row houses, Government House, the Old Military Barracks and the New Military Barracks.

Stage 2 – Sewerage infrastructure (trunk main) to connect Stage 1 infrastructure to the existing Norfolk Island Regional Council (NIRC) Water Assurance Scheme. Also, sewerage infrastructure along Middlegate Road between the intersection of Middlegate Road, Country Road, Quality Row and Pier Street and the Panorama Seaside Apartments.

Stage 3 – Sewerage infrastructure to collect sewage from various buildings on Crown land in the Kingston Pier area, the Cemetery Toilets and the Lone Pine Bathing Shed.

The Proposal

DITRDCA is currently preparing a development application for Stage 2 of the Project (the Proposal). This Environmental Impact Statement (EIS) has been prepared to support this application.

The Proposal would:

- Connect Stage 1 sewerage infrastructure to the Norfolk Island Regional Council (NIRC) Water Assurance Scheme (existing sewerage scheme). This would involve replacement of the approved Stage 1 'end of line' sewage holding tanks¹ near the intersection of Middlegate Road, Country Road, Quality Row and Pier Street with a sewage pumping station, and provision of sewerage infrastructure (trunk main and sewage pumping stations) along Country Road and Taylors Road that would connect into the Water Assurance Scheme on Taylors Road near the intersection of Queen Elizabeth Avenue.
- Provide sewerage infrastructure along Middlegate Road between the intersection of Middlegate Road, Country Road, Quality Row and Pier Street and about 15 metres before the Panorama Seaside Apartments.

¹ Temporary above ground 'end of line' holding tanks were approved as part of the Stage 1 of the Project. To avoid potential impact from the construction and operation of these tanks, it is intended that they will no longer be constructed (subject to timing for approval and construction of the Proposal) and would instead be replaced by an underground sewage pumping station (PS3) and emergency storage tank installed as part of the Proposal.

Key features of the Proposal would include:

- Installation of one sewage pumping station (PS3) with an associated 30,200 litre (30.2 cubic meter), underground emergency sewage storage tank near the intersection of Middlegate Road, Country Road, Quality Row and Pier Street.
- Installation of three sewage pumping stations (PS4 – PS6) along Country Road / Taylors Road.
- Installation of about 2,000 metres of rising pressure (trunk) main along Country Road / Taylors Road.
- Installation of about 550 metres of rising pressure main along Middlegate Road.
- Minor electrical installations to connect each sewage pumping station to existing overhead power lines and electrical control cabinets.
- Creation of a temporary construction compound near Watermill Dam for storage of materials, plant and equipment required during the construction period.

Variation to the Proposal as described

Following completion of this Environmental Impact Statement, sewage pumping station PS3, and the associated emergency storage tank, have been removed from Stage 2 of the Project and transferred to Stage 1 of the Project.

Approval for PS3, and the associated emergency storage tank, has been applied for separately as a modification to Stage 1. The modification would facilitate the following changes to the approved Stage 1 sewerage infrastructure:

- Removal of the approved, but not yet constructed temporary above ground 'end of line' holding tanks.
- Replacement of the approved above ground 'end of line' holding tanks with PS3 and associated emergency storage tank, which would be installed underground.

This modification has been made to enable Stage 1 of the Project to be commissioned:

- Without the financial and environmental impacts associated with the construction of the temporary above ground 'end of line' holding tanks.
- As soon as possible in the event that the planning approval and / or construction period for Stage 2 of the Project are delayed.

Information about PS3 and the associated emergency storage tank has not been removed from this assessment for the following reasons:

- The Environmental Impact Statement was complete at the time it was decided to proceed with the modification.
- To provide the public, other stakeholders and the decision makers with all the information about the Stage 2 infrastructure and how it will operate.
- In case planning approval for the modification is not granted, in which case PS3 and the associated emergency storage tank could still be assessed as part of Stage 2 of the Project.

Need for the Project / Proposal

Human waste contamination (sewage) is contributing to poor surface water and groundwater quality across Norfolk Island.

Contaminated surface water and groundwater are adversely impacting downstream areas including KAVHA, Emily Bay and Slaughter Bay, causing potentially irreversible damage to marine ecosystems and posing public health risks.

The impacts of the pollution have been exacerbated by high rainfall generated during the 2022 – 2023 la Nina weather system (increased mobilisation of pollutants into the bays) and increasing sea temperatures (better conditions for algal growth). This is evidenced by increased incidence of coral bleaching and algal growth and increased frequency of public health alerts in relation to swimming in Emily Bay and Slaughter Bay (Wilson; 2022).

The Project, should all three stages proceed, would result in the containment and removal of all sewage generated at buildings on Crown land in KAVHA. Whilst this would not solve the island wide water pollution problems, or the consequent downstream pollution issues in Emily Bay and Slaughter Bay, it would remove the closest point sources of pollution and assist in the reduction of levels of human waste contamination in the bays.

The Proposal is an important component of the overall project, being the trunk main that would convey all sewage collected from buildings on Crown land in Kingston to the sewage treatment plant via the NIRC Water Assurance Scheme.

Project objectives

The objectives of the Project include:

- Reduce human waste contamination in KAVHA and the adjacent Norfolk Marine Park.
- Reduce adverse impacts of human waste contamination on terrestrial and aquatic (fresh and marine waters) biodiversity.
- Improve safety and usability of Kingston and the Norfolk Marine Park for recreational (land and sea based), economic and culturally significant purposes by reducing environmental contamination and public health risks.
- Contribute to achievement of the objectives in the following strategic plans:
 - *Australian Marine Parks, Temperate East Marine Parks Network Management Plan 2018* (Director of National Parks, Canberra, 2018).
 - *KAVHA Heritage Management Plan April 2016* (Jean Rice Architects *et. al.*, 2016).
 - *Norfolk Island Community Strategic Plan 2016-2026: Our Plan for the Future* (Norfolk Island Regional Council 2016).

Proposal objectives

The objectives of the Proposal include:

- Transport sewerage collected from Kingston directly to the NIRC Water Assurance Scheme, removing the need for the 'end of line' sewage holding tanks that were approved as part of Stage 1 of the Project.
- Remove the following potential impacts:
 - Sewage spill risk: The approved 'end of line' holding tanks, should they proceed, will be emptied as required (about every 48 hours) and the sewage transported by effluent tanker to the NIRC Sewage Treatment Plant for disposal. Whilst the holding tanks have been designed and would be constructed and operated to minimise the risk of spills, there is still a risk resulting from potential holding tank failure, equipment failure or human error.
 - Visual impact: The approved 'end of line' holding tanks, should they proceed, will be located above ground at a visually sensitive intersection.
- Provide for the possible future connection of private properties along Country Road, Taylors Road and Middlegate Road that, should these connections proceed, would eventually remove a further significant volume of sewage from the KAVHA catchment.

Options and alternatives considered

The following short list of options were considered for the Project:

No regrets measures

No regrets measures were considered in order to minimise impacts on the bays as soon as possible. These were considered as emergency measures and were not designed to be implemented as 'stand-alone' measures. The no regrets measures considered were:

- **Leaky weirs** - Installation of leaky weir system downstream of Watermill Dam to attenuate surface water runoff, promote infiltration and minimise waterway erosion reducing sediment loads.
- **Pump out septic tanks** - Pump out septic tanks at 138 houses in eight priority areas that are suspected to discharge to the KAVHA catchment and subsequently, Emily Bay, and transfer wastewater to the sewage treatment plant to reduce land disposal and prolonged system leakages.

Intermediate measures

Intermediate measures were considered to improve the quality of groundwater and surface water that discharges into the bays. The intermediate measures considered were:

- **Denitrification trenches** - Installation of denitrification trenches to treat shallow groundwater that upwells and discharges into the bays. Trenches should be installed immediately upstream of the bays then progressively upstream to provide groundwater treatment across the KAVHA catchment.
- **Redirection of surface water** - Redirection of existing surface water to another outlet (Headstone Reserve outfall) or to the Golf Course or pine plantations (not yet established) for direct application (irrigation).
- **Utilisation of novel treatment technology** - Use of Nualgi / Diatomox which are proprietary products that stimulate diatom growth in waterbodies, draw down nutrient levels and limit algal growth.

Ultimate measures

Ultimate measures were recommended to prevent future contamination of surface water and groundwater. The ultimate measures considered were:

- **Sewer the KAVHA catchment** – Norfolk Island Regional Council to expand the existing Water Assurance Scheme to service all properties on the island to prevent future contamination of groundwater and surface water. In the absence of funding to connect all properties on the island, high risk properties in the KAVHA catchment should be connected first.

The preferred option was to implement the following measures which best met the Proposal objectives:

- No Regrets (emergency) Measures: Leaky weirs and pump out septic tanks.
- Ultimate Measures: Sewer the KAVHA catchment (to the extent that it is applicable to sewage generated on Crown land).

The following alternatives to the preferred option were considered:

- Base case ('do nothing')
- Convert all sewerage assets in the Proposal area into pump out sewage holding tanks

In light of the documented scientific evidence that poor water quality is increasingly adversely impacting the Norfolk Marine Park, the 'do-nothing' option was not considered to be an acceptable alternative.

In light of ongoing potential for sewage leakage or overflow into the receiving environment from due to issues such as poor tank maintenance or delayed pump out, permanent pump out sewage holding tanks were not considered to be an acceptable alternative.

Statutory and planning context

The *Planning Act 2002 (NI)* permits development on any land for the purposes of a significant development subject to development approval. Significant developments include infrastructure developments including sewerage schemes.

The Proposal was declared as Significant Development on 25 June 2023. As such it can be assessed under Part 3A of the *Planning Act 2002 (NI)*. The Minister is the determining authority.

This Environmental Impact Statement fulfils the requirements of Section 45(4) of the *Planning Act 2002 (NI)* and has been prepared in accordance with the environmental assessment undertaken for the Proposal, the requirements of Section 45(6) Directions from the General Manager of the Norfolk Island Regional Council and Schedule 2 of the *Planning Regulations 2004 (NI)* 'Matters to be included in Environmental Statement'. It has also considered the *Norfolk Island Plan 2002: Housekeeping Amendment 2022 (effective 16 March 2023)*; the *Heritage Act 2002 (NI)*, the *Public Reserves Act 1997 (NI)* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Environmental impacts

Long-term beneficial outcomes resulting from the Project would include a reduction in human waste pollution of KAVHA, Emily Bay, Slaughter Bay and the Norfolk Marine Park contributing to:

- Reduced risk to marine biodiversity including the coral reefs.
- Reduced risk to public health.

A number of potential adverse environmental impacts of the Proposal have been avoided or reduced during the assessment of options and alternatives and the development of the concept design. Notwithstanding, some temporary, short-term construction impacts such as traffic, noise and visual amenity are unavoidable and would be mitigated and managed using the safeguards and management measures identified in this Environmental Impact Statement. Many of these measures are standard practice in the construction industry.

There is potential for discovery of unknown archaeological artefacts during excavation. Impact to archaeological artefacts would be avoided where possible and otherwise managed in accordance with the archaeological policies included in the *KAVHA Archaeological Zoning and Management Plan* (Extent, 2020).

The Proposal is unlikely to significantly affect Commonwealth land or have a significant adverse impact on any matters of national environmental significance. It would have a positive impact on the Norfolk Marine Park, a Commonwealth Marine Area. Notwithstanding, to confirm this conclusion, a self-assessment of impacts to matters protected under *Environment Protection and Biodiversity Conservation Act 1999* will be undertaken and if required, the Proposal would be referred to the Federal Minister for the Environment for further assessment.

Justification and conclusion

The Proposal would both meet its objectives and contribute to the overall Project objectives. It would also contribute to achievement of objectives in key government strategies and plans, including the *Australian Marine Parks, Temperate East Marine Parks Network Management Plan 2018*, *KAVHA Heritage Management Plan April 2016*, *Norfolk Island Community Strategic Plan 2016-2026: Our Plan for the Future*; *Norfolk Island Plan 2002: Housekeeping Amendment 2022 (effective 16 March 2023)*; and *Kingston and Arthur's Vale Historic Area Development Control Plan 2020*. These plans identify the protection and enhancement of water quality as a priority.

By reducing human waste emissions into the local environment, the Project (including the Proposal) would achieve positive environmental outcomes for water quality, for the marine ecosystem health and for public safety.

Potential adverse impacts of the Proposal would be short-term and temporary and would be managed using standard mitigation and management measures. On balance, the Proposal is considered justified.

Contents

Executive summary	i
Submission of Environmental Impact Statement (EIS).....	xi
1 Introduction	1
2 The Project.....	1
2.1 Staging	1
2.2 Interim remediation works	3
2.2.1 Pump out of sewage holding tanks.....	4
2.2.2 Installation of leaky weirs	4
3 Justification for the Project	5
3.1 Water quality investigations.....	5
3.2 Water quality issues	5
3.2.1 The AECOM Report (2017).....	5
3.2.2 The CSIRO Report (2020).....	6
3.2.3 The Bligh Tanner Report (2020).....	6
3.2.4 The SIMS Report (2021)	6
3.3 Need for the Project	7
3.4 Option evaluation	7
3.4.1 AECOM Report	8
3.4.2 The CSIRO Report.....	8
3.4.3 Bligh Tanner Report	8
3.4.4 The SIMS Report.....	11
3.5 Preferred option	11
3.6 Alternatives	11
3.6.1 Base case or 'do-nothing' option	12
3.6.2 Pump out sewage holding tanks.....	12
4 The Proposal.....	13
4.1 Overview	13
4.2 Site.....	14
4.2.1 Site location.....	14
4.2.2 Site description.....	15
4.2.3 Land tenure	16
4.2.4 Existing land use	18
4.3 Objectives	18
4.3.1 The Project.....	18
4.3.2 The Proposal.....	19
4.4 Design.....	19
4.4.1 Environmental impact.....	19
4.4.2 Design capacity	20
4.4.3 Design refinements	23
4.5 Operation	23
4.5.1 Sewage pumping stations	23
4.5.2 Rising pressure mains.....	26
4.5.3 Power	27
4.5.4 Repairs and maintenance	27

4.6	Construction	28
4.6.1	Overview	28
4.6.2	Excavation / earthworks	28
4.6.3	Infrastructure installation	29
4.6.4	Construction compound	32
4.6.5	Access.....	32
4.6.6	Equipment and machinery.....	36
4.6.7	Construction hours and duration	37
4.7	Future private connections	37
4.7.1	Overview	37
4.7.2	Design	37
4.7.3	Operation	37
4.7.4	Power	38
5	Statutory and planning context.....	39
5.1	Commonwealth legislation	39
5.1.1	Environment Protection and Biodiversity Conservation Act 1999.....	39
5.2	Norfolk Island planning legislation	40
5.2.1	Planning Act 2002 (NI)	40
5.3	Norfolk Island environmental planning instruments	46
5.3.1	Norfolk Island Plan 2002 (NI)	46
5.4	Other Norfolk Island legislation	61
5.4.1	Heritage Act 2002 (NI).....	61
5.4.2	Public Reserves Act 1997 (NI)	61
5.5	Summary of required approvals	61
6	Consultation	64
6.1	Consultation activities to date.....	64
6.2	Future consultation.....	64
6.2.1	Consultation during public display of the EIS	64
6.2.2	Consultation following public display of the EIS	64
6.2.3	Consultation during construction	72
7	Environmental assessment	73
7.1	Water quality	73
7.1.1	Existing environment.....	73
7.1.2	Potential impacts.....	78
7.1.3	Safeguards and management measures	79
7.2	Geology and soils.....	81
7.2.1	Existing environment.....	81
7.2.2	Potential impacts	88
7.2.3	Safeguards and management measures	95
7.3	Biodiversity.....	97
7.3.1	Methodology	97
7.3.2	Existing environment.....	97
7.3.3	Potential impacts.....	107
7.3.4	Safeguards and management measures	109
7.4	Heritage.....	110
7.4.1	Heritage significance	110
7.4.2	Statutory context	111
7.4.3	Management context.....	112
7.4.4	Approach to heritage impact assessment	119
7.4.5	Existing environment.....	120
7.4.6	Potential impacts	124
7.4.7	Safeguards and mitigation measures	131

7.5	Noise and vibration.....	134
7.5.1	Construction noise assessment methodology	134
7.5.2	Construction vibration assessment methodology	137
7.5.3	Existing environment	138
7.5.4	Potential impacts	139
7.5.5	Safeguards and management measures	141
7.6	Traffic and access	144
7.6.1	Existing environment	144
7.6.2	Potential impacts	146
7.6.3	Safeguards and management measures	147
7.7	Visual amenity	148
7.7.1	Existing environment	148
7.7.2	Potential impacts	148
7.7.3	Safeguards and management measures	151
7.8	Air Quality.....	153
7.8.1	Existing environment	153
7.8.2	Potential impacts	153
7.8.3	Safeguards and management measures	154
7.9	Waste	155
7.9.1	Existing environment	155
7.9.2	Potential impacts	155
7.9.3	Safeguards and management measures	155
7.10	Hazard and risk	157
7.10.1	Potential impacts	157
7.10.2	Safeguards and management measures	159
7.11	Socio-economic.....	161
7.11.1	Existing environment	161
7.11.2	Potential impacts	162
7.11.3	Safeguards and management measures	164
7.12	Cumulative impacts	165
7.12.1	KAVHA sewerage scheme project	165
7.12.2	Other development activities	165
7.12.3	Potential cumulative impacts	166
7.12.4	Safeguards and management measures	167
7.13	Implications for long term sustainability	167
8	Environmental management	168
8.1	Compilation of safeguards and management measures	168
8.2	Permits and approvals.....	181
9	Conclusion	182
10	References.....	183
11	Glossary of terms and abbreviations	186
Appendix A	Interim works	
Appendix B	Bligh Tanner Report (Section 2) – Options	
Appendix C	Kingston and Arthur's Vale Historic Area Sewerage Scheme Stages 2 & 3 – Concept Design and Construction Plan	
Appendix D	Development Control Plan No 7 - KAVHA (Assessment)	
Appendix E	Significant Development Declaration	
Appendix F	CEO Directions for the Environmental Impact Statement	
Appendix G	Heritage Impact Statement	
Appendix H	Wacker Neuson Operator Manual	
Appendix I	Waste Sorting Guide	

(This page has been left blank intentionally)

Submission of Environmental Impact Statement (EIS)

Prepared in accordance with the requirements of subsection 45(5) of the *Planning Act 2002 (NI)*.

EIS prepared by

Planning Assist for the Commonwealth Department of Infrastructure, Transport, Regional Development, Communications and the Arts

Applicant

Carmen Jereb
Project Director, Territories Capital and Major Projects
Territories Division
Department of Infrastructure, Transport, Regional Development, Communications and the Arts
GPO Box 594 Canberra ACT 2601

Land subject to the development application

Land in and around the Kingston and Arthurs Vale Historic Area, Norfolk Island as follows:

Land Description	Portion Number	Lot Number	Section Number	Land Area
Middlegate Road Reserve	RD 25	N/A	N/A	N/A
Country Road Reserve	RD 78	N/A	N/A	N/A
Taylors Road Reserve	RD 57	N/A	N/A	N/A
Kingston Common Reserve	RES	50	17	4.723 ha
Kingston Common Reserve	RES	7	4	19.16 ha

Note: Land details are obtained from the Official Survey of Norfolk Island Sheets 15, 45, and 94 and the Norfolk Island Regional Council Registry Office.

Proposed use or development to which the EIS relates

Major Public Infrastructure and Works (Sewerage System).
KAVHA Sewerage Scheme: Stage 2

Statement that the information contained in the EIS is neither false nor misleading.

To the best knowledge of DITRDCA staff and independent specialists who have contributed to the development of the EIS, the information presented in the EIS is true in all material particulars and does not, by its presentation or omission of information, materially mislead.

Disclaimer

Following completion of this Environmental Impact Statement, sewage pumping station PS3, and the associated emergency storage tank, have been removed from Stage 2 of the Project and transferred to Stage 1 of the Project.

Approval for PS3, and the associated emergency storage tank, has been applied for separately as a modification to Stage 1. The modification would facilitate the following changes to the approved Stage 1 sewerage infrastructure:

1. Removal of the approved, but not yet constructed temporary above ground 'end of line' holding tanks.
2. Replacement of the approved above ground 'end of line' holding tanks with PS3 and associated emergency storage tank, which would be installed underground.

This modification has been made to enable Stage 1 of the Project to be commissioned:

1. Without the financial and environmental impacts associated with the construction of the temporary above ground 'end of line' holding tanks.
2. As soon as possible in the event that the approval and / or construction period for Stage 2 of the Project are delayed.


Information about PS3 and the associated emergency storage tank has not been removed from this assessment for the following reasons:

1. The Environmental Impact Statement was complete at the time it was decided to proceed with the modification.
2. To provide the public, other stakeholders and the decision makers with all the information about the Stage 2 infrastructure and how it will operate.
3. In case planning approval for the modification is not granted, in which case PS3 and the associated emergency storage tank could still be assessed as part of Stage 2 of the Project.

Document controls

Title:	KAVHA Sewerage Scheme: Stage 2 Environmental Impact Statement
---------------	--

Approval and authorisation

Prepared by:	Planning Assist
Accepted on behalf of the DITRDCA by:	Sarah Vandembroek
	Signed: 
	Date: 3/4/2024.

1 Introduction

Human waste contamination in the Kingston and Arthur's Vale Historic Area (KAVHA) in Norfolk Island has increased over recent years due to deterioration and failure of existing septic treatment systems and sewage holding tanks in the KAVHA catchment. This poses an increasing risk to public health and to the marine environment of Emily Bay and Slaughter Bay in the Norfolk Marine Park which adjoins KAVHA.

In order to reduce human waste pollution of soil, surface water and groundwater in KAVHA and the adjoining Norfolk Marine Park, the Commonwealth Department of Infrastructure, Transport, Regional Development, Communications and the Arts (DITRDCA) has proposed the development of a reticulated sewerage scheme in KAVHA and surrounds (the Project).

The Project would be delivered in three stages. Stage 1 is currently under construction. Stage 2 and Stage 3 are both in the planning and design phase.

DITRDCA is currently preparing a development application for Stage 2 (the Proposal). This Environmental Impact Statement (EIS) has been prepared to support this application.

The Proposal is classified in the *Norfolk Island Plan 2002: Housekeeping Amendment 2022* as 'Major Public Infrastructure and Works (Sewerage Services)' and was declared as Significant Development under Section 28C of the *Planning Act 2002 (NI)* on 25 June 2023.

2 The Project

2.1 Staging

The Project is intended to be delivered in three stages. The Proposal is for Stage 2 only. Information about Stage 1 and Stage 3 of the Project is provided solely for context purposes. In summary, the three stages are:

Stage 1 (under construction) – Sewerage infrastructure to collect, transfer and store (in holding tanks¹) sewage from buildings on Crown land in Kingston on the KAVHA valley floor including the Golf Club, Emily Bay Bathing Shed, Quality Row houses, Government House, the Old Military Barracks and the New Military Barracks.

Stage 2 (the Proposal) – Sewerage infrastructure (trunk main) to connect Stage 1 infrastructure to the existing Norfolk Island Regional Council (NIRC) Water Assurance Scheme. The trunk main would connect to Stage 1 infrastructure near the intersection of Middlegate Road, Country Road, Quality Row and Pier Street. The trunk main would traverse Country Road and Taylors Road and connect into the Water Assurance Scheme on Taylors Road near the intersection of Queen Elizabeth Avenue.

Also, sewerage infrastructure along Middlegate Road between the intersection of Middlegate Road, Country Road, Quality Row and Pier Street and the Panorama Seaside Apartments.

Stage 3 – Sewerage infrastructure to collect sewage from various buildings on Crown land in Kingston in the KAVHA pier area, the Cemetery Toilets and the Lone Pine Bathing Shed. This infrastructure would connect into the sewerage scheme at the intersection of Middlegate Road, Country Road, Quality Row and Pier Street, the Golf Club and the Emily Bay Bathing Shed respectively.

The three stages of the Project are shown in **Figure 2-1**.

.

¹ Temporary above ground 'end of line' holding tanks were approved as part of the Stage 1 of the Project. To avoid potential impact from the construction and operation of these tanks, it is intended that they will no longer be constructed (subject to timing for approval and construction of the Proposal) and would instead be replaced by an underground sewage pumping station (PS3) and emergency storage tank installed as part of the Proposal.

KAVHA SEWERAGE SCHEME - STAGES 1-3: CONCEPT DESIGN



Figure 2-1: The Project: KAVHA sewerage scheme stages 1-3 – Concept design

As part of the Project, provision would be made for the possible future connection of private properties located in suitable proximity to the sewer. Private connections are not included in the scope of the Project and would be managed separately by NIRC.

The Proposal is not co-dependent on Stage 3 and would be able to operate effectively in the absence of Stage 3. Stage 3 is in the planning and design phase, and should it proceed, would be the subject of a separate development application that would take residual impacts (if any) of Stage 1 and Stage 2 into consideration.

Completion of Stage 2 and Stage 3 as stand-alone proposals would expedite the construction of Stage 2 and the reduction of adverse environmental impacts from human waste pollution whilst Stage 3 is undergoing planning, design and approval phases. It would also enable construction methods and operation of the proposed infrastructure to be tried and tested, and any lessons learned applied to subsequent Stage 3 should it proceed.

2.2 Interim remediation works

Septic treatment systems and sewage holding tanks on Crown land in Kingston had deteriorated to the point that they were defective and leaking sewage into the soil (refer **Figure 2-2**). This has resulted in human waste contamination of the local environment – soil, groundwater, downstream surface water (Town Creek, Watermill Creek and associated wetlands), and Emily Bay and Slaughter Bay in the Norfolk Marine Park. It is expected that many septic treatment systems and sewage holding tanks on private property along the sewerage scheme route are in a similar state of disrepair.



Figure 2-2: Example of a defective sewage holding tank in KAVHA prior to interim remediation work

As an interim measure to minimise human waste contamination impacts on KAVHA and the Norfolk Marine Park prior to implementation of the Project, DITRDCA undertook two emergency preventative measures which are detailed in **Section 2.2.1** and **Section 2.2.2**. Further to these interim remediation works, Stage 1 of the Project is now under construction.

2.2.1 Pump out of sewage holding tanks

In 2021, interim remediation works were undertaken to repair and seal existing sewage holding tanks and septic treatment systems in Kingston. This work was undertaken so that future sewage would be contained, and ongoing pollution halted. Since the beginning of 2021, the majority of tanks on Crown land in Kingston have been repaired and septic soakage/absorption trenches disconnected². Images of the deteriorated tanks prior to repair, and details of the repairs undertaken, are provided at **Appendix A**).

Stand-alone solar powered alarms have been installed at each repaired sewage holding tank³. There is a float installed in each tank, which rises as the tank fills and activates the alarm when the tank needs to be pumped out. The alarm is visual and audible and triggers text messages to be sent to both: Norfolk Septic Services who responds as soon as practicable to pump out the respective tank; and to Norfolk Island Plumbing and Gas who monitors the text messages and ensures Norfolk Septic Services has responded to the alarm.

Whilst the interim remediation works are currently preventing ongoing human waste contamination from the repaired tanks, this is only a short term solution. Hydrogen sulfide gases generated from sewage and wastewater corrode concrete and plaster, meaning the remediation works have a limited lifespan (pers. comm. Peter Wilson, NIRC, 14/9/2021).

The existing sewage holding tanks and septic treatment systems in Kingston will be progressively decommissioned as sections of the sewerage scheme are progressively commissioned.

2.2.2 Installation of leaky weirs

In 2021 (November), four leaky weirs were installed in Watermill Creek, downstream of Watermill Dam (refer **Figure 2-3**).

The leaky weirs slow surface water flows during rain events giving the water more time to infiltrate the soil, minimising volume of runoff, waterway erosion and consequent mobilisation of sediment into Emily Bay. How the leaky weirs work is shown in **Figure 2-4**.



Figure 2-3: Location of leaky weirs in Watermill Creek, KAVHA



Figure 2-4: Leaky weir in operation

² The two septic soakage/absorption trenches at the Golf Club have not been disconnected in case of overflow during periods of high usage. However, the tanks are alarmed and have been pumped out prior to any overflow to the trenches).

³ Except for the three holding tanks at the Emily Bay Bathing Shed which is in an area too shaded for solar power to be effective. Trickle battery chargers were installed at this location.

3 Justification for the Project

3.1 Water quality investigations

Numerous investigations into water quality on Norfolk Island have been undertaken over previous years. The most recent investigations include:

- *Emily Bay and Upper Cascade Creek Catchments: Norfolk Island Water Quality Study* (AECOM, 2017).

AECOM was commissioned by NIRC to undertake a water quality study of the Watermill Creek and Upper Cascade Creek catchments of Norfolk Island to assess water quality issues (including recreational use in Emily Bay and ecosystem health) to determine potential risks to human health and the environment, and to provide practical recommendations for improving water quality.

- *Norfolk Island Water Resource Assessment: Options for improving the resilience of Norfolk Island to extended dry spells* (CSIRO, 2020).

The CSIRO was commissioned by DITRDCA to quantify key components of the water balance of Norfolk Island, understand the drivers of change of hydrological behaviours and to investigate options to improve the resilience of Norfolk to extended dry spells. Whilst the scope of this study is not directly relevant to water quality in Emily Bay and Slaughter Bay, the report does confirm island wide sewage pollution of surface water and groundwater.

- *Improving the Water Quality of Emily Bay, Norfolk Island* (Bligh Tanner, 2020).

Bligh Tanner was commissioned by Parks Australia to investigate options into the management of polluted water to protect the health of the lagoon at Emily Bay and Slaughter Bay.

- *Norfolk Island Lagoonal Reef Ecosystem Health Assessment 2020–2021* (SIMS et. al., 2021).

The Sydney Institute of Marine Science (SIMS) along with the University of New South Wales, the University of Newcastle and the James Cook University, was commissioned by Parks Australia to survey the coral health of Emily Bay and Slaughter Bay. The surveys were conducted during February and March 2020, which was a period when the reef was also impacted by a tropical cyclone and high rainfall events, leading to increases in bacteria and nutrients entering the bays. Follow up surveys were undertaken in June, September and December 2020 and April 2021.

Whilst the primary purpose of this study was an investigation into marine health rather than water quality, the report does confirm that contaminated land based runoff is adversely impacting marine health in the bays.

3.2 Water quality issues

Issues identified in recent investigations as relevant to the Project are outlined in **Section 3.2.1** to **Section 3.2.4**.

3.2.1 The AECOM Report (2017)

The AECOM Report concluded that:

- Surface waterbodies and shallow groundwater aquifers are polluted with contaminants of potential concern (COPCs) from animal and human sources via multiple pathways.
- COPCs pose a risk to human health through exposure pathways of:
 - Secondary contact such as swimming in Emily Bay.
 - Primary contact from ingestion of water supply, irrigation of food crops, stock watering and consumption of impacted food sources (shellfish etc).
- Fresh and marine ecosystems are considered to be impacted by contamination.

3.2.2 The CSIRO Report (2020)

The CSIRO Report confirmed that:

- Sewage pollution is present in both groundwater and surface water island wide.
- Prevalence of sewage is higher in ground water than surface water.
- It is possible that defective sewer systems or nearby sewer lines are a major source of groundwater contamination.

3.2.3 The Bligh Tanner Report (2020)

The Bligh Tanner Report documents investigations into the pollution of Emily Bay and Slaughter Bay and is specific to protecting the health of the lagoons. The following conclusions are drawn in the report:

- Reef health:
 - The coral reefs in Emily Bay and Slaughter Bay are in poor health due to historic and ongoing wastewater management issues.
 - Coral bleaching and rapid algal overgrowth (which prevents coral recovery from bleaching) due to poor water quality in Emily Bay and Slaughter Bay is causing damage to the coral reefs that may be irreversible.
 - Reefs are normally resilient to incidental pollution events. The continual deterioration of the reef suggests that both groundwater and surface water pollution are contributing to the pollution with contaminated groundwater acting as a chronic source of pollutants and incidental surface water flooding into Emily Bay during high rainfall events being the 'trigger' to noticeable health incidents. This is further exacerbated by increased temperatures.
 - Poor reef health could result in structural degradation which could expose Emily Bay and Slaughter Bay to erosive coastal processes.
- Water quality (amongst others):
 - Groundwater is contaminated, primarily due to island wide use of septic tanks and soakage trenches.
 - Groundwater naturally upwells at Emily and Slaughter Bays.

3.2.4 The SIMS Report (2021)

The SIMS Report documents the most recent scientific investigations into the health of the lagoonal reef systems of Norfolk Island and identifies potential reasons for declining coral health. The report generally supports the findings of the Bligh Tanner Report from a reef health perspective. The following conclusions are documented in the report:

- High rainfall events in May, July, August, September and November 2020 led to increases in inorganic nitrogen (ammonium (NH_4^+) and nitrate/nitrite (NO_x)) in Emily and Slaughter Bays that are:
 - Between four and five times above Australian and New Zealand Environment and Conservation Council (ANZECC) water quality guidelines for ammonium; and
 - Two times above the ANZECC water quality guidelines for nitrate/nitrite.

These forms of nitrogen are commonly found in sewage.

- During the survey period, the dominant form of algal cover in Emily Bay and Slaughter Bay changed from Green Turfing Algae in March 2020 to Fleshy Algae in April 2021. Fleshy Algae smothers both corals and other algae. This change is consistent with increased nutrient input to the coral reef system.

- Coral diseases identified during the survey include *Atrementous Necrosis* which has a high coral mortality rate and is correlated to run-off events and resultant low salinity, high nutrients and sedimentation. This disease was identified in December 2020 and March 2021 but was not present in March 2020.
- Six taxa of bacteria were found which have been associated with faecal pollution including *Escherichia coli* (*E. coli*).
- Nutrient concentrations were highest following rain events but were also elevated in Slaughter Bay during dry periods suggesting infiltration of the bays by contaminated groundwater.

The study has confirmed the coral reef in the Emily Bay and Slaughter Bay lagoons is in poor and declining health, with increased coral disease and algae growth. Observations made during the study indicate that Emily Bay and Slaughter Bay are being affected by contaminated surface water runoff and contaminated groundwater infiltration and that this is adversely impacting the health of the marine environment in a number of ways.

To confirm this conclusion, seawater outside Emily Bay and Slaughter Bay was tested (test sites in the open water to the north of the island and inshore lagoonal Cemetery Bay). In comparison to Emily Bay and Slaughter Bay, test results for these waters were below the ANZECC water quality guidelines, reinforcing that the inshore lagoonal waters at Emily Bay and Slaughter Bay are impacted by land based runoff.

3.3 Need for the Project

The four reports discussed above demonstrate that human waste contamination (sewage) is contributing to poor surface water and groundwater quality across Norfolk Island.

Contaminated surface water and groundwater are adversely impacting downstream areas including Kingston (soil, surface water and groundwater), Emily Bay and Slaughter Bay, causing potentially irreversible damage to marine ecosystems and posing public health risks.

The impacts of the pollution have been exacerbated by high rainfall generated during the 2022-2023 La Nina weather system (increased mobilisation of pollutants into the bays) and increasing sea temperatures (better conditions for algal growth). This is evidenced by increased incidence of coral bleaching and algal growth and increased frequency of public health alerts in relation to swimming in Emily Bay and Slaughter Bay (P Wilson; 2022).

The Project would result in the containment and removal of all sewage generated at buildings on Crown land in KAVHA. Whilst this would not solve the island wide water quality problems, or the consequent downstream pollution issues in Emily Bay and Slaughter Bay, it would remove the closest point sources of sewage and assist in the reduction of levels of human waste contamination in Emily Bay and Slaughter Bay.

3.4 Option evaluation

During development of the preferred option for the Project, a number of options recommended as a result of previous investigations were considered. These options are presented in **Section 3.4.1 to Section 3.4.4**.

3.4.1 AECOM Report

Recommendations made in the AECOM Report (as relevant to the Project) include:

- Sealing of existing water extraction bores and decommissioning of disused wells to prevent unnecessary impacts to groundwater from surface contaminants.
- Controlling cattle access to surface water (waterways).
- Planting or enhancing riparian zones along creeks to act as a natural filter for surface water runoff entering waterways.
- Investigating benefits of wetland areas in lower catchment areas and extension of these areas which may improve water quality discharging into Emily Bay.
- Conduct of water quality monitoring in Emily Bay to assess potential risks to recreational users and marine habitats and employ management measures to reduce risks.

3.4.2 The CSIRO Report

Recommendations made in the CSIRO Report generally relate to island wide hydrological behaviours and most are not relevant to the Project.

The relevant recommendation was for the identification and management of sources of sewage contamination to reduce human health risks.

3.4.3 Bligh Tanner Report

The Bligh Tanner Report utilises water quality information provided in earlier reports and provides a comprehensive assessment of options for the management of polluted water specific to the treatment or management of polluted water to protect the health of the lagoons at Emily Bay and Slaughter Bay.

The final recommendations made in the Bligh Tanner Report include implementation of the most effective subset of the overall options considered.

3.4.3.1 Options considered

Options considered in the Bligh Tanner Report include:

- Interception
 - Damming the groundwater to prevent flow into Emily Bay.
- Treatment
 - Package Treatment Plant to remove nutrients and produce water of a suitable quality to release into Emily Bay.
 - Denitrification trenches to pass water through a carbon rich anaerobic trench to complete the denitrification cycle and convert nitrates and ammonia to nitrogen gas.
 - Re-establishment of wetlands on the Kingston Common or lowlands to detain water, enabling some removal of nitrogen and preventing uncontrolled release of water into Emily Bay.
 - Use of Nualgi / Diatomox, proprietary products that stimulate diatom growth in waterbodies, draw down nutrient levels and limit algal growth.
 - Deliberate growth of a suitable species of freshwater macroalgae to remove nutrients (nitrogen and phosphorus) from contaminated water.
 - Aeration to encourage denitrification prior to release of water to Emily Bay.

- Disposal of surface water / groundwater
 - Use of surface water and groundwater to irrigate the golf course to enable nutrient uptake by plants.
 - Establishment of a seven hectare pine plantation near Rooty Hill Rd and Country Road to enable nutrient uptake by plants.
 - Deep ocean outfall at Emily Bay.
 - Ocean outfall at Headstone Reserve.
 - Use of surface water to irrigate the airport and mitigate excess runoff to downstream areas.
- Preventative measures
 - Installation of leaky weir system downstream of Watermill Dam to attenuate surface water runoff, promote infiltration and minimise waterway erosion reducing sediment loads.
 - Pump out septic tanks in eight priority areas in the KAVHA catchment and transfer wastewater to the sewage treatment plant to reduce land disposal and prolonged system leakages.
 - Extension of the sewer network (NIRC Water Assurance Scheme).
 - Upgrade the sewage treatment plant.
- Other measures
 - Flushing Emily Bay:
 - Pump nutrient rich water from Emily Bay to an area beyond the reef where it may be dispersed by ocean currents; or
 - Pump cooler clean water from offshore into the Bay to displace warmer, polluted water.

These options, including an assessment of the potential effectiveness and feasibility/constraints for each option, are detailed in full in Section 2 of the Bligh Tanner Report (refer **Appendix B**).

3.4.3.2 Options recommended

Of all the options considered in the Bligh Tanner Report for the management of polluted water to protect the health of the lagoon at Emily Bay and Slaughter Bay, the following subset of options were recommended for implementation.

No regrets measures

No regrets measures were recommended in order to minimise impacts on the bays as soon as possible. These were considered as emergency measures and were not designed to be implemented as 'stand-alone' measures. The recommended no regrets measures were:

- **Leaky weirs** - Installation of a leaky weir system downstream of Watermill Dam to attenuate surface water runoff, promote infiltration and minimise waterway erosion reducing sediment loads.
- **Pump out septic tanks** - Pump out septic tanks at 138 houses in eight priority areas that are suspected to discharge to the KAVHA catchment and subsequently, Emily Bay, and transfer wastewater to the sewage treatment plant to reduce land disposal and prolonged system leakages.

Intermediate measures

Intermediate measures were recommended to improve the quality of groundwater and surface water that discharges into the bays. The recommended intermediate measures were:

- **Denitrification trenches** - Installation of denitrification trenches to treat shallow groundwater that upwells and discharges into the bays. Trenches should be installed immediately upstream of the bays then progressively upstream to provide groundwater treatment across the KAVHA catchment.
- **Redirection of surface water** - Redirection of existing surface water to another outlet (Headstone Reserve outfall) or to the Golf Course or pine plantations (not yet established) for direct application (irrigation).
- **Utilisation of novel treatment technology** - Use of Nualgi / Diatomox which are proprietary products that stimulate diatom growth in waterbodies, draw down nutrient levels and limit algal growth.

Ultimate measures

Ultimate measures were recommended to prevent future contamination of surface water and groundwater. The recommended ultimate measures were:

- **Sewer the KAVHA catchment** – NIRC to expand the existing Water Assurance Scheme to service all properties on the island to prevent future contamination of groundwater and surface water. In the absence of funding to connect all properties on the island, high risk properties in the KAVHA catchment should be connected first (refer **Figure 3-1**).



Figure 3-1: High risk properties in the KAVHA catchment

(Source: Bligh Tanner, 2020)

3.4.4 The SIMS Report

The key recommendation made in the SIMS report was to examine ways in which nutrient / pollution inputs into the bays can be reduced or eliminated to improve water quality and subsequently coral health.

The report highlighted the need for immediate and effective action.

3.5 Preferred option

The preferred option was developed from the final recommendations made in the Bligh Tanner Report and included the No Regrets Measures and the Ultimate Measures.

- No Regrets Measures:
 - Leaky weirs.
 - Pump out septic tanks.
- Ultimate Measures:
 - Sewer the KAVHA catchment.

The recommended No Regrets Measures did not require planning or environmental approvals and have already been implemented (refer **Section 2.2**) by DITRDCA on Crown land in Kingston in order to minimise ongoing pollution of Emily Bay and Slaughter Bay during the lengthy planning stages for sewerage the KAVHA catchment.

The recommended Ultimate Measure of sewerage the KAVHA catchment has been proposed to the extent that it is applicable to sewage generated on Crown land in KAVHA. Notwithstanding, provision has been included in the design of the Project for the possible future connection of private properties at such time that appropriate legislative provisions are put into place by NIRC.

The recommended Intermediate Measures were not included in the preferred option due to: unproven ability to achieve the desired outcomes in the Norfolk Island conditions; high environmental impact; impracticality of implementation and redundancy due to the proposed implementation of the ultimate measure (sewer).

3.6 Alternatives

Strategic alternatives to the preferred option for the Project were assessed against the objectives of the Project (refer **Section 4.3.1**) as part of this environmental assessment. The following alternatives were considered¹:

- Base case ('do nothing').
- Pump out sewage holding tanks:
 - Repair existing septic treatment systems and convert to sewage holding tanks.
 - Repair sewage holding tanks.

These alternatives are discussed below.

¹ The alternatives were considered prior to the interim remediation works detailed in **Section 2.2**. Therefore, the assessment of each alternative is described as though the interim works had not been completed.

3.6.1 Base case or ‘do-nothing’ option

Polluted surface water and groundwater is being discharged to Emily Bay and Slaughter Bay via various pathways causing potentially irreversible damage to the coral reefs and broader marine ecosystems.

In light of the documented scientific evidence that poor water quality is increasingly adversely impacting the health of the Norfolk Marine Park, the ‘do-nothing’ option was not considered to be an acceptable alternative.

3.6.2 Pump out sewage holding tanks

Individual septic tanks (disposal via soakage / absorption trench) and sewage holding tanks (disposal by pump out)) can be repaired. Septic treatment systems with soakage / absorption trenches can be converted to sewage holding tanks. This would ‘in theory’ prevent ongoing sewage contamination of surface water and groundwater.

However, following repair of these systems, there is still potential for sewage leakage or overflow into the receiving environment due to issues such as poor tank maintenance or delayed pump out. The proximity of these systems to water sources signifies that any failure or overflows would have damaging impacts on downstream environments (Bligh Tanner, 2020).

In light of ongoing maintenance requirements and potential for system failure, the pump out sewage holding tanks option is not considered a suitable long term alternative to the Project.

Note that, in accordance with the Ecologically Sustainable Development ‘Precautionary Principle’:

‘If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. Public and private decisions should be guided by careful evaluation to avoid serious or irreversible damage to the environment wherever practicable, and an assessment of the risk-weighted consequences of various options’ (EDO, 2022).

DITRDCA has implemented this alternative as a short term management measure (interim remediation works) for sewage systems on Crown land in KAVHA (refer to **Section 2.2**).

4 The Proposal

4.1 Overview

The Proposal is for Stage 2 of the three stage KAVHA Sewerage Scheme Project (refer **Section 2**).

The Proposal would:

- Connect Stage 1 sewerage infrastructure to the Water Assurance Scheme. This would involve replacement of the approved Stage 1 'end of line' sewage holding tanks¹ near the intersection of Middlegate Road, Country Road, Quality Row and Pier Street with a sewage pumping station (PS3), and provision of sewerage infrastructure (trunk main) along Country Road and Taylors Road. The trunk main would connect into the Water Assurance Scheme on Taylors Road near the intersection of Queen Elizabeth Avenue. The trunk main is a higher capacity main that would transfer all sewage collected by the Project directly from the point of collection in Kingston / KAVHA, via the Water Assurance Scheme, to the sewage treatment plant at the Norfolk Island Airport.
- Provide sewerage infrastructure along Middlegate Road between the intersection of Middlegate Road, Country Road, Quality Row and Pier Street and about 15 metres before the Panorama Seaside Apartments.
- Provide for the future connection of private properties along both these sewerage routes to the sewerage scheme at such time that appropriate legislative provisions are put into place by NIRC. These connections are not included in the scope of the Proposal and would be managed separately by NIRC. No private property(s) would be connected to the proposed sewerage infrastructure as part of the Proposal.

The Proposal area is the area that would be disturbed during construction of the Proposal (the construction footprint) plus a 25 metre buffer area around the construction footprint.

The concept design for the Proposal is shown in **Figure 4-1**.

The Proposal would require the following works:

- Installation of one sewage pumping station (PS3) with an associated 30,200 litre (30.2 cubic meter) underground emergency sewage storage tank near the intersection of Middlegate Road, Country Road, Quality Row and Pier Street.
- Installation of three sewage pumping stations (PS4 – PS6) along Country Road / Taylors Road.
- Installation of about 2,000 metres of rising pressure (trunk) main along Country Road / Taylors Road.
- Installation of about 550 metres of rising pressure main along Middlegate Road.
- Minor electrical installations to connect each sewage pumping station to existing overhead power lines and electrical control cabinets.
- Creation of a temporary construction compound near Watermill Dam for storage of materials, plant and equipment required during the construction period.

¹ Temporary above ground 'end of line' holding tanks were approved as part of the Stage 1 of the Project. To avoid impact from the construction and operation of these tanks, it is intended that they will no longer be constructed (subject to timing for approval and construction of the Proposal) and would instead be replaced by an underground sewage pumping station (PS3) and emergency storage tank installed as part of the Proposal.

KAVHA SEWERAGE SCHEME - STAGE 2: CONCEPT DESIGN

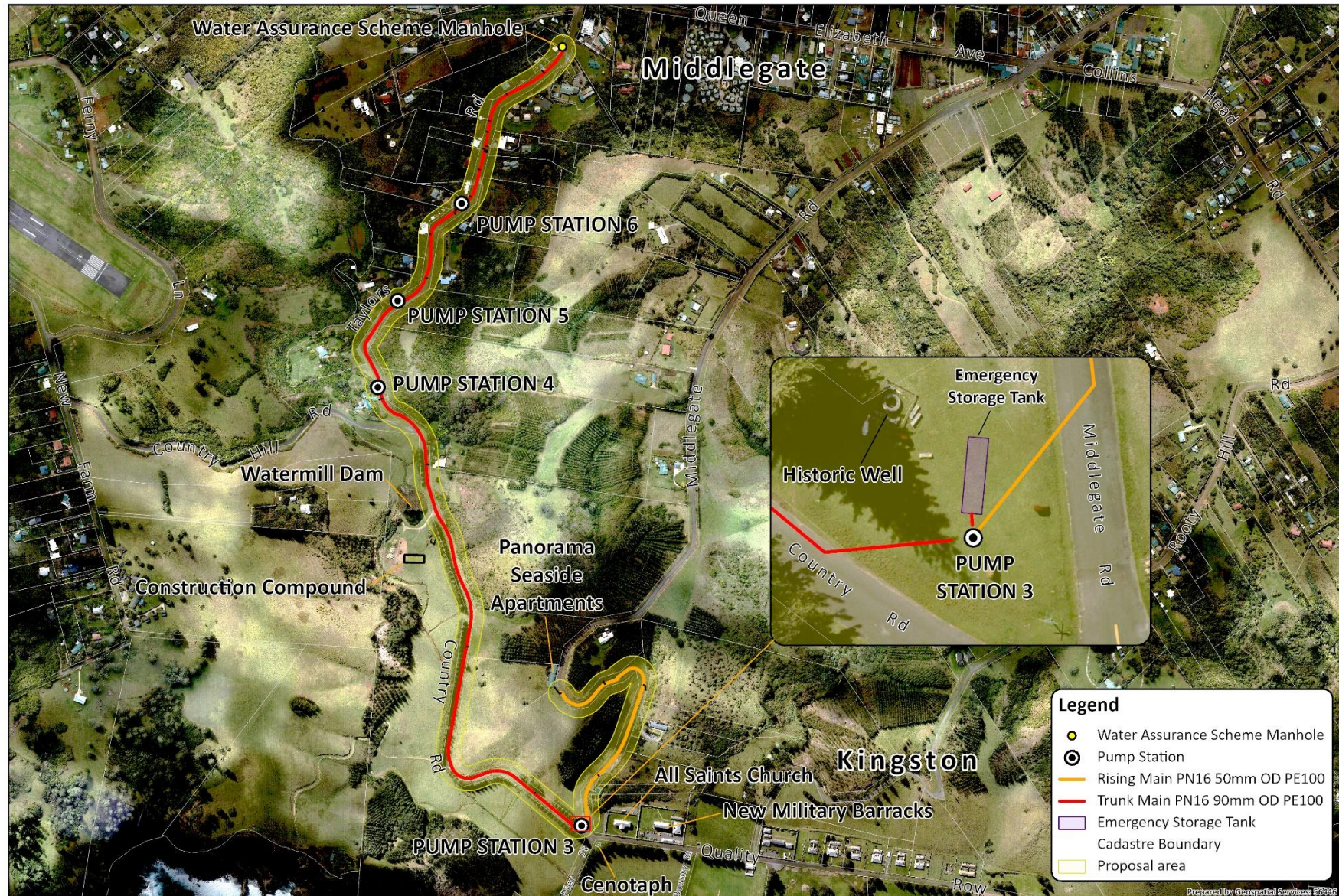


Figure 4-1: The Proposal: KAVHA sewerage scheme stage 2 – concept design

4.2 Site

4.2.1 Site location

The Proposal area is located in the Kingston and Arthur's Vale Historic Area (KAVHA) and surrounds, Norfolk Island.

Norfolk Island is an external territory of Australia. It is located about 1,600 km east of Sydney in the South Pacific Ocean.

KAVHA is located at the southern end of Norfolk Island at about latitude 29°35'S, longitude 167°57'E (refer **Figure 4-2**) and has an area of about 250 hectares.



Figure 4-2: Geographic location of KAVHA and Norfolk Island

Inset shows the location of Norfolk Island relative to Australia and New Zealand.

(Source: CSIRO, 2020)

4.2.2 Site description

The majority of the Proposal area is located within KAVHA. About 670 linear metres of the proposed infrastructure on Taylors Road would be located outside KAVHA.

4.2.2.1 KAVHA

KAVHA is a site with great heritage value to the Norfolk Island people, Australia and the world. It is listed on multiple heritage registers including the:

- Norfolk Island Heritage Register – listed in 2003.
- National Heritage List – listed in 2007.
- Commonwealth Heritage List – listed in 2007.
- World Heritage List – listed in 2010.

It is significant as a convict settlement spanning the era of transportation to eastern Australia between 1788-1855, as a site containing evidence of early Polynesian settlement, and the place where the Pitcairn Island descendants of the Bounty mutineers were re-settled in 1856 (DAWE, 2021). KAVHA was included the World Heritage list in 2010 as one of the 11 sites included in the Australian Convict Sites World Heritage Property.

Locally, KAVHA is intrinsic to the life, identity and culture of the Norfolk Island people.

Geographically, KAVHA comprises an area of low lying land that adjoins the coast and the Norfolk Marine Park (part of the temperate East Marine Parks Network) to the south, surrounding steep hills to the north and the west and two major valleys (Arthur's Vale and Stockyard Valley).

The lowland area of KAVHA area was developed in the nineteenth century and contains a number of Georgian buildings as well as extensive ruins and standing structures, archaeological features and landform and landscape elements (Jean Rice Architects, et. al., 2016). The lowland adjoins the coastal plain and three sandy beaches (Emily Bay, Slaughter Bay and Cemetery Bay). This lowland / coastal plain area is known as Kingston.

The majority of the lowland area (Kingston) is developed and either manicured or grazed (cattle). Heading in the direction of the ocean, manicured / grazed land adjoins a wetland that is fed by two creeks, Watermill Creek and Town Creek. Watermill Creek flows into Emily Bay during periods of high rainfall.

The wetlands are separated from Emily Bay and Slaughter Bay by grassland and a sealed road (Bay Street). Further to the east, the Golf Course and the Norfolk Island Cemetery adjoin Cemetery Bay.

The topography of Norfolk Island results in KAVHA being a downstream receiver of surface water and groundwater from other areas of the island. Surface and groundwater enter the Norfolk Marine Park from KAVHA via various pathways (refer **Figure 7.1-3**).

4.2.2.2 The Proposal area

The construction footprint for the Proposal would be contained within the Country Road, Taylors Road and Middlegate Road reserves, except for:

- Sewage pumping station (PS3) and the associated underground emergency sewage storage tank which would be installed in the Kingston Common Reserve near the intersection of Middlegate Road, Country Road, Quality Row and Pier Street.
- The temporary construction compound which would be located in the Kingston Common Reserve near Watermill Dam.

Country Road

Country Road is a sealed road located within KAVHA. It commences in Kingston at the intersection of Middlegate Road, Country Road, Quality Row and Pier Street and traverses the Arthur's Vale lowland to the north.

From south to north, Country Road runs adjacent to an area of swampland with acid sulfate soil potential, grassy paddocks, a public water collection point and Watermill Dam. This length of Country Road bisects Kingston Common Reserve and is lined on one side with a commemorative planting of Norfolk Island Pine trees. Beyond Watermill Dam, Country Road turns into Taylors Road.

Taylors Road

Taylors Road is a sealed road that climbs the steep hill to the Burnt Pine township. It is characterised by medium density roadside residential development, grass banks on one side and steep rocky banks on the other. About 670 linear metres of the Taylors Road construction footprint would be located outside the KAVHA boundary.

Middlegate Road

The section of Middlegate Road impacted by the Proposal is located within KAVHA. It is a sealed road that climbs the steep hill to the north of Kingston. The section of Middlegate Road that is within the Proposal area is cut into the hill with steep slopes on either side. There are four residential type developments along the Middlegate Road sewerage route.

Kingston Common Reserve

The location of PS3 and the associated sewage holding tank is bounded by Middlegate Road and Country Road. It is a grassed area that slopes away from Middlegate Road. There is a historic well on the site and a row of Norfolk Island Pine trees along the Country Road boundary.

The temporary construction compound would be located on a flat grassed area next to the existing KAVHA materials stockpile near Watermill Dam.

4.2.3 Land tenure

The Proposal would be constructed on the land detailed in **Table 4-1**.

All land identified in **Table 4-1** is either Crown land (inside KAVHA), or NIRC land (outside KAVHA).

There are various non-Commonwealth occupiers of buildings in the Proposal area including private residents, commercial tourist accommodation operators and NIRC. This Proposal has been prepared in consultation with these parties. Consultation is detailed in full in **Section 6**.

Table 4-1: Land on which the Proposal would be constructed

Land Description	Portion Number	Lot Number	Section Number	Land Area (Hectares)	Land Tenure
Middlegate Road Reserve	RD 25	N/A	N/A	N/A	Crown land
Country Road Reserve	RD 78	N/A	N/A	N/A	Crown land
Taylors Road Reserve	RD 57	N/A	N/A	N/A	Crown land / NIRC
Kingston Common Reserve	RES	50	17	4.723	Crown land
Kingston Common Reserve	RES	7	4	19.16	Crown land

Note: Land details have been obtained from the Official Survey of Norfolk Island Sheets 15, 45 and 94 and the Norfolk Island Regional Council Registry Office.

4.2.4 Existing land use

KAVHA is heritage listed for its local, national and world heritage significance. Kingston, the historic township on the KAVHA valley floor is highly utilised by both the Norfolk Island community and visitors to the island.

More specifically the Proposal area, which is mostly outside Kingston, is used for the following purposes:

- Roads.
- Residential dwelling houses.
- Tourist accommodation.
- Agriculture (cattle grazing).
- Kingston Common Reserve (open space, historic structures, KAVHA material stockpile site).

4.3 Objectives

4.3.1 The Project

The key objectives of the Project are to:

- Reduce human waste contamination in KAVHA and the adjacent Norfolk Marine Park.
- Reduce adverse impacts of human waste contamination on terrestrial and aquatic (fresh and marine waters) biodiversity.
- Improve safety and usability of KAVHA and the Norfolk Marine Park for recreational (land and sea based), economic and culturally significant purposes by reducing human waste contamination and associated public health risks.
- Contribute to the protection of the natural, heritage, cultural, social and economic values of the Norfolk Marine Park as stated in Schedule 2 of the *Australian Marine Parks, Temperate East Marine Parks Network Management Plan 2018* (Director of National Parks, Canberra, 2018).
- Contribute to achievement of the objectives of the *KAVHA Heritage Management Plan April 2016* (Jean Rice Architects *et. al.*, 2016) including the essential objective that environmental management and physical works should ensure an appropriate level of water quality in Watermill Valley and throughout the KAVHA site, while conserving heritage values. One of the implementation strategies for this objective is to renew and, where necessary, upgrade sewerage infrastructure for all occupied buildings.
- Contribute to achievement of the objectives of NIRC's Strategic and Operational Plans including *Norfolk Island Community Strategic Plan 2016-2026: Our Plan for the Future* (Norfolk Island Regional Council 2016) (refer to **Section 5.2.1.2**):
 - Strategic Direction 1 (An Environmentally Sustainable Community), Objective 1 (Use and Manage our Resources Wisely).
 - Strategic Direction 1 (An Environmentally Sustainable Community), Objective 2 (Preserve a Healthy Environment).

4.3.2 The Proposal

The objectives of the Proposal are to:

- Transport sewerage collected from Kingston directly to the NIRC Water Assurance Scheme, removing the need for the 'end of line' sewage holding tanks that were approved as part of Stage 1 of the Project.
- Remove the following potential impacts:
 - Sewage spill risk: The 'end of line' holding tanks, should they proceed, will be emptied as required (about every 48 hours) and the sewage transported by effluent tanker to the NIRC Sewage Treatment Plant for disposal. Whilst the holding tanks have been designed, and would be constructed and operated to minimise the risk of spills, there is still a risk resulting from potential holding tank failure, equipment failure or human error.
 - Visual impact: The 'end of line' holding tanks, should they proceed, will be located above ground at a visually sensitive intersection.
- Provide for the future connection of private properties along Country Road, Taylors Road and Middlegate Road that would eventually remove a further significant volume of sewage from the KAVHA catchment.
- Minimise human waste contamination and associated public health risks and adverse impacts on the sensitive environment of the Norfolk Marine Park.

4.4 Design

The Proposal was designed by Fluent Solutions Pty. Ltd. (Fluent Solutions) in collaboration with Island Plumbing and Gas, and reviewed by GHD Pty. Ltd. The design details of the Proposal are documented in full in the *Kingston and Arthur's Vale Historic Area Sewerage Scheme Stages 2 & 3 – Concept Design and Construction Plan* (Fluent Solutions Pty. Ltd, 2023) (refer **Appendix C**) and summarised in **Section 4.4.1 – Section 4.4.3**.

4.4.1 Environmental impact

Both the Project and the Proposal have been designed taking the remote location and environmental sensitivity of Norfolk Island into consideration.

The type of sewerage scheme that was selected is a standard pressure sewerage system that: uses simple technology; requires minimal maintenance; and requires shallower trenches than a gravity system which would need to achieve a fall along the length of the main.

To keep operation, repairs and maintenance of the sewerage scheme as simple as possible, the same brand of sewage pumping stations and control systems have been used across the whole Project.

The concept design has been developed to utilise previously disturbed areas, and to avoid impacts to existing underground services, heritage buildings, potential archaeological deposits and the natural environment where possible. It has also been designed to avoid high risk areas for acid sulfate soil. Where it has not been possible to avoid impacts, measures to mitigate and manage impacts have been developed as described throughout this EIS.

4.4.2 Design capacity

4.4.2.1 Overview

The design capacity of the Proposal is based on an assessment of design wastewater flows undertaken by Fluent Solutions Pty. Ltd. in accordance with *AS/NZS 1547:2012 On-Site Domestic Wastewater Management*.

In addition, the *AS/NZS 1547:2012* design wastewater flows were cross checked against the frequency and volume of existing septic tank pump outs from July 2022 to January 2023. This cross check determined that the estimated flows used to design the Proposal are conservative (Fluent Solutions, 2023a).

Because the trunk main along Country Road and Taylors Road would convey all sewage collected by the Project, the design takes into consideration estimated wastewater flows from the whole Project including:

- Stage 1 connections, including possible future private connections (two connections).
- Stage 2 possible future private connections (Country Road / Taylors Road (19 connections) and Middlegate Road (four connections)).
- Stage 3 proposed connections.

The estimated wastewater flow that would be pumped into the Water Assurance Scheme near the intersection of Taylors Road and Queen Elizabeth Avenue is about five litres per second.

4.4.2.2 Emergency storage

The design provides for 24 hours emergency storage at each of the four sewage pumping stations along the trunk main to cater for routine maintenance and system failure, including power outages.

Further details about emergency storage is provided in **Section 4.5.1.3**.

4.4.2.3 Future flow increases

The design also takes into consideration the potential for future flow increases that may result from intensified land use in the area serviced by the Project.

The sewerage system feeding into PS3 allows for about 50 percent additional flow to cater for future flow increases that may result from higher intensity usage of land in the area serviced by the sewerage scheme.

Should flows arriving at PS3 increase significantly in the future:

- Sewage pumping stations PS3 – PS6 would pump more frequently to transfer the increased flows from PS3 to the Water Assurance Scheme.

The Proposal includes capacity for this as current design flows (including possible future connections) only require sewage pumping stations along Country Road and Taylors Road to pump about 2.6 hours per day to transfer 24 hours of average daily flows.

- Emergency storage capacity associated with PS3 would need to be increased to maintain 24 hours storage capacity.

4.4.2.4 NIRC Water Assurance Scheme (existing)

Downstream of PS6, the sewage would enter the existing Water Assurance Scheme and gravity feed to the Water Assurance Scheme sewage pumping station which is known as Mildred's sewage pumping station (refer **Figure 4-3**). The majority of sewage collected by the Water Assurance Scheme (red lines in **Figure 4-3**) is received by Mildred's sewage pumping station which then pumps it uphill for a short distance and into a gravity main that feeds into the sewage treatment plant.

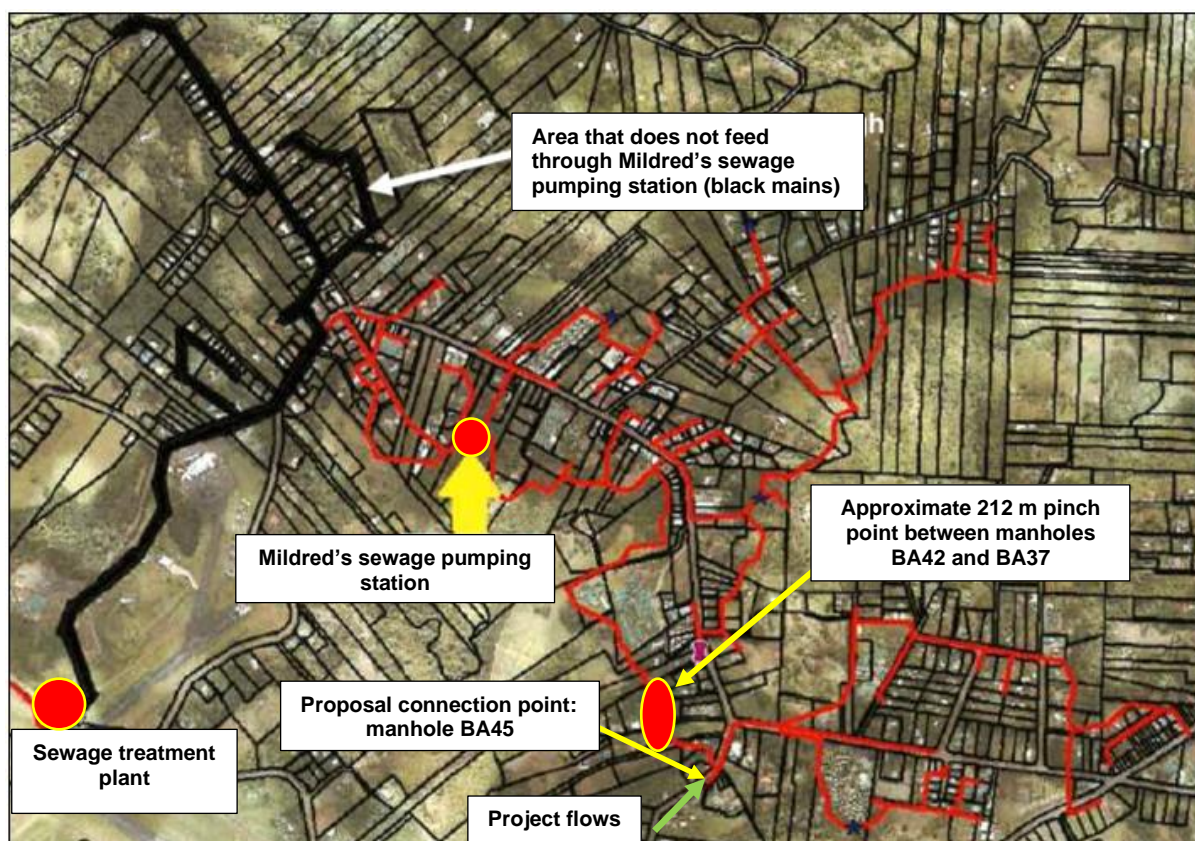


Figure 4-3: Water Assurance Scheme and Mildred's sewage pumping station

(Source: Fluent Solutions, 2024; labelling modified)

An assessment of the capacity of the existing Water Assurance Scheme infrastructure to convey the additional flows from the Project was undertaken (Fluent Solutions, 2024). The following infrastructure components were assessed:

- Receiving sewerage network.
- Mildred's sewage pumping station and rising main.
- The sewage treatment plant.

Receiving sewerage network

One potential pinch point was identified in the receiving gravity sewerage network. This is located at the flattest section of the 150 millimeter diameter receiving gravity sewer pipeline not far downstream of the Proposal connection point (refer **Figure 4-3**). This is a 212 meter section of gravity sewer where the fall gradient is 1 in 200.

This section of gravity main has an estimated capacity of 12.50 L/s. If sewage from all properties feeding into this section of sewer arrives at the same time, the peak wet weather flow is estimated to be 10.64 L/s.

All sewage arriving at the same time is an unrealistic scenario as sewage from all properties is not released at the same time. When flows were assessed using probable simultaneous demands, the peak flow estimate was 7.75 L/s.

The Project (excluding possible future private connections which are outside the scope of the Project and would be managed by NIRC) would input an estimated peak wet weather flow rate of 2.29 L/s into this section of the Water Assurance Scheme network. With possible future private connections included, this estimated peak wet weather flow rate could increase to 5.29 L/s (estimated maximum).

In summary, flows at the potential pinch point which has a 12.50 L/s capacity could be:

- Existing flows – 7.75 L/s realistic scenario | 10.64 L/s worst case scenario.
- Existing and Project flows – 10.04 L/s realistic scenario | 12.93 L/s worst case scenario.
- Existing and Project flows, plus flows from possible future private connections – 13.04 L/s realistic scenario | 15.93 L/s worst case scenario.

In a realistic scenario and excluding possible future connections, the estimated flow rate at the identified pinch point would be 10.04 L/s, which is lower than the sewer capacity of 12.50 L/s at this point.

Notwithstanding, the assessment concluded that addition of the flows from the Project (all three stages including possible future connections) to this potential pinch point may cause the gravity main to back up slightly. This potential issue could be addressed by:

- **Option 1:** Reducing the flow rate of PS3 to PS6 by adjusting the frequency of the variable speed drives. This option is not recommended as it would slow down scouring velocities in the rising main and the reduction in flows that the pumps would deliver would be limited.
- **Option 2:** Installation of a level transducer at the Water Assurance Scheme manhole (BA42) located at the start of the 150 diameter pipeline, along with an autodialler to send an SMS message to PS6 to stop pumping when wastewater flows start backing up in the manhole. Stopping PS6 from pumping would then follow the same procedure for shutdown in the event there was an issue at the Mildred's sewage pumping station (refer **Section 4.5.1.3**).
- **Option 3:** Replacement of the 212 m long flat section of 150 millimeter diameter gravity main with 225 millimeter diameter gravity main between Water Assurance Scheme manholes BA42 and BA37 to increase their capacity to about 36.5 L/s.

Given the unknown performance of the existing 150 diameter gravity sewer at the pinch point location, it was recommended in the assessment that sewage levels in manhole BA42 are initially monitored. If NIRC monitoring of flows determines that the gravity main in this location has capacity limitations due to the flows from the Project, then DITRDCA would implement Option 2. Further consideration would be given to this approach should it be deemed appropriate following post-commissioning monitoring.

Mildred's sewage pumping station and rising main

Based on daily power usage readings in kWhr for the Mildred's sewage pumping station from 1 March 2023 to 15 January 2024 (with a gap between 13 July 2023 and 19 September 2023), there is no evidence of the pumping station pumping more than 13 hours per day. This was the pumping duration following a three day significant rainfall event between 14 and 23 April 2023 where there was potential rainfall infiltration into the network. Generally, throughout the year when daily rainfall got close to 30 millimetres per day. The Mildred's sewage pumping station pumped for about two to three hours per day. It was concluded that the Mildred's sewage pumping station has capacity to accept additional flows.

The sewage treatment plant

All sewage generated on land included in the Project (excluding possible future connections) is currently transported to the sewage treatment plant by effluent tanker for disposal. Whilst sewage volumes disposed at the sewage treatment plant would not change as a result of the Project, the impact of the Project on the sewage treatment plant should be reduced as shock loadings from the rapid discharge of sewage from the effluent tanker(s) would cease and future inflow of sewage would be more constant / regular.

4.4.3 Design refinements

The Proposal was designed taking the following matters into consideration:

- Area and buildings to be serviced.
- Topography of the Proposal area.
- Ease and cost of construction.
- Existing infrastructure and services.
- Known heritage items and potential archaeological deposits.
- Other environmental features such as potential acid sulfate soil and protected / significant trees.
- Design of proposed future road upgrades in the Proposal area.

Additional design refinements may be required during the detailed design and construction phases of the Proposal for various reasons such as technical functionality, environmental constraints and to further minimise environmental impacts (e.g. impacts to unexpected archaeological finds identified during excavation).

It is not expected that any significant design refinements would be required.

4.5 Operation

The operation of the Proposal is summarised in **Section 4.5.1** to **Section 4.5.4**. Full details are available at in the *Kingston and Arthur's Vale Historic Area Sewerage Scheme Stages 2 & 3 – Concept Design and Construction Plan* (Fluent Solutions Pty. Ltd, 2023) (refer **Appendix C**).

4.5.1 Sewage pumping stations

4.5.1.1 Sewage pumping stations PS3 to PS6

Four sewage pumping stations (PS3, PS4, PS5 and PS6) would be installed along the Country Road / Taylors Road trunk main route.

PS3 would be located at the beginning of the trunk main near the intersection of Middlegate Road, Country Road, Quality Row and Pier Street. All sewage from the upstream Stage 1, Stage 2 (Middlegate Road route) and Stage 3 sewage collection areas would arrive at PS3 before being pumped uphill along Country Road / Taylors Road to the Water Assurance Scheme by PS3, PS4, PS5 and PS6.

The pumping stations would vary in size subject to operational requirements (refer **Table 4-2**), but would all be custom-made fiberglass Aquatec pumping stations with a dual pump system (duty / standby) which is a type of pump suitable for multiple residential, industrial or commercial applications (refer Appendix 3 of **Appendix C**).

Table 4-2 Wet well dimensions

Sewage Pumping Station ID	Wet Well Internal Diameter (m)	Wet Well Depth (m)
PS3*	2.0	3.5
PS4	1.5	2.5
PS5	1.5	2.5
PS6	2.0	2.5

**PS3 works in conjunction with an associated emergency storage tank to provide a total storage volume of about 31 cubic metres.*

Each sewage pumping station would include:

- A fiberglass wet well providing both operational and emergency storage volumes.
- Two Flygt submersible grinder pumps.
- An OmniSmart 6000 Dual Controller.
- McBerns activated carbon filters to prevent escape of unpleasant odours.
- Plumbing connections to the sewer main.
- Electrical connections.

A schematic diagram of a sewage pumping station is shown in **Figure 4-4**.

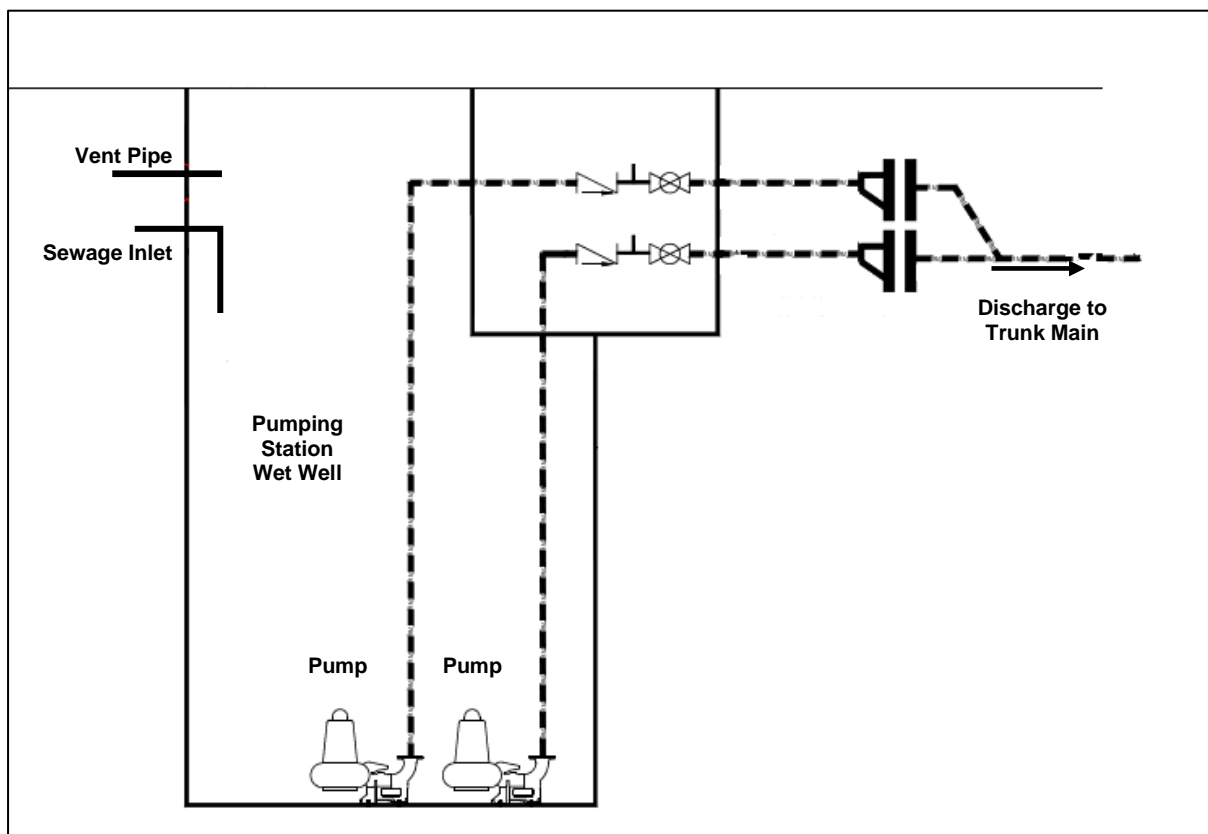


Figure 4-4: Sewage pumping station schematic layout

(Source: Adapted from Aquatec drawing No. 19855-40401 at Appendix 1 of **Appendix C**)

For both operational and emergency purposes, PS3 needs to be able to store the equivalent volume of wastewater collected from all upstream collection areas in a 24 hour period. Therefore, in addition to the inbuilt wet well storage, PS3 would be connected to an underground fiberglass emergency storage tank with a storage capacity of 23.7 cubic metres to provide a combined PS3 wet well and emergency storage tank capacity of 30.6 cubic metres.

PS3 and the emergency storage tank would be connected by a 100 millimetre diameter pipe that would enable the tank to both drain and fill as required. The layout of PS3 and the emergency storage tank is shown in **Figure 4-5**.

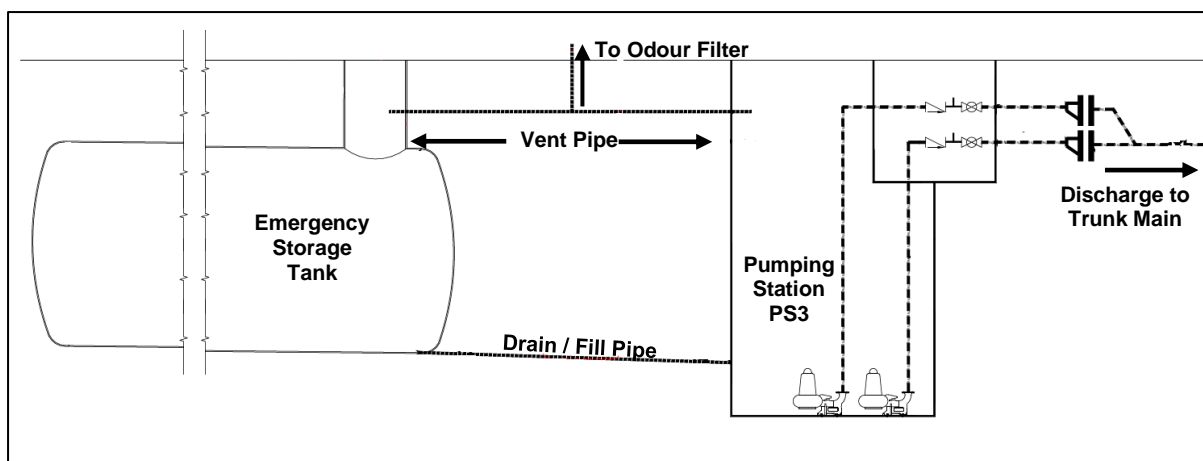


Figure 4-5: PS3 and emergency storage tank schematic layout

(Source: Adapted from Aquatec drawing No. 19855-40301 at Appendix 1 of Appendix C)

4.5.1.2 Sewage pumping station operation

Each sewage pumping station would have two pumps. Each pump would be capable of pumping the required flows by itself. One pump would be the primary pump, and the second would be the backup pump. If the primary pump should fail, the backup pump would automatically start pumping and take over from the primary pump.

Sewage pumping station controls include automatic switches for: pump on; pump off; and emergency high float level.

The pump would operate when the rising sewage level in the sewage pumping station chamber triggers the pump to start. The pump would stop when the sewage level has dropped to a point that is as low as possible without allowing the pump to run dry.

Under normal operating conditions, the pumps would be controlled automatically. To enable system maintenance / repairs, the pumps would also be able to be controlled manually. The manual controls would enable the low 'pump off' level to be ignored so that the sewage pumping station can be pumped dry.

4.5.1.3 Sewage pumping station failure

PS3 – PS6 and Mildred's sewage pumping station in the Water Assurance Scheme are all interlocked. Should any of these sewage pumping stations fail, the sewage level in the respective wet well would rise above the 'pump on' trigger level and an emergency high level alarm would be triggered.

Should Mildred's sewage pumping station fail, an SMS alarm would be sent to PS6 to stop it pumping. Once the wastewater level in PS6 reaches its high level alarm setting, it would send a digital signal (through a 5 core digital steel wire armoured cable) to PS5 to stop it pumping. This process would be repeated to sequentially shut down PS4 and then PS3. Once PS3 stops pumping, incoming sewage would be stored in the emergency storage tank which has capacity to hold incoming sewage from upstream collection areas for 24 hours.

This process would occur for upstream sewage pumping stations should any of the sewage pumping stations fail.

All alarms would also be sent to the scheme operator via SMS.

In the event of system failure:

- Each sewage pumping station PS3 to PS6 would have emergency storage capacity to hold about 24 hours of wastewater flows from its respective catchment, plus the volume of one pumping cycle from the upstream pumping station.
- The combined emergency storage at PS3 would have capacity to hold all incoming sewage from upstream collection areas (Stage 1, Stage 2 (Middlegate Road route) and Stage 3) for about 24 hours. This would provide 24 hours for the maintenance / repair to be undertaken without impacting sewer operation in these collection areas.
- If more than 24 hours is required to complete a repair, the scheme operator would be able to pump wastewater from each sewage pumping station into an effluent tanker for transfer to the sewage treatment plant.

4.5.2 Rising pressure mains

The rising pressure mains for the Proposal would comprise:

- Trunk Main - Polyethylene resin pressure pipes with a nominal diameter of 90 millimetres that would convey the wastewater flows from PS3, along Country Road and Taylors Road to the Water Assurance Scheme manhole on Taylors Road near the intersection of Queen Elizabeth Avenue.
- Middlegate Road Main - Polyethylene resin pressure pipes with a nominal diameter of 50 millimetres that would convey sewage collected from Middlegate Road properties (future connections) to PS3.

The trunk main pipe diameter is larger than the Middlegate Road main pipe diameter because the flows conveyed in the trunk main would be greater.

The rising pressure mains would be supplemented with the following features for maintenance purposes:

Flushing points: Flushing points enable the mains to be flushed periodically (annually) for maintenance cleaning. A water tanker would be connected to the camlock coupling at the flushing point and would pump water through the system.

The Proposal includes two flushing points. One would be located on Country Road about 115 metres from PS3 and the other on Middlegate Road just before the Panorama Seaside Apartments (Refer Appendix 1: Sheet C10 and Sheet C80 of **Appendix C**).

Isolation valves: Isolation valves enable sections of the sewerage scheme to be isolated so a section can be shut down for maintenance whilst other sections still function.

The Proposal includes five isolation valves located just before the entrance to each sewage pumping station². (Refer Appendix 1: Sheet C30, Sheet C40, Sheet C50 and Sheet C60 of **Appendix C**).

Tracer wire: Coloured tracer wire tape would be laid above all sewer pressure mains pipes and all electrical and signal cables to enable rapid location of underground services in the future.

Combination air and vacuum release valve: Combination air and vacuum release valves enable any air that enters the scheme to be released. They include an activated carbon filter installed on top of the air valve chamber to prevent the release of odours. This filter is rainproof and would be located above ground to avoid inundation in the unlikely event of heavy surface water flows.

The Proposal includes two combination air and vacuum release valves. One would be located on Country Road about 550 metres from PS3 and the other on Middlegate Road just before the Panorama Seaside Apartments (Refer Appendix 1: Sheet C13 and Sheet C80 of **Appendix C**).

² Note there are two isolation valves before sewage pumping station PS3, one in the Middlegate Road rising main and one in the Country Road rising main.

Water Assurance Scheme Manhole: Upgrade of the existing manhole by coating it with epoxy, adding an odour vent and replacing the lid (refer Appendix A: Sheet C24 of **Appendix C**).

4.5.3 Power

There are existing overhead high voltage power lines along Country Road and Taylors Road. These power lines would be used to supply low voltage three phase power to the sewage pumping stations.

Each sewage pumping station would be connected to a dedicated control cabinet containing an electrical switchboard and the Aquatec OmniSmart 6000 dual pump controller.

The control cabinets would be similar to the cabinet shown in **Figure 4-6**. They would be made from powder coated marine grade aluminium and would be about 1.8 metres high, 0.8 metres wide and 0.45 metres deep. Each cabinet would be located near the associated sewage pumping station (Refer Appendix 1: Sheet C30I³, Sheet C40, Sheet C50 and Sheet C60 of **Appendix C**) and would be mounted on a concrete slab.



Figure 4-6: Typical sewage pumping station control cabinet

(Source: Fluent Solutions, 2023)

4.5.4 Repairs and maintenance

Operation and maintenance of the sewerage scheme would be outsourced to a local contractor. The successful contractor would be required to keep spare parts and components for the entire sewerage scheme in stock to enable timely repairs in the event of maintenance problems or equipment failure.

For the Proposal, this includes, but is not limited to spare Aquatec pumps and other components for PS3 to PS6.

As an additional measure to protect against system breakdown:

- Each of PS3, PS4, PS5 and PS6 would be fitted with dual pumps (duty / standby) in case of failure.

³ The control cabinet for PS3 would be relocated away from the heritage well to minimise heritage and visual impacts that would occur if located as shown in Sheet C30. An appropriate alternate site would be determined in consultation with the KAVHA Archaeologist, NIRC and Fluent Solutions prior to the commencement of construction of PS3.

- The pumps in PS4, PS5 and PS6⁴ would all be the same so that a standby pump from one sewage pumping station could be transferred to another sewage pumping station in an emergency.

4.6 Construction

4.6.1 Overview

It is expected that the Proposal would be constructed in the following stages:

- PS3 and associated emergency storage tank. Once complete, this would enable Stage 1 infrastructure to be connected to PS3 and tested. Testing would be conducted using clean water which would be pumped out of PS3 by effluent tanker and removed to the sewage treatment plant. Where practicable, construction of PS3 and the associated emergency storage tank would be undertaken from within the Kingston Common Reserve to minimise impacts to traffic on Middlegate Road.
- Trunk main and sewage pumping stations along the Country Road / Taylors Road. Once complete, this section would be commissioned to enable sewage collected from the Stage 1 area to be pumped directly to the Water Assurance Scheme.
- Rising mains along the Middlegate Road route.

Some variation to this progression may occur due to logistical and operational constraints that may arise during the construction period. Examples include: prolonged weather events; and the need to undertake construction in the lower areas of Country Road during the driest part of summer to mitigate the potential impact of high water tables in that area.

4.6.2 Excavation / earthworks

4.6.2.1 Description

Construction of the Proposal would require the following excavation / earthworks:

- Sewage pumping station (PS3) – excavation of an area about three metres long, three metres wide and four metres deep | Earthworks of about 36 cubic metres.
- Emergency storage tank at sewage pumping station PS3 – excavation of an area about three metres wide, nine metres long and 3.5 metres deep | Earthworks of about 94.5 cubic metres.
- Sewage pumping station x 2 (PS4 / PS5) – excavation of an area about 2.5 metres wide, 2.5 metres long and three metres deep (x2) | Earthworks of about 37.5 cubic metres.
- Sewage pumping station (PS6) – excavation of an area about three metres long, three metres wide and three metres deep (x1) | Earthworks of about 27 cubic metres.
- Trunk / Rising pressure mains – excavation of trenches about one metre deep and 0.45 metre wide (about 2,550 linear metres) | Earthworks of about 1,147.5 cubic metres.
- Power – excavation of trenches about 0.9 metres deep and 0.45 metre wide (about 51 linear metres) | Earthworks of about 21 cubic metres.

The total volume of earthworks would be about 1,364 cubic metres.

⁴ The PS3 pump is larger than the PS4, PS5 and PS6 pumps and is not interchangeable.

The area of exposed earthworks would be kept to a practical minimum to minimise potential for erosion, sedimentation and dust:

- The maximum length of area undergoing excavation at any point in time would be about 30 cumulative linear metres.
- Excavated soil would be stockpiled 1 - 2 metres uphill / upgradient of the excavated area in stockpiles no greater than 1.5 metres high and about 30 cumulative linear metres.
- Any open excavation would be backfilled within the same working day, with the exception of:
 - An area of about 2.5 square metres at the end of the trench which would be left open to enable work to continue the next day.
 - Any area that is required to be left open for purposes such as managing an unexpected archaeological find (refer **Section 7.4**).
- Any excavation that must be left open overnight would be fenced for safety purposes.

This methodology would be supplemented with additional erosion and sedimentation mitigation and management measures (refer **Section 7.2.3**).

4.6.2.2 Reinstatement

Excavated material (where suitable) would be used for both bedding material and backfill during the installation of the sewerage infrastructure.

Suitable bedding material would be created by straining the excavated material from below the topsoil layer to remove larger rocks and stones. The strained material would be placed in the bottom of the excavation as bedding for the sewerage component being installed. Alternately, crusher dust or another suitable material may be used subject to availability.

Remaining excavated material (where suitable) would be used to backfill around the infrastructure component being installed. Excess or unsuitable material (if any) would be relocated to the KAVHA materials stockpile site (currently located adjacent to the Watermill Dam) for use in alternate projects.

Should additional backfill be required (this is not anticipated), suitable material (clean fill) would be sourced from the KAVHA materials stockpile site. Alternately, crusher dust or another suitable material may be used subject to availability.

When infrastructure has been installed and excavated areas backfilled, the area would be compacted with a foot compactor and / or plate compactor (if feasible - refer to **Section 7.5.5**). The area would then be finished with a layer of topsoil and shaped to match the surrounding ground. This would be completed prior to progressing to any new areas.

Excavations within grassed areas would be irrigated as required to suppress dust and promote grass regrowth. Excavations within roadways would be reinstated to match the existing road pavement as closely as possible.

4.6.3 Infrastructure installation

4.6.3.1 Sewage pumping stations

The pumping stations would be installed in accordance with the manufacturer's installation instructions included in Aquatec drawings presented in Appendix 1 of **Appendix C**.

A typical cross section of the installation method is shown in **Figure 4-7**.

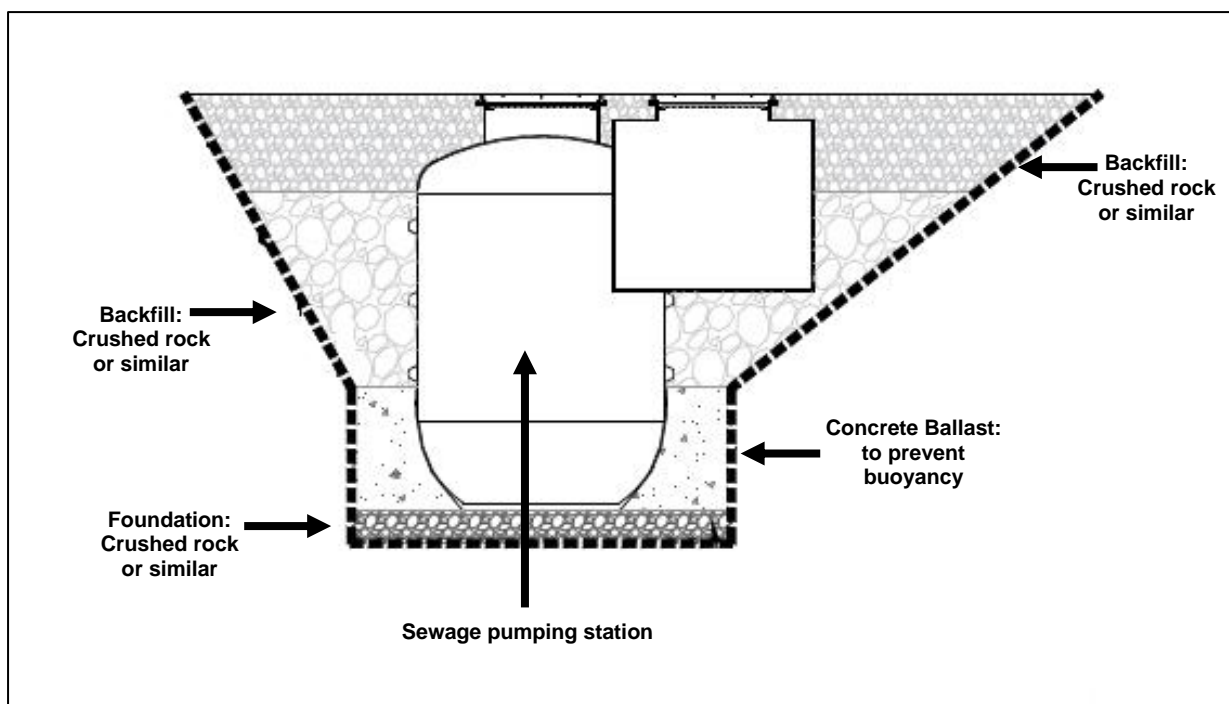


Figure 4-7: Typical sewage pumping station installation detail

(Source: Adapted from Aquatec drawing No. 19855-20401 at Appendix 1 of **Appendix C**)

The excavated area would be backfilled and reinstated as described in **Section 4.6.2.2**.

4.6.3.2 Emergency storage tank

The emergency storage tank associated with sewage pumping station PS3 would be a cylindrical fiberglass tank (two metre diameter x eight metres long) installed underground. Depth from ground level to the top of the tank would be about one metre.

A 6 metre x 10.25 metre x 0.2 metre concrete anti-floatation slab would be installed above the tank just below the ground surface.

Typical cross sections showing the installation method are shown in **Figure 4-8** and **Figure 4.9**.

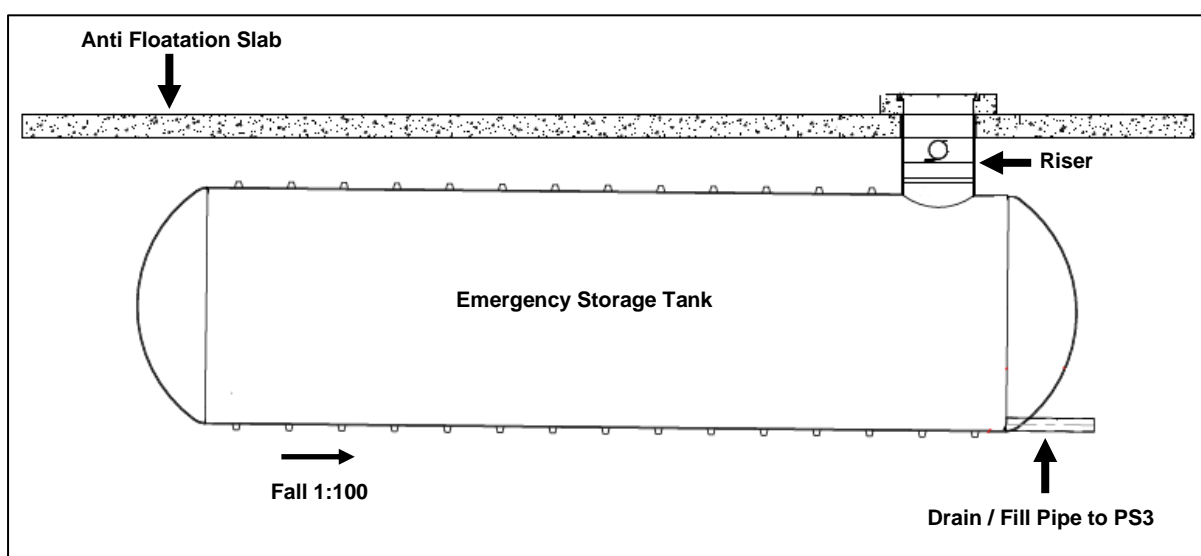


Figure 4-8: Typical emergency storage tank installation detail

(Source: Adapted from Aquatec drawing No. 19855-10306 at Appendix 1 of **Appendix C**)

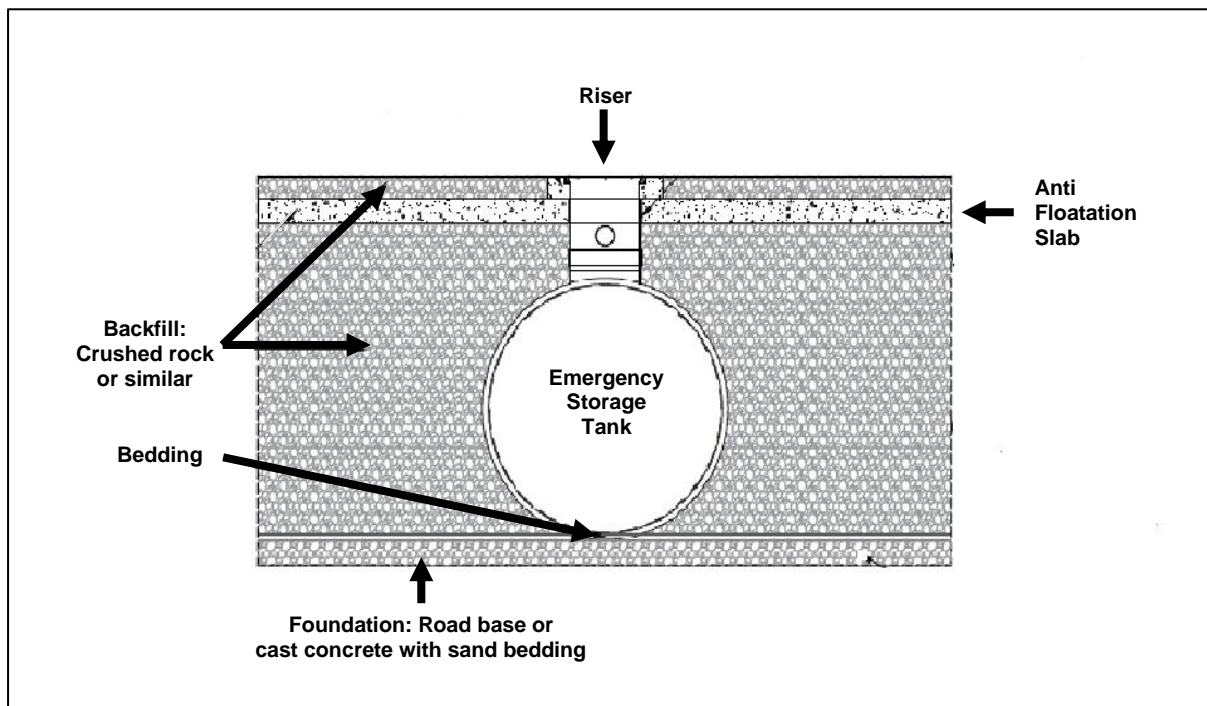


Figure 4-9: Typical emergency storage tank installation detail

(Source: Adapted from Aquatec drawing No. 19855-20302 at Appendix 1 of **Appendix C**)

The excavated area would be backfilled and reinstated as described in **Section 4.6.2.2**.

4.6.3.3 Rising pressure mains

Rising pressure mains would be installed in accordance with *AS/NZS 2566.2:2002 Buried Flexible Pipelines – Part 2: Installation*.

Rising mains would generally be installed in trenches about 0.45 metre wide and one metre deep.

Typical cross sections for rising pressure main trenches are shown in **Figure 4-10**.

Depth to the top of the rising pressure mains would be 600 millimetres outside roadways (unsealed non-trafficable areas) and generally 750 millimetres within roadways (sealed trafficable areas).

If the depth to top of the rising pressure main within roadways would be less than 750 millimetres (for example when crossing existing culverts), the pipe would be reinforced with concrete made from Sika Fibremesh 150 or similar. There are four existing culverts along Middlegate Road and eight existing culvert along Country Road / Taylors Road. The final treatment for each culvert crossing would be determined on a case by case basis in consultation with the DITRDCA Norfolk Island Contracts and Building Supervisor, the KAVHA Archaeologist and the NIRC Team Leader for Public Works.

The trenches would be backfilled and the disturbed area reinstated as described in **Section 4.6.2.2**.

4.6.3.4 Power

Each sewage pumping station would be powered via existing high voltage power lines in the Proposal area.

Sewage pumping station PS3

A pole mounted transformer would be installed on an existing power pole near PS3. From this transformer, a low voltage power supply cable would be run between the power pole and the PS3 control cabinet in a dedicated 0.9 metre x 0.45 metre trench (Refer Appendix A: Sheet C10 and Sheet C30 of **Appendix C**).

Sewage pumping stations PS4 – PS6

A pole mounted transformer would be installed on an existing power pole between PS5 and PS6. From this transformer, a low voltage power supply cable would be run between the power pole and each of the PS4, PS5 and PS6 control cabinets. These power supply cables would be installed in the same trench as the rising pressure main and the digital signal cable. Services would be laid side by side with power cable separated from the rising main by at least 150 mm and the signal cable by at least 300 millimetres.

A typical cross section for multi purpose trench is shown in **Figure 4-11**.

For each sewage pumping station, the pump control and power cables would run underground from the control cabinet to the associated sewage pumping station (Refer Appendix A: Sheets C30, C40, C50 and C60 of **Appendix C**).

4.6.4 Construction compound

A temporary construction compound would be located in the Kingston Common Reserve, downstream of Watermill Dam and next to the KAVHA materials stockpile site (refer **Figure 4-12**).

The construction compound would be used as a temporary storage site for the materials (including the sewage pumping stations and the emergency storage tank), plant and equipment required during construction of the Proposal. A shipping container(s) may be used for temporary on-site storage.

The construction compound would be accessed via an existing vehicular access point from Country Road.

4.6.5 Access

Vehicular access roads or tracks to the Proposal area, the construction compound and the KAVHA materials stockpile site at Watermill Dam are already established and would be utilised for access during construction and operation of the Proposal.

Temporary vehicular access to the PS3 site in Kingston Common Reserve near the intersection of Middlegate Road, Country Road, Pier Street and Quality Row would need to be created for access during construction.

The access track would run from Country Road, between the eastern most Norfolk Island Pine tree west of the entry point and the historic well located on the site (refer **Figure 4-13**). Construction of the access track would require minor ground levelling and trimming of the lower branches of the eastern most Norfolk Island Pine tree to enable construction vehicles to pass underneath.

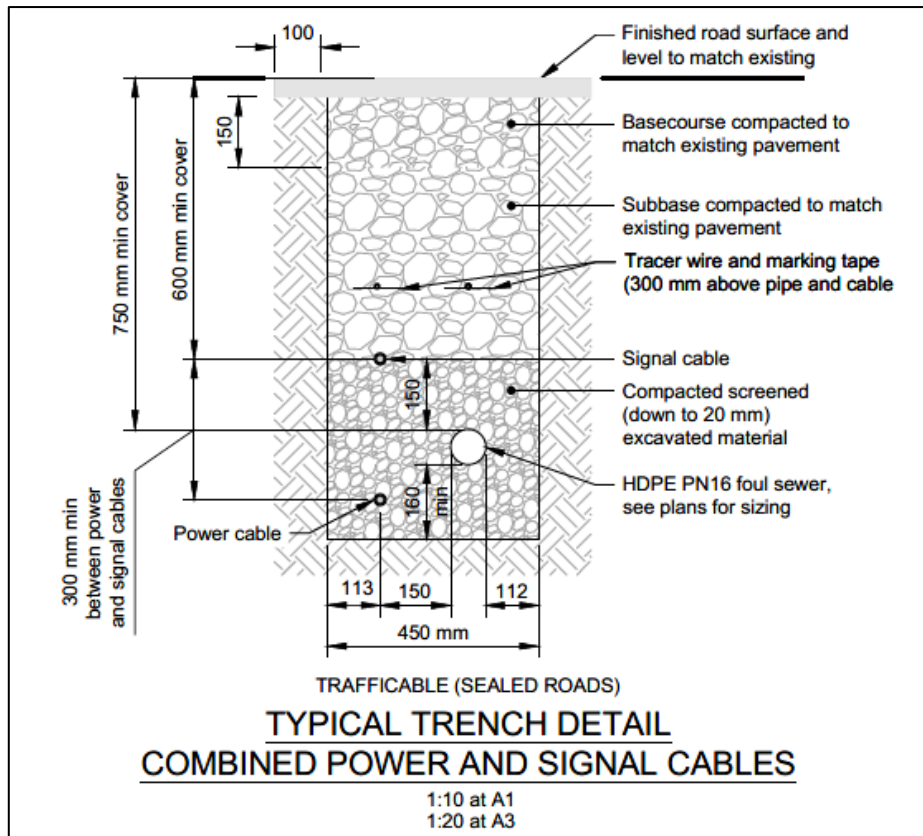


Figure 4-11: Typical dual purpose trench detail
(Source: Fluent Solutions Drawings Sheet C70 at Appendix 1 of **Appendix C**)

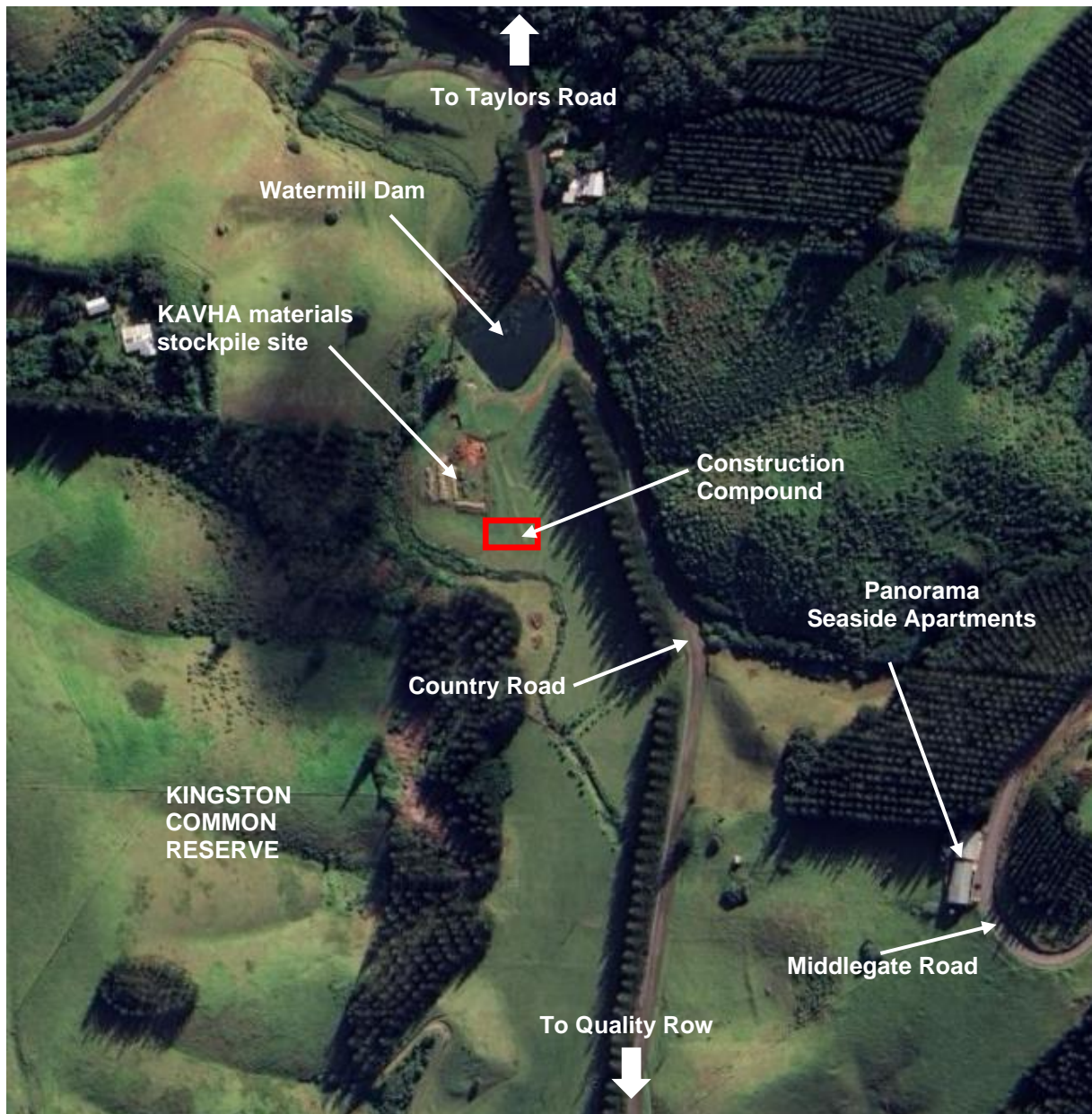


Figure 4-12: Construction compound location

(Source: Google Earth, 12 October 2023)



Figure 4.13: Access to PS3 construction site in Kingston Common Reserve

4.6.6 Equipment and machinery

Due to the small scale of the Proposal, plant and equipment requirements are minimal and include:

- One SK750 Ditch Witch trenching machine.
- One five tonne excavator.
- One Takeuchi TB235 excavator.
- One Takeuchi TB016 excavator.
- One Ramrod mini skid steer loader.
- One Wacker Neuson BS65-4As vibrator rammer (foot compactor).
- One plate compactor.
- One Ford Trader tipper truck.
- One Mazda Titan tipper truck.

4.6.7 Construction hours and duration

Standard construction hours⁵ would be:

- Monday - Friday: 7.00am – 5.00pm.
- Saturday: 7.00am – 1.00pm.
- Sunday and public holidays: no work.

Noise generating activities would not be undertaken until 7.30 am on any day.

Construction would be limited to these hours except in the event of emergency work required to avoid injury or the loss of life, to avoid damage or loss of property and / or to prevent environmental harm.

Construction is expected to be completed within a period of about 4 - 6 months which is a conservative estimate including contingency for delays incurred due to wet weather.

4.7 Future private connections

4.7.1 Overview

Future connections of private property to the sewerage scheme would be managed by NIRC and are outside the scope of this Proposal. This information has been provided solely to demonstrate viability of possible future connections.

Section 4.7.2 and **Section 4.7.3** describe how future connections would work if NIRC decides to proceed.

4.7.2 Design

Should freehold properties adjacent to the sewer along Country Road, Taylors Road and Middlegate Road be connected in the future, each property would be fitted with either an Aquatec Simplex or an Aquatec Enduraplex polyethylene pumping station subject to operational requirements. Each sewage pumping station would be fitted with a submersible Omni Grind Turbine pump and an OmniSmart 1000 controller. These are the same sewage pumping stations, pumps and controllers that are being used for Stage 1 and are proposed for Stage 3 of the Project.

4.7.3 Operation

Sewage pumping station controls include automatic switches for: pump on; pump off; and emergency high float level.

The pumps would operate when the sewage level in the sewage pumping station chamber triggers the pump to start. The pump would stop when the sewage level has dropped to a point that is set at a level that is as low as possible, but would prevent the pump running dry.

The pump would grind and macerate solids present in the sewage into a fine slurry. This minimises the potential for system blockages. The slurry would be pumped directly into the adjacent rising pressure main.

⁵ *Kingston and Arthur's Vale Historic Area Sewerage Scheme Stages 2 and 3 – Concept Design and Construction Plan* (Fluent Solutions Pty. Ltd., 2023) Section 7.2 states that construction hours would be 7.00 am to 6.00 pm, seven days per week. This is superseded by the standard construction hours provided in **Section 4.6.7** of this EIS.

If more than one sewage pumping station is operating at the same time, the pressure in the rising main may be too high for sewage from another sewage pumping station to feed into the main. This conflict is unlikely because:

- It takes less than one minute for the operating storage in each sewage pumping station to be pumped into the rising main.
- For a standard house, a sewage pumping station would only operate about four times per day.

Notwithstanding, the system has been designed to cater for this scenario. If there is insufficient capacity for a sewage pumping station to pump into a rising main, the pump would stop. A randomised timer fitted to the pump would trigger the pumping station to try again after a period of time. The pump can 'try again' up to 10 times before an alarm is generated.

Sewage pumping station alarms would be triggered in the following events:

- After a pump has 'tried again' to pump into a rising main 10 times.
- When the emergency high-level float switch is triggered (e.g. if a pump does not start and the sewage level in the chamber reaches the set 'emergency level').
- If unacceptable electrical current levels or high motor temperatures are experienced.

If an alarm is generated, the OmniSmart Controller would trigger a red flashing light on the control panel and would send out an SMS alert to the scheme operator. The scheme operator would then be able to pump out sewage from the sewage pumping station into an effluent tanker for disposal at the sewage treatment plant.

Each sewage pumping station would have about 24 hours storage capacity in the event of equipment failure which would allow time for the scheme operator to rectify a problem. If more than 24 hours is required to complete a repair, the water could be turned off at the associated building to prevent further inflow to the sewage pumping station and / or the sewage pumping station could be manually pumped out into an effluent tanker for disposal at the sewage treatment plant.

4.7.4 Power

Should freehold property connections proceed in the future, each property would be provided with a dedicated sewage pumping station powered by single phase power sourced from the associated property.

An electrical control panel for each sewage pumping station would be located in a small weatherproof box on the wall of the associated building (refer **Figure 4-14**). Power should run between the box and the sewage pumping station at an underground depth of about one metre.



Figure 4-14: OmniSmart Pump Controller

5 Statutory and planning context

5.1 Commonwealth legislation

5.1.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) protects Matters of National Environmental Significance (MNES), such as threatened species and ecological communities, migratory species (protected under international agreements), World Heritage properties and National Heritage places (among others). It also applies to actions taken on Commonwealth land and actions taken by Commonwealth agencies.

Any action that would be undertaken by a Commonwealth agency, or any action that would, or would be likely to, have a significant impact on a MNES or on Commonwealth land, requires referral to the Australian Government Environment Minister for consideration as to whether it is, or is not, a 'Controlled Action' that requires approval under the EPBC Act.

An EPBC Act Protected Matters Report generated on 1 March 2024 for the Proposal area (plus a two kilometre buffer area) indicates that the following MNES occur in, or may relate to, the Proposal area:

- World Heritage Properties: Australian Convict Sites (KAVHA).
- National Heritage Places: KAVHA and HMS Sirius Shipwreck.
- Commonwealth Heritage Places: Various.
- Natural Places: Nepean Island Reserve.
- Commonwealth Marine Area: Norfolk Marine Park – Part of the Temperate East Marine Parks Network.
- Listed Threatened Species: Various.
- Listed Migratory Species: Various.
- Listed Marine Species: Various.

Commonwealth actions and actions taken on Commonwealth land are also relevant to the Proposal.

These are the same MNES that were triggered for Stage 1 of the Project. A referral prepared for Stage 1 of the Project was assessed by the Department of Climate Change, Energy, the Environment and Water (DCCEEW). It was determined that Stage 1 was not a 'Controlled Action', and that further assessment under the EPBC Act was not required.

Based on the outcome of the referral process for Stage 1, and the highly disturbed condition of the Proposal area, it is not expected that the Proposal would have a significant adverse impact on any MNES or on Commonwealth Land. Notwithstanding, a self-assessment will be undertaken in accordance with the guidance provided in the:

- *Significant Impact Guidelines 1.1: Matters of National Environmental Significance* (Commonwealth of Australia, 2013).
- *Significant Impact Guidelines 1.2: Actions on, or impacting upon, Commonwealth Land and Actions by Commonwealth Agencies* (Commonwealth of Australia, 2013).

Should the self-assessment indicate the potential for significant adverse impact on one or more MNES or on Commonwealth land, a referral would be prepared and submitted to DEECCW for assessment. This approach is supported by DEECCW.

5.2 Norfolk Island planning legislation

5.2.1 Planning Act 2002 (NI)

The *Planning Act 2002 (NI)* (the Planning Act) and the *Planning Regulations 2004 (NI)* (the Planning Regulations) promote the conservation of Norfolk Island's natural, cultural and built heritage, and provide the overarching regulatory structure for the use, development and management of land on Norfolk Island.

The Proposal is classified under the Planning Act as both Prescribed Development and Significant Development.

5.2.1.1 Prescribed use or development status

Prescribed Use or Development is use or development that is listed in Schedule 1 of the Planning Regulations.

The Proposal is defined in the *Norfolk Island Plan 2002: Housekeeping Amendment 2022* (the Plan) as 'Major Public Infrastructure and Works':

***"Major Public Infrastructure and Works"** means the Use or Development of Land for installation of infrastructure and utilities to supply or provide the public with services such as the following:*

- (a) supply or treatment of water;*
- (b) electricity generating works and installations;*
- (c) sewerage, drainage or stormwater services;*
- (d) waste water treatment and disposal facilities;*
- (e) waste management facilities;*
- (f) network and broadcasting infrastructure.*
- (g) The use includes maintenance and storage depots and*
- (h) other facilities for the operation of the development."*

'Major Public Infrastructure and Works' is listed in Schedule 1 of the Planning Regulations.

Section 45(2) and section 45(3) of the Planning Act provide that Prescribed Use or Development, unless prohibited by the Plan, is permissible (with consent) use or development

Section 45(4) of the Act requires development applications for Prescribed Use or Development to be accompanied by an Environmental Impact Statement (EIS). Requirements for an EIS are detailed in **Section 5.2.1.3.**

5.2.1.2 Significant development status

Significant development is defined in the Planning Act as development to establish or upgrade infrastructure to support economic growth or community welfare, or both, in Norfolk Island. To be eligible for consideration as Significant Development, a proposed development must either be prescribed as Significant Development in Clause 15A of the Planning Regulations or be considered by the Commonwealth Minister to be infrastructure that would have a significant economic or community benefit in Norfolk Island.

If eligible, the Minister may declare the Proposal to be Significant Development following consideration of the following matters listed in Section 28D(2)(a)-(e) of the Planning Act:

- Any potential economic or community benefits from the development.
- Any links the development has, or could have, with other developments.
- Consistency with the *Norfolk Island Plan 2002*.
- NIRC's community strategic plan, delivery program and operational plan.
- Any other matters considered by the Commonwealth Minister to be relevant (none identified at the time of writing).

The Proposal is prescribed as Significant Development in Clause 15A(k) of the Planning Regulations (Sewerage Systems) and was therefore eligible for consideration as declared Significant Development.

The Proposal complies with the matters listed in Section 28D(2)(a)-(d) of the Planning Act as follows.

Potential economic or community benefits

Existing septic systems and sewage holding tanks in the KAVHA catchment are generally in disrepair and have been leaking sewage into the soil in KAVHA for many years. This has resulted in human waste contamination of soil and consequently downstream groundwater, surface water (Town and Watermill Creeks) and the Norfolk Marine Park.

Human waste contamination presents public health risks and adverse impacts to biodiversity, both terrestrial and aquatic (fresh and marine waters).

Under the approved Stage 1 of the sewerage scheme (currently under construction), raw effluent collected from a number of buildings on Crown Land on the KAVHA valley floor would be collected and stored in temporary above ground 'end of line' sewage holding tanks near the intersection of Middlegate Road, Country Road, Quality Row and Pier Street¹. The holding tanks would be emptied as required (about every 48 hours) and the sewage transported by effluent tanker to the NIRC Sewage Treatment Plant located at the Norfolk Island Airport for disposal. Whilst the holding tanks have been designed, and would be managed, to minimise the risk of sewage spills at the holding tank site, there is still a potential risk of spills as a result of holding tank failure, equipment failure or human error.

If the Proposal (Stage 2) proceeds, the above ground holding tanks would no longer be required. This would remove the 'weak link' at the holding tank site and the associated risk of effluent pollution at this location. Removal of the above ground holding tanks would also remove the visual impact at the site. Providing for the possible future connection of private properties along Country Road / Taylors Road and Middlegate Road would eventually remove a further significant volume of sewage from the KAVHA catchment.

This would contribute to minimising human waste contamination of the area, reducing public health risks and reducing impacts of pollution to the sensitive environment of the Norfolk Marine Park which is highly utilised by Norfolk Island residents and tourist alike.

Links the development has, or could have, with other developments

The Proposal is for Stage 2 of a three stage sewerage scheme designed to collect sewage generated in the KAVHA catchment for removal to the NIRC Sewage Treatment Plant (refer **Section 2**).

Consistency with the *Norfolk Island Plan*

The Proposal is consistent with the Plan. It complies with:

- The purpose and the relevant objectives of the 'High Rural / Conservation Value, Semi-rural and Urban Preferred Dominant Land Use Areas' as detailed in **Section 5.3.1.1**.
- The intent and relevant objectives and guidelines for the Conservation, Road, Rural, Rural Residential and Mixed Use Zones as detailed in **Section 5.3.1.2**.
- The Heritage Overlay and the Obstacle Limitation Surfaces Overlay as detailed in **Section 5.3.1.3**.
- *Development Control Plan No. 7 – KAVHA* as detailed in **Section 5.3.1.4** and **Appendix D**.

¹ Temporary above ground 'end of line' holding tanks were approved as part of the Stage 1 of the Project. To avoid potential impact from the construction and operation of these tanks, it is intended that they will no longer be constructed (subject to timing for approval and construction of the Proposal) and would instead be replaced by an underground sewage pumping station (PS3) and emergency storage tank installed as part of the Proposal.

The Norfolk Island Regional Council's strategic plans

Relevant clauses in NIRC's Strategic Plans are outlined in **Table 5-1**. The Proposal is consistent with NIRC's Strategic Plans as follows:

- The Proposal would support Strategic Direction 1 (An Environmentally Sustainable Community), Objective 1 (Use and Manage our Resources Wisely) and relevant implementation actions (Action 1.2 (Protect and enhance our water quality) and Action 1.7 (Keep our waters around Norfolk Island sustainable for the enjoyment of future generations)) of the *Norfolk Island Community Strategic Plan 2016-2026: Our Plan for the Future* (NIRC, 2016) because:
 - It would extend Stage 1 infrastructure (approved Stage 1 infrastructure will collect and store, in temporary above ground 'end of line' sewage holding tanks near the intersection of Middlegate Road, Country Road, Quality Row and Pier Street², about 75 percent of sewage / wastewater generated in KAVHA). The Stage 2 infrastructure would connect Stage 1 infrastructure directly to the Water Assurance Scheme in Burnt Pine and downstream, the Sewage Treatment Plant at the Norfolk Island Airport. This connection would enable the removal of the Stage 1 'end of line' sewage holding tanks which would eliminate any risk of holding tank failure and consequent human waste contamination of the local area, including downstream creeks, wetlands, groundwater and marine waters. It would also eliminate the need for manual pump out every 48 hours, reducing the risk of potential accidental spillage.
 - It would provide for future connection of sewage generating developments in the KAVHA catchment including the higher density residential / commercial area in the upper areas of the catchment (Taylors Road) and tourist accommodation and residential development on Country Road and Middlegate Road.
 - Once adjoining properties are connected, it would provide for significant reduction in the human waste pollution of the Norfolk Marine Park and the coastal zone generally, enhancing water quality, promoting intergenerational equity and protecting our sensitive aquatic ecosystems.
 - Indicator of Success 'Quality Infrastructure' would be achieved.
- The Proposal would support Strategic Direction 1 (An Environmentally Sustainable Community), Objective 2 (Preserve a Healthy Environment) and relevant implementation actions (Action 2.3 (Protect and preserve environmentally sensitive areas and those of high conservation value, through improved land management practices and pest control practices) and Action 2.5 (Ensure a healthy, diverse marine ecosystem) of the *Norfolk Island Community Strategic Plan 2016-2026: Our Plan for the Future* (NIRC, 2016) because:
 - It would extend Stage 1 infrastructure enabling the removal of the Stage 1 'end of line' sewage holding tanks and eliminate risk of holding tank failure and consequent human waste contamination of the local area (refer Strategic Direction 1, Objective 1).
 - It would be a Commonwealth Government funded infrastructure upgrade that would improve wastewater management and contribute to the protection of ecological and cultural values in the KAVHA catchment and surrounding marine waters.
 - It is Stage 2 of the 3 stage KAVHA sewer development.
 - Indicator of Success 'Reduction of the flow of nutrients into marine environments' would be achieved.

² Temporary above ground 'end of line' holding tanks were approved as part of the Stage 1 of the Project. To avoid potential impact from the construction and operation of these tanks, it is intended that they will no longer be constructed (subject to timing for approval and construction of the Proposal) and would instead be replaced by an underground sewage pumping station (PS3) and emergency storage tank installed as part of the Proposal.

The Proposal was declared as Significant Development by the Commonwealth Minister under Section 28C(5)(a) of the Planning Act on 25 June 2023. The Proposal was deemed to meet the requirements for declaration as significant for the following reasons:

- The development is to establish or upgrade infrastructure of a type prescribed in the regulations, namely *(k) sewerage systems*.
- The development has potential economic and community benefits. A reticulated sewerage system that collects sewage for disposal at the sewerage treatment plant would contribute towards improvements to water quality in surface water, groundwater, beaches at Kingston and the Norfolk Marine Park and consequently reduce risks to public health potentially caused by contaminated soil and water.
- The development has links with other developments, as it would connect to Stage 1 (currently under construction). It is planned that all development on Crown land in the KAVHA catchment would be connected to the reticulated sewerage network and sewage transported directly to the sewage treatment plant.
- The development is consistent with the objectives of the Plan for areas designated as High Rural Conservation Value Preferred Dominant Land Use Area as it would contribute to improvements in natural and cultural values through reduced contamination of soil and water.
- The development is consistent with actions identified in the Operational Plan 2022-23 to protect water quality; and the Community Strategic Plan:
 - Strategic Direction 1 - An environmentally sustainable community | Objective 1 - Use and manage our resources wisely:
 - Protect and enhance our water quality.
 - Keep our waters around Norfolk Island sustainable for the enjoyment of future generations.

The Significant Development Declaration (**Appendix E**) is not subject to any conditions:

Section 45(4) of the Act requires development applications for Declared Significant Development to be accompanied by an EIS. Requirements for an EIS are detailed in **Section 5.2.1.3**.

5.2.1.3 Requirements for an EIS

As Prescribed Use and Development and Declared Significant Development, the Development Application for the Proposal must be accompanied by an EIS.

Section 45(4) of the Planning Act provides that the EIS must be prepared in accordance with:

- An environmental impact assessment undertaken for the Proposal (this document).
- Requirements prescribed by Schedule 2 of the Planning Regulations – ‘Matters to be included in Environmental Statement’.
- Section 45(6) Directions from the Chief Executive Officer to guide the environmental impact assessment and the environmental impact statement.

NIRC issued Chief Executive Officer (General Manager) Directions for the EIS on 30 June 2023 (refer **Appendix F**). The requirements specified for the EIS are:

- The EIS must address matters set out in Schedule 2 of the Planning Regulations.
- Inclusion of a Heritage Impact Statement (HIS) that addresses the requirements of *the Heritage Act 2002 (NI)* (Section 28).

As required by Clause 28 of the Planning Regulations, this EIS documents the environmental impact assessment undertaken for the Proposal and has been prepared in accordance with Schedule 2 of the Planning Regulations and the Chief Executive Officer (General Manager) Directions for the EIS.

Table 5.1: Relevant clauses from NIRC's integrated planning and reporting framework

Strategic Plan				Actions to Implement Strategic Plan		
Norfolk Island Community Strategic Plan 2016-2026: Our Plan for the Future (Norfolk Island Regional Council 2016)				Norfolk Island Regional Council Delivery Program 2022-2026 (Norfolk Island Regional Council 2022)	Norfolk Island Regional Council Operational Plan 2023-2024 (Norfolk Island Regional Council 2023)	Norfolk Island Environment Strategy 2018-2023 (Norfolk Island Regional Council 2018)
Strategic Direction 01: An Environmentally Sustainable Community.	Objective 1: Use and manage our resources wisely.	Action 1.2: Protect and enhance our water quality. Action 1.7: Keep our waters around Norfolk Island sustainable for the enjoyment of future generations.	NIRC's role: Utilise an Environment Strategy setting out plans to deliver better environmental outcomes including areas of waste management (amongst others). Investigate the islands water quality to inform future investment decisions. Investigate life cycle costs for the expansion of the existing sewerage system. Indicators of success: Quality of infrastructure	Action 1.7: Keep our waters around Norfolk Island sustainable for the enjoyment of future generations: Continue monitoring system to monitor responsible activity in and on the bays and beaches. Enhanced Beach Program - A committed updated Webpage for Beach Health and expand the program to include other swimming holes.	Nil. However, the Operational Plan includes a budget allocation of about \$1.4 million for the upgrade of the sewage treatment plant (design and sewer extensions).	Action 1.2: Protect and enhance water quality: Priority 1 - Investigate the option of expanding the WAS network to include higher density development areas such as high density housing in the upper KAVHA catchment. Action 1.7: Keep our waters around NI sustainable for the enjoyment of future generations: Priority 3 - Prepare a coastal zone management plan that adopts a coordinated approach to the maintenance of a sustainable coastal zone and marine ecosystem encompassing appropriate management of all impact pathways such as (amongst others) sewage and wastewater treatment and disposal.

Strategic Plan				Actions to Implement Strategic Plan		
Norfolk Island Community Strategic Plan 2016-2026: Our Plan for the Future (Norfolk Island Regional Council 2016)				Norfolk Island Regional Council Delivery Program 2022-2026 (Norfolk Island Regional Council 2022)	Norfolk Island Regional Council Operational Plan 2023-2024 (Norfolk Island Regional Council 2023)	Norfolk Island Environment Strategy 2018-2023 (Norfolk Island Regional Council 2018)
	Objective 2: Preserve a Healthy Environment.	Action 2.3: Protect and preserve environmentally sensitive areas and those of high conservation value, through improved land management practices and pest control practices. Action 2.5: Ensure a healthy, diverse marine ecosystem.	NIRC's role: Reduce the input of nutrients into the surrounding marine environment. Indicators of success: Reduction of the flow of nutrients into marine environments.	Action 2.5 Facilitate KAVHA sewer development.	Nil. However, the Operational Plan includes a budget allocation of about \$1.4 million for the upgrade of the sewage treatment plant (design and sewer extensions).	Nil

5.3 Norfolk Island environmental planning instruments

5.3.1 Norfolk Island Plan 2002 (NI)

The primary document controlling land use and development on Norfolk Island is the *Norfolk Island Plan 2002 Housekeeping Amendment 2022* (the Plan). The Plan has two key sections:

- Part A – Strategic Plan.
- Part B – Planning Requirements.

Relevant provisions of the Plan are addressed below.

In the Plan, the Proposal is defined as ‘Major Public Infrastructure and Works’:

“Major Public Infrastructure and Works means the Use or Development of Land for installation of infrastructure and utilities to supply or provide the public with services such as the following:

- (a) supply or treatment of water;*
- (b) electricity generating works and installations;*
- (c) sewerage, drainage or stormwater services;*
- (d) waste water treatment and disposal facilities;*
- (e) waste management facilities;*
- (f) network and broadcasting infrastructure.*
- (g) The use includes maintenance and storage depots and*
- (h) other facilities for the operation of the development.”*

5.3.1.1 Part A – Strategic Plan

The purpose of Part A of the Plan (the Strategic Plan) is to guide the Norfolk Island Government’s decisions on development applications and to serve as a basis for amendments to Part B of the Plan (Planning Requirements including Zoning Scheme, Overlays and General Provisions).

Under the Strategic Plan, the Proposal is located largely in an area where the preferred dominant land use is ‘High Rural / Conservation Value’. Toward the northern of the proposed alignment, the Proposal would run along the boundary between the ‘High Rural / Conservation Value’ and ‘Semi-rural’ preferred dominant land use areas and then along the boundary between the ‘Semi-rural’ and ‘Urban’ preferred dominant land use areas (refer **Figure 5-1**). These preferred dominant land use areas are discussed below.

KAVHA SEWERAGE SCHEME - STAGE 2: STRATEGIC LAND USE

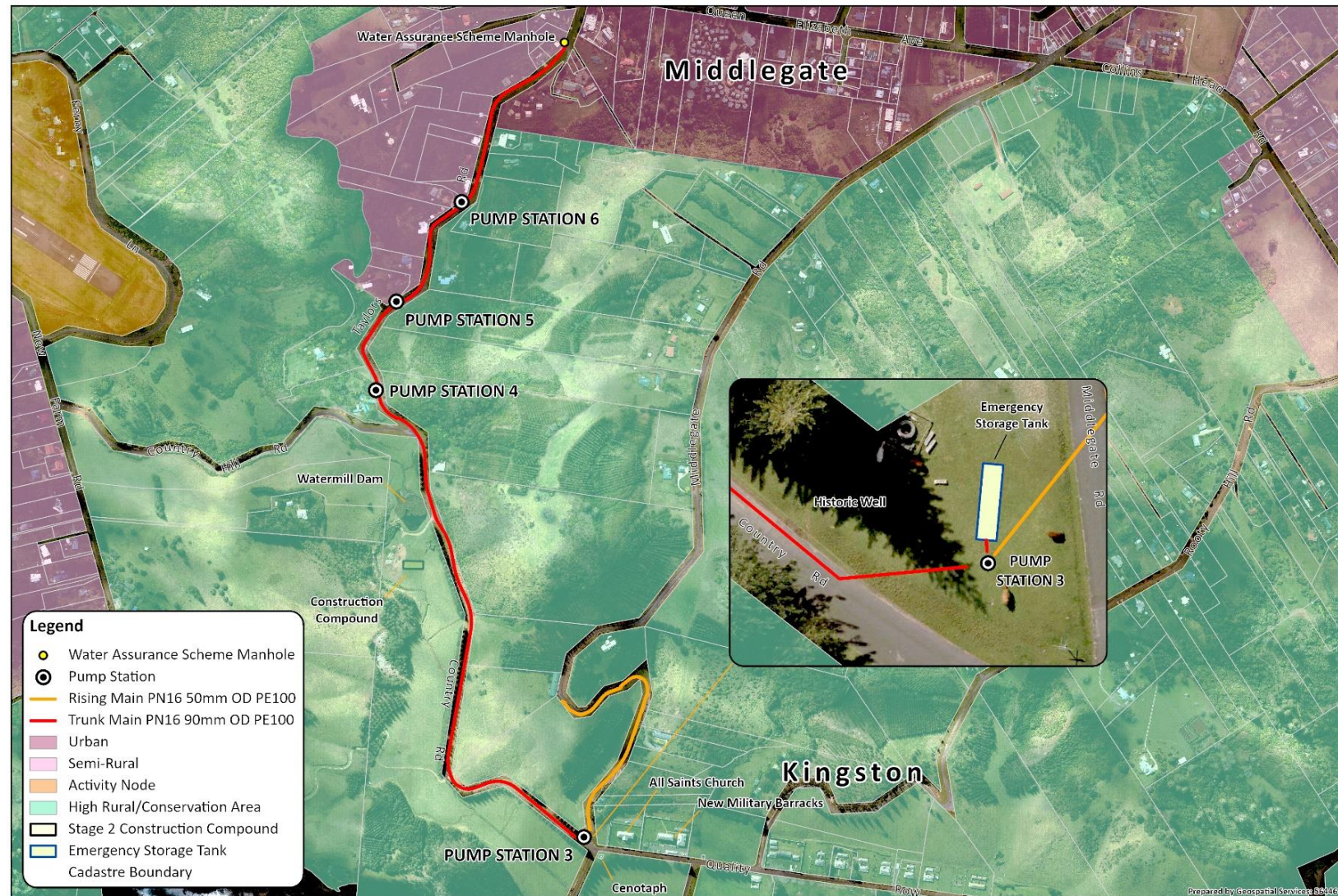


Figure 5-1: Strategic land use areas and proposed works

(Extract from *Norfolk Island Plan 2002 Housekeeping Amendment 2022*)

High Rural / Conservation Value

Land designated as having 'High Rural/Conservation Value' either has high environmental values and/or is land that is not needed in the short to medium term for other more intense land uses. It is intended to remain largely undeveloped in the long term. These areas are intrinsic to the rural character, and natural and cultural heritage environment of Norfolk Island. Permitted uses or developments should not change the fundamental nature and character of the land. Where areas require protection and preservation of their conservation values, a very limited range of activities comprising use or development activities that complement the conservation values may be permitted and catered for.

The objectives of the 'High Rural / Conservation Value Preferred Dominant Land Use' are to:

- Retain and enhance the open space, natural environment and wildlife habitat that is vital to life systems on the Island.
- Conserve and protect areas that have very high natural and/or cultural heritage conservation values.
- Allow for a very limited range of complimentary low intensity and low impact use or development in areas with very high natural and/or heritage conservation values.
- Maintain and protect the aesthetic backdrop for Norfolk Island.
- Maintain the existing rural character of much of Norfolk Island.
- Provide land that may buffer certain incompatible uses.
- Protect and preserve land for existing and future public and government use or development.

The Proposal is a government initiative intended to connect existing occupied buildings on Crown land in KAVHA to a reticulated sewerage system.

The Proposal would contribute to the reduction of human waste that is currently leaching from septic systems and sewage holding tanks in the KAVHA catchment into the downstream waterways, the groundwater and the adjacent Norfolk Marine Park which is ecologically sensitive and highly valued in terms of the biodiversity it supports, as well as for cultural and recreational use.

Infrastructure for the Proposal would be predominantly located underground and would not impact the aesthetic backdrop or rural character of the area. Potential impacts to archaeology would be carefully managed in accordance with avoidance, mitigation and management measures recommended in the HIS prepared for the Proposal (refer **Appendix G**).

The primary impact to the high natural and cultural conservation values of the area would be the reduction of pollution / health risk from uncontained human waste which is consistent with the purpose and the relevant objectives of the 'High Rural / Conservation Value Preferred Dominant Land Use Area'.

Semi-rural

Land designated as "Semi-rural" is intended to provide a frame around the urban area and in the long term to provide the transition area from the urban areas to the areas with High Rural / Conservation Value. The permitted use or development types in the Semi-rural Preferred Dominant Land Use area are for rural residential use or development or are urban or semi-rural in nature and require larger amounts of land and are best suited in an area with a rural or semi-rural character.

The character of the Semi-rural Preferred Dominant Land Use area should be predominantly rural. The scale and intensity of use or development in the Semi-rural Preferred Dominant Land Use area are not appropriately part of the High Rural/Conservation Value area.

The objectives of the Semi-rural Preferred Dominant Land Use are to:

- Provide opportunities for rural residential use or development in a rural or natural setting with an acceptance of medium and smaller sized lots.
- Maintain the existing rural character of much of Norfolk Island and to provide opportunities for appropriate non-agricultural use or development.
- Promote small-scale rural and rural support uses or developments.
- Enable use of rural and semi-rural land for low density residential purposes where that land has lost its intrinsic agricultural viability.
- Provide opportunities for a limited range of appropriate of low intensity and low impact use or development within areas that have natural, cultural and heritage values.
- Retain and enhance the open space, vegetation communities and wildlife habitat that is vital to life systems on Norfolk Island.
- Provide land that may buffer certain incompatible uses.
- Protect and preserve land for existing and future public and government use or development.

The Proposal is a Government initiative intended to connect existing buildings on Crown land in the KAVHA catchment to a reticulated sewerage system.

The Proposal would support the low density residential intent for the area by contributing to the management of human waste which currently leeches from septic systems and sewage holding tanks in the KAVHA catchment into the downstream waterways, the groundwater and the adjacent Norfolk Marine Park which is ecologically sensitive and highly valued in terms of the biodiversity it supports, as well as for cultural and recreational use.

Infrastructure for the Proposal would be predominantly located underground and would not impact the aesthetic backdrop, rural character or natural setting of the area. Potential impacts to archaeology would be carefully managed in accordance with avoidance, mitigation and management measures recommended in the Heritage Impact Statement for the Proposal (refer **Appendix G**).

The primary impact to the natural, cultural and heritage conservation values of the area would be the reduction of pollution / health risk from uncontained human waste which is consistent with the purpose and the relevant objectives of the 'Semi-rural Preferred Dominant Land Use Area'.

Urban

Land designated as "Urban" is characterised by urban type use and development. These areas are intended to provide the essential urban functions on Norfolk Island in the long term. The use or development types permitted in the Urban Preferred Dominant Land Use area are varied and principally include residential, commercial and industrial use or development.

Land for urban use or development in the longer term may appropriately be used for a range of non-urban purposes in the short to medium term. Such use or development types include rural, rural residential and open space uses. The areas designated for urban use or development should be serviced by appropriate infrastructure or be capable of being serviced by appropriate infrastructure.

The objectives of the Urban Preferred Dominant Land Use are to:

- Provide opportunities for a range of urban use or development types including residential commercial and industrial uses or developments.
- Focus urban use or development on the existing commercial area, which is typified by a pattern of relatively higher intensity urban use or development.
- Enable residences, businesses and activities for urban character to be located on small, centralised lots alleviating the need to sub-divide valuable agricultural and non-urban land for urban use or development.

- Utilise existing infrastructure to limit potential impacts of urban use or development on the surrounding environment.
- Minimise the potentially adverse effects of higher intensity urban use or development by clustering urban use or development together.
- Protect and preserve land for existing and future public and government use or development.
- The Proposal is a Government initiative intended to connect existing buildings in the KAVHA catchment to a reticulated sewerage system.

The Proposal would support the higher intensity urban (residential, commercial and industrial) intent for the area by providing appropriate infrastructure to manage human waste which currently leaches from septic systems and sewage holding tanks in the KAVHA catchment into the downstream waterways, the groundwater and the adjacent Norfolk Marine Park which is ecologically sensitive and highly valued in terms of the biodiversity it supports, as well as for cultural and recreational use. This is subject to the future connection of private property to the sewerage scheme by NIRC.

Infrastructure for the Proposal would connect to the existing NIRC Water Assurance Scheme, maximising the use of the existing infrastructure.

The primary impact to the surrounding environment would be the reduction of pollution / health risk from uncontained human waste which is consistent with the purpose and the relevant objectives of the 'Urban Preferred Dominant Land Use Area'.

5.3.1.2 Part B – Planning Requirements – Zoning

Part B1 of the Plan outlines the zoning scheme for Norfolk Island.

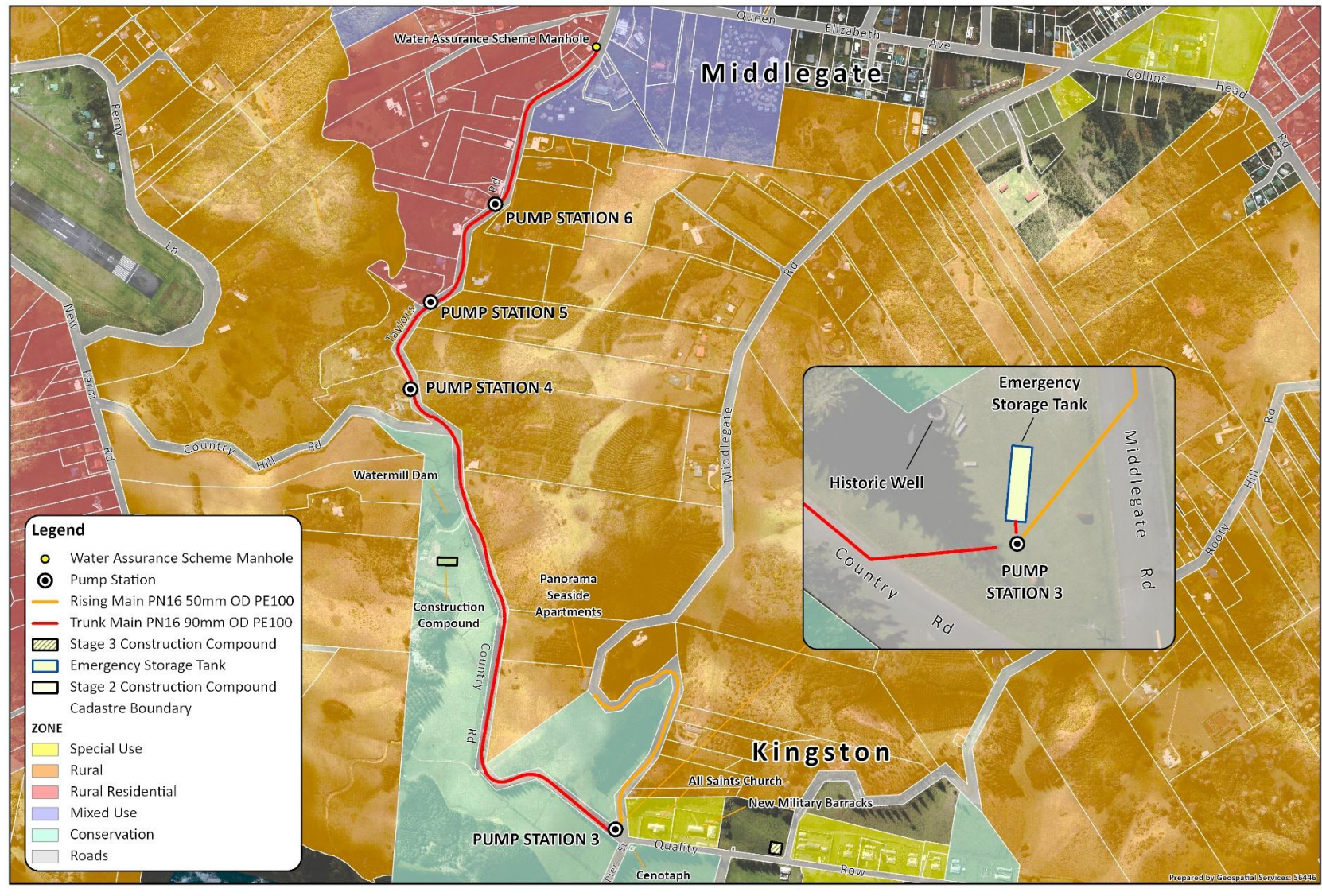
Land that would be directly impacted by the Proposal would be predominantly located in the Road Zone. Sewage pumping station PS3 (and associated structures including emergency storage tank and electrical installations) and the construction compound would be located in the Conservation Zone.

The buffer area around the construction footprint would extend into the following additional zones:

- Special Use.
- Rural.
- Rural Residential.
- Mixed Use.

The zoning, and the proposed work in each zone, is shown in **Figure 5-2**.

KAVHA SEWERAGE SCHEME - STAGE 2: ZONING



Permissibility of the Proposal in each zone is detailed in **Table 5-2**.

Table 5-2: Permissibility of the Proposal in each zone

Zoning	Permissibility – Public Works – Major Prescribed Development	Permissibility – Public Works – Major Declared Significant Development
Construction Footprint		
Road	Permissible (with consent)	Permissible (with consent)
Conservation	Prohibited	Permissible (with consent)
Buffer Area (additional zones)		
Special Use	Permissible (with consent)	Permissible (with consent)
Rural	Permissible (with consent)	Permissible (with consent)
Rural Residential	Prohibited	Permissible (with consent)
Mixed Use	Prohibited	Permissible (with consent)

Under the Plan, Use or Development for the purpose of ‘Major Public Infrastructure and Works’ (Prescribed Development) is prohibited in the Conservation, Rural Residential and Mixed Use Zones.

However, Declared Significant Development is exempt from prohibition, so given the Proposal has been declared as Significant Development, no aspect of the Proposal is prohibited, and the Proposal is permitted to be assessed in its entirety following the pathway outlined in Part 3A of the Planning Act.

Consistency of the Proposal with the intent, objectives and development standards for each relevant zone is discussed below.

Road Zone

The intent of the Road Zone is to:

- Provide a very limited range of use or development opportunities within areas that are set aside for transport and public access purposes.
- Preserve and protect land for existing and future road requirements. The areas within the Roads Zone will include existing formed and unformed roads, as defined in this Plan, and may include provision to be made for future road requirements.
- Identify the extent of the existing and future road network.

The objectives for the Road Zone are:

- Provide opportunities for a very limited range of use or development types.
- Provide opportunities for a variety of exempt developments including but not limited to, certain signs, street furniture, fire hydrants and traffic control devices, works carried out for the maintenance and repair of infrastructure including but not limited to roads, tracks, footpaths, drains, sewers, powerlines and telecommunications facilities within road reservations.
- Provide opportunities to ensure that existing and future operational road requirements are met.

The development standards for the Road Zone are:

- There are no maximum height or minimum setback requirements except those necessary to meet the zone intent.
- All use or development must comply with relevant environmental standards specified in the applicable environmental planning and land management codes.

The Proposal is for underground infrastructure and with the exception of the construction period, would not compromise the use of the Road Zone for transport and public access purposes. Consequently, it is not inconsistent with intent and objectives for the Road Zone.

The development standards for the Road Zone are not applicable to the Proposal with the exception of the requirement to comply with relevant environmental standards specified in the approved applicable environmental planning and land management codes. This is addressed in **Section 5.3.1.4.**

Conservation Zone

The intent of the Conservation Zone is to:

- a) Provide a very limited range of low intensity and low impact use or development opportunities in areas that are considered to have very high natural and/or heritage conservation values.
- b) Ensure that the areas within the Conservation Zone continue to provide the aesthetic backdrop for Norfolk Island and the open space and wilderness habitat that is vital to life systems on the Island.

The objectives for the Conservation Zone are:

- a) Provide opportunities for a very limited range of use or development.
- b) Give highest priority to ecologically sustainable development practices that contribute to biodiversity maintenance and preservation.
- c) Encourage management goals and practices that promote the conservation and protection of areas with very high natural and/or heritage conservation values.
- d) Enable the continuation of practices that have important cultural significance to Norfolk Island's residents.
- e) Encourage management goals and practices that promote cliff and foreshore stability in the coastal portion of the zone.

The Proposal is classified in the Plan as 'Major Public Infrastructure and Works'. 'Major Public Infrastructure and Works' is prohibited use or development in the Conservation Zone. However, the Significant Development Declaration removes the prohibition and development approval may therefore be sought under section 44A(2) of the Act. Notwithstanding, the Proposal is not inconsistent the intent and objectives of the Conservation Zone.

The Conservation Zone is intended to conserve and protect areas of Norfolk Island that have very high natural and / or heritage conservation values. Use and development is restricted in Conservation Zone and generally limited to conservation, recreational, and access (road and sea) purposes.

The Proposal is for Stage 2 of a three stage sewerage scheme project intended to prevent ongoing human waste contamination from septic treatment systems and sewage holding tanks on Crown land in KAVHA. This would minimise impacts of ongoing contamination to biodiversity (land and sea) and increase the safety of use of the area by the public for culturally significant activities including sport, community and social events and enjoyment of the beaches and the Norfolk Marine Park.

The works proposed in the Conservation Zone are considered to be consistent with the intent and objectives for the Conservation Zone.

The development standards for the Conservation Zone are not applicable to the Proposal, with the exception of the requirement to comply with relevant environmental standards specified in the approved applicable environmental planning and land management codes. This is addressed in **Section 5.3.1.4.**

Special Use Zone

The Special Use Zone is intended to protect and preserve land for existing and future public, government, and community use or development.

The objectives and guidelines for the Special Use Zone are:

- a) Provide opportunities for a range of existing and future public, government, and community use or development.
- b) Encourage ecologically sustainable development practices that contribute to biodiversity maintenance and preservation.
- c) Encourage preservation and development practices that are compatible with conservation of heritage values.

The Special Use Zone (all Saint's Church (in part)) is located in the Proposal area. It is outside the construction footprint but within the buffer zone. Being in the buffer zone, land in the Special Use Zone would not be physically impacted by the Proposal and consequently, the controls for the zone are not technically relevant. However, consideration of adjoining zones is considered prudent.

Potential impacts on land use in the Special Use Zone would be impacts such as noise and visual impacts which would be short term and limited to the construction period.

The Proposal is for Stage 2 of a government project intended to reduce human waste contamination of KAVHA and the adjacent Norfolk Marine Park, thereby minimising existing contamination impacts on the biodiversity of the KAVHA area as well as the use of the area for culturally significant purposes. It would not preclude use of the land in the Special Use Zone for existing government, community or public purposes, and impacts of construction would be managed to minimise disruption to these uses.

Consequently, the Proposal is considered to be consistent with the intent, objectives and guidelines for the Special Use Zone.

Rural Zone

The intent of the Rural Zone is to:

- a) Maintain the existing rural character of much of Norfolk Island and to provide opportunities for both agricultural and appropriate non-agricultural use or development.
- b) Retain the existing pattern of rural land use or development and retain the large lots that predominate in the area covered by the zone.

The objectives and guidelines for the Rural Zone are:

- a) Preserve larger lots so that viable agriculture can be maintained.
- b) Encourage use or development within the zone so that the existing landscape quality and visual amenity is maintained and preserved.
- c) Preserve large lots that contribute to the maintenance and protection of biodiversity by preserving remnant native vegetation and habitat.
- d) Avoid fragmentation of the land in the zone. Retention of large lots will contribute to maintenance of water quality by retaining vegetation and minimising erosion.
- e) Encourage use or development of land within the zone for low intensity, predominantly rural use or development to buffer sensitive conservation areas and provide valuable open space.
- f) Encourage ecologically sustainable development practices that contribute to biodiversity maintenance and preservation.

The Rural Zone is located in the Proposal area. It is outside the construction footprint but within the buffer zone. Being in the buffer zone, land in the Rural Zone would not be physically impacted by the

Proposal and consequently, the controls for the zone are not technically relevant. However, consideration of adjoining zones is considered prudent.

Potential impacts on land use in the Rural Zone would be impacts such as noise, visual and traffic impacts which would be short term and limited to the construction period. These impacts would be managed to minimise disruption to the use of land in the Rural Zone.

The Proposal is for Stage 2 of a sewerage scheme intended to promote ecologically sustainable development practice by reducing human waste contamination of KAVHA and the adjacent Norfolk Marine Park, thereby minimising existing contamination impacts on the biodiversity of the KAVHA area.

The sewerage scheme would be constructed predominantly underground on land outside the Rural Zone and would not have any impact on lot size, landscape quality, visual amenity (post construction), remnant native vegetation, or use and development in the Rural Zone.

Consequently, the Proposal is considered to be consistent with the intent, objectives and guidelines for the Rural Zone.

Rural Residential Zone

The intent of the Rural Residential Zone is to:

- a) Provide opportunities for primarily rural residential use or development in a rural or natural setting, where that use or development is located on lots that are large enough to support small scale rural uses but which are unlikely to provide economically viable rural use or development.
- b) Retain the pattern of low-density semi-rural land use and retain the sub-division pattern that has resulted in a predominance of medium and smaller sized lots.

The objectives and guidelines for the Rural Residential Zone are:

- a) Provide opportunities for rural residential development in a rural or natural setting.
- b) Design subdivision in a manner that enables the maintenance of an informal rural character. Formation of a pattern of regular sized lots that front roads in a ribbon development will be discouraged. Variations in the size of lots and the use of variations in setbacks between dwellings should be encouraged.
- c) That each lot created must be sufficient to contain appropriate on-site wastewater management systems and water storage facilities that comply with the development control plan for the management of water resources.
- d) Encourage use or development within the zone so that the existing landscape quality and visual amenity is maintained and enhanced.
- e) Encourage use or development that is low in intensity to maintain and protect biodiversity by preserving remnant vegetation and habitat.

The Rural Residential Zone is located in the Proposal area. It is outside the construction footprint but within the buffer zone. Being in the buffer zone, land in the Rural Residential Zone would not be physically impacted by the Proposal and consequently, the controls for the zone are not technically relevant. However, consideration of adjoining zones is considered prudent.

Potential impacts on land use in the Rural Residential Zone would be impacts such as noise, visual and traffic impacts which would be short term and limited to the construction period. These impacts would be managed to minimise disruption to the use of land in the Rural Residential Zone.

The Proposal is for Stage 2 of a sewerage scheme intended promote ecologically sustainable development practice by reducing human waste contamination of KAVHA and the adjacent Norfolk Marine Park, thereby minimising existing contamination impacts on the biodiversity of the KAVHA area.

The sewerage scheme would be constructed predominantly underground on land outside the Rural Residential Zone and wouldn't have any impact on subdivision patterns or density, lot size, landscape setting, landscape quality, visual amenity (post construction), remnant native vegetation, or use and development opportunities in the Rural Residential Zone.

If connections of properties in the Rural Residential Zone to the sewerage scheme proceed in the future, on-site wastewater management systems would no longer be required. These connections would contribute to minimising the impact of the higher density Rural Residential use and development on the environment.

Consequently, the Proposal is considered to be consistent with the intent, objectives and guidelines for the Rural Zone.

Mixed Use Zone

The intent of the Mixed Use zone is to:

- a) Provide a compact, centralised, and accessible area offering a range of retail, commercial, business, residential, light industrial and resort style use or development opportunities.
- b) Focus the area covered by the zone on Burnt Pine, characterised by a pattern of higher intensity mixed use or development that demonstrates equity, efficiency, and high standards of amenity and environmental quality.
- c) Cluster higher intensity mixed use or development in a centralised area to minimise the potentially adverse effects of higher intensity use or development on the remainder of Norfolk Island.
- d) Concentrate mixed use or development in the area covered by the Norfolk Island sewer mains, maximising the availability of existing and future infrastructure, and minimising the potential adverse impacts on the environment caused by higher intensity mixed use or development.

The objectives and guidelines for the Mixed Use Zone are:

- a) Provide opportunities for a wide range of retail, commercial, business, residential, tourist and light industrial uses or development on lots of varying sizes.
- b) Create an active and vibrant retail and business centre.
- c) Cluster of mixed use development, such as commercial, business, residential, tourist and light industrial use or development to allow maximum use to be made of existing infrastructure, facilities and services. Minimising the need to provide infrastructure outside the Mixed Use Zone will limit impacts on the environment and economy.
- d) Car-parking serving use or developments within the Mixed Use zone should also be sited within the zone allowing for centralised parking and traffic control systems.
- e) Co-locate government functions where possible in the Mixed Use zone enabling economies of scale to be achieved and minimising vehicular movements made by people needing to access these functions.
- f) Encourage sustainable development practices.

The Mixed Use Zone is located in the Proposal area. It is outside the construction footprint but within the buffer zone. Being in the buffer zone, land in the Mixed Use Zone would not be physically impacted by the Proposal and consequently, the controls for the zone are not technically relevant. However, consideration of adjoining zones is considered prudent.

Potential impacts on land use in the Mixed Use Zone would be impacts such as noise, visual and traffic impacts which would be short term and limited to the construction period. These impacts would be managed to minimise disruption to the use of land in the Mixed Use Zone.

The Proposal is for Stage 2 of a sewerage scheme intended promote ecologically sustainable development practice by reducing human waste contamination of KAVHA and the adjacent Norfolk Marine Park, thereby minimising existing contamination impacts on the biodiversity of the KAVHA area.

The sewerage scheme would be constructed predominantly underground on land outside the Mixed Use Zone and wouldn't have any impact on use of the area as an active and vibrant retail and business centre.

If connections of private properties in the Mixed Use Zone to the sewerage scheme proceed in the future, the availability of infrastructure to service this high intensity area would be improved, and would minimise the potential adverse impacts on the environment caused by higher intensity mixed use or development.

Consequently, the Proposal is considered to be consistent with the intent, objectives and guidelines for the Mixed Use Zone.

5.3.1.3 Part B – Planning Requirements – Overlays

Part B2 of the Plan provides a series of 'Overlay' maps that identify areas that are of special significance, value, or sensitivity. These areas are:

- Coastal environment and buffer area.
- Heritage.
- Obstacle limitation surfaces.

The Heritage Overlay and the Obstacle Limitation Surfaces Overlay are relevant to the Proposal.

Heritage Overlay

The Heritage Overlay identifies land that contributes to an appreciation of Norfolk Island's archaeological, historical, aesthetic, architectural, scientific, natural, or social heritage. Land identified on the Heritage Overlay is also listed in the *Norfolk Island Heritage Register* (Administration of Norfolk Island, 2003) (established in accordance with the *Heritage Act 2002 (NI)*).

Restrictions are placed on the development of land identified in the Heritage Overlay to:

- Conserve the environmental heritage of Norfolk Island.
- Integrate heritage conservation into the planning and development control processes.
- Provide for public involvement in the conservation of environmental heritage.
- Ensure that any use or development does not adversely affect the heritage significance of the land subject to the Heritage Overlay.

The majority of the controls relevant to land identified in the Heritage Overlay relate to development that would be undertaken on that land. This includes works carried out for the maintenance and repair of public infrastructure, including sewers.

All land within KAVHA is identified in the Heritage Overlay. About two thirds of the Proposal area is located within KAVHA.

The Heritage Overlay sets out a number of provisions relevant to use and development of land identified in the Heritage Overlay. These are:

- The designation of all use and development specified in Use and Development Tables for each Zone to be assessed as Permissible (with Consent) use or development and subject to development approval. This is independent of any other provision of the Plan.
- The preparation of a Heritage Impact Statement (HIS) addressing the following matters that must be considered by the Minister when determining a development application:
 - The cultural significance and physical integrity of land (and structures) identified on the Heritage Overlay.
 - Any advice received from NIRC, and/or any other relevant authority or organisation consulted.
 - In the case of a development application within KAVHA, compliance with the development control plan for KAVHA and any advice received from the KAVHA Advisory Committee or its successor bodies.
 - The siting, orientation, setback, bulk, form, height, scale, materials, and external finishes of buildings and structures.
 - Whether the design, colours, materials and external finishes are compatible with the forms and colours of the landscape setting of the land (and structures) identified on the Heritage Overlay.
 - The extent to which the carrying out of the proposed development would affect the heritage significance of the land (and structures and curtilages) identified on the Heritage Overlay.
 - The impact upon the heritage values of the place of building, clearing, excavation, access construction, fences, earthworks, or landscaping or planting of trees.
 - Whether any special works or practices are required to protect the heritage values of the place.
 - The design, content and location of signage and interpretive displays.
 - Any relevant conservation management plans or development control plans prepared for the land identified on the Heritage Overlay.
- Use or development involving any historic building(s) and/or ruin(s), will respect the associated archaeological, aesthetic, historic and social values and adequately respect the design and construction elements of the building(s) and/or ruin(s), including the relationship to space, orientation, form, mass, scale, fenestration, detailing, style, materials and colour.
- Use or development of any item, area, feature, customary activity, or site with conservation value listed in the Norfolk Island Heritage Register will be carried out in accordance with the principles of the Burra Charter.

A HIS (refer **Appendix G**) has been prepared as required by the provisions of the Heritage Overlay. The HIS also addresses the relevant requirements of the *Heritage Act 2002 (NI)* (refer **Section 5.4.1**), *Development Control Plan No. 7 – KAVHA* (refer **Section 5.3.1.4**).

The following parties have been consulted throughout development of the Proposal and the HIS:

- KAVHA Advisory Committee.
- KAVHA Community Advisory Group.
- KAVHA Archaeologist.

Consultation is detailed in full in **Section 6**.

Obstacle Limitation Surfaces Overlay

The Obstacle Limitation Surfaces Overlay identifies land and airspace at the Norfolk Island Airport and its surrounds that require special management and protection to ensure that obligations in relation to Obstacle Limitation Surfaces required under national and international aviation regulations are met.

The objectives of the Obstacle Limitation Surfaces Overlay are to:

- Prohibit development that would adversely affect Airport operations, or be adversely affected by Airport operations.
- Protect valuable airspace required for Obstacle Limitation Surfaces from use or development that would pose a hazard to aircraft movements.

Clause 86 of the Plan requires that any development application that relates to land identified on the Obstacle Limitation Surfaces Overlay Map must be referred to the Norfolk Island Airport Manager for assessment against the Obstacle Limitation Surfaces.

Being underground infrastructure, the Proposal would not impact on the Obstacle Limitation Surfaces, and this consultation was not considered to be necessary.

5.3.1.4 Development Control Plans

There are seven development control plans that supplement the provisions of the Plan. These are:

- *Development Control Plan No. 1 – New Subdivision Roads.*
- *Development Control Plan No. 2 – Water Resources.*
- *Development Control Plan No. 3 – Multi-Units.*
- *Development Control Plan No. 4 - Outdoor Advertising Structures and Signs.*
- *Development Control Plan No. 5 – Community Title.*
- *Development Control Plan No. 5 – Airport.*
- *Development Control Plan No. 7 – KAVHA.*

Development Control Plan No. 7- KAVHA is applicable to the Proposal.

Development Control Plan No. 7 - KAVHA

Development Control Plan No. 7 – KAVHA guides development in and around KAVHA. It provides standards and guidelines to assist the preparation and assessment of development applications. *Development Control Plan No. 7 – KAVHA* divides the land in KAVHA into a number of heritage precincts. These are shown in **Figure 5-3**.

The section of the Proposal that is within KAVHA is predominantly located within Precinct M. In addition to this:

- The upper reaches of the proposed route on both Middlegate Road and Taylors Road are located within Precinct E.
- The lower section of the proposed route on Country Road is located within Precinct F, immediately adjacent to the boundary of Precinct M.
- The lower section of the proposed route on Middlegate Road is located within Precinct M, immediately adjacent to the boundary of Precinct D.

While the construction footprint would be physically located within Precincts M, E and F, potential impacts on Precinct D have also been considered as it is immediately adjacent to the proposed route.

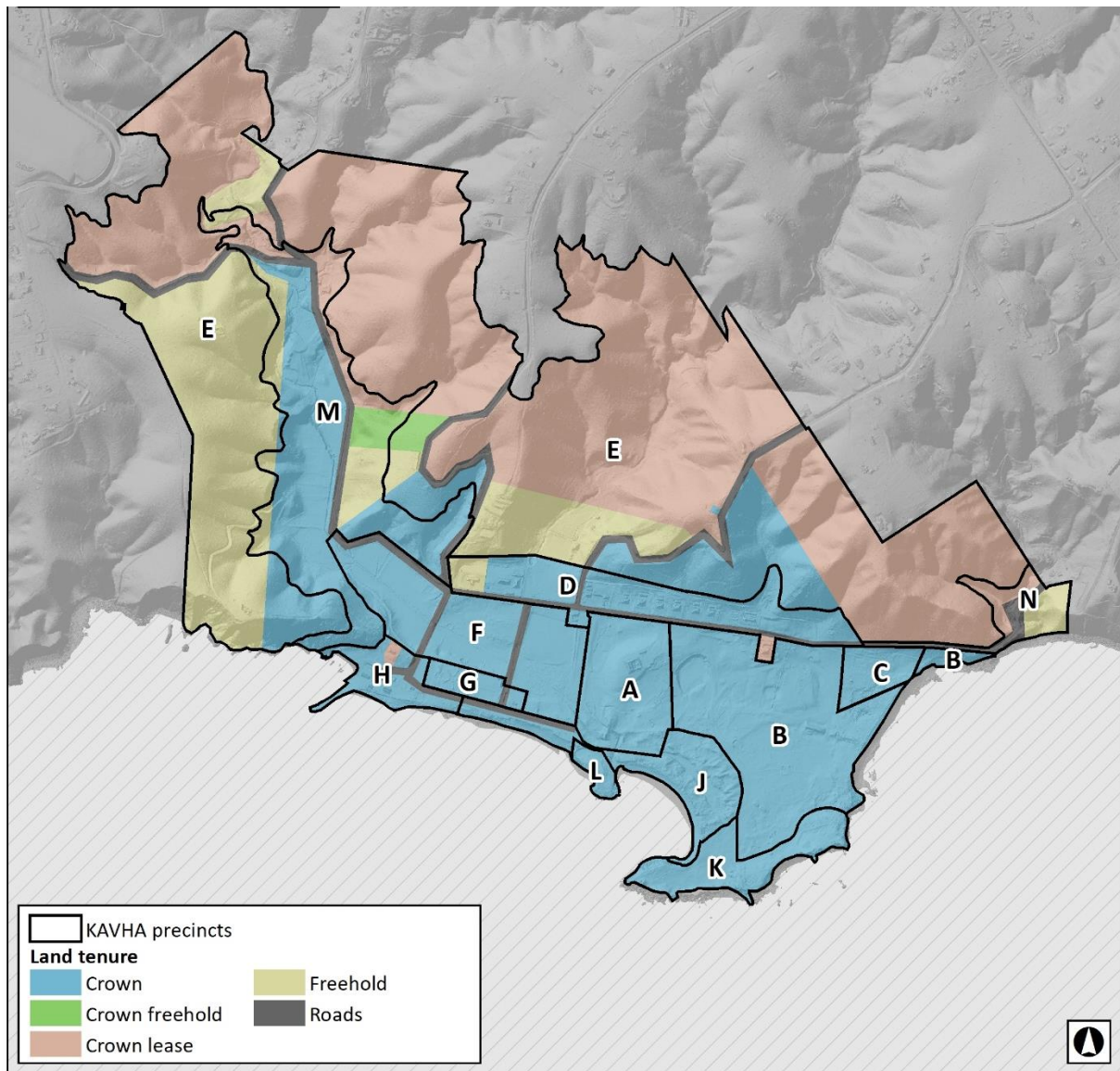


Figure 5-3: KAVHA heritage precincts
(Source: Extent Heritage Advisors, 2020)

A development application for a Proposal in KAVHA must address the controls for each relevant precinct as well as some overall controls designed to:

- Ensure that the Proposal would not have an adverse impact on the setting, streetscape or views associated with the heritage precinct.
- Ensure that new development is compatible with the significance of heritage precincts.

The relevant controls provided in *Development Control Plan No. 7 – KAVHA* are detailed and addressed in **Appendix D**.

Following assessment of the Proposal against the provisions of *Development Control Plan No. 7 – KAVHA*, it is considered that the Proposal complies with all relevant controls.

5.4 Other Norfolk Island legislation

5.4.1 Heritage Act 2002 (NI)

The Proposal is located (in part) within KAVHA. KAVHA is identified as a heritage item in the *Norfolk Island Heritage Register* (Administration of Norfolk Island, 2003). Section 28 of the *Heritage Act 2002 (NI)* (the Heritage Act) requires that a heritage impact statement (HIS) accompany a development application that is in relation to, or likely to affect a heritage item.

Therefore, the Development Application for the Proposal is accompanied by a HIS (**Appendix G**) prepared in accordance with the requirements of the Heritage Act.

Heritage impacts are discussed further in **Section 5.3.1.3**, **Section 5.3.1.4** and **Section 7.4**.

5.4.2 Public Reserves Act 1997 (NI)

Several areas within KAVHA are designated as public reserves and are managed and protected under the *Public Reserves Act 1997 (NI)* (Public Reserves Act). One reserve is located in the Proposal area, the Kingston Common Reserve.

The Kingston Common Reserve would be directly impacted by two components of the Proposal:

- Installation of sewage pumping station PS3 and associated infrastructure near the intersection of Middlegate Road, Country Road, Quality Row and Pier Street. This would be a permanent impact.
- The construction compound adjacent to the KAVHA materials stockpile site near Watermill Dam. This would be a temporary impact limited to the construction period.

The public reserves are managed in accordance with the *Plans of Management for Norfolk Island Public Reserves* (Norfolk Island Parks and Forestry Service, 2003).

The Public Reserves Act provides that certain activities prescribed as 'controlled activities' must not be carried out without a permit issued by the Conservator of Public Reserves.

'Major Public Infrastructure and Works' are not prescribed as a 'controlled activity' and consequently no controlled activity permit is required. Notwithstanding, additional relevant requirements in the Plan of Management for the Kingston Common reserve are detailed in **Table 5-3** and addressed in the HIS for the Proposal (Refer to **Section 6.4** and **Appendix G**).

5.5 Summary of required approvals

Approvals that must be obtained before the Proposal may lawfully be carried out are:

- Development Approval (Significant Development) under the *Planning Act 2002 (NI)*.

Approvals that must be obtained before certain components of the work may be carried out are:

- Approval to install pipeline or conduit in a public roadway.
- Approval to construct a driveway/access/entrance from a public roadway.
- Approval to take a protected tree under the *Trees Act 1997 (NI)*.

Approvals that may be required (yet to be determined) include:

- Approval to undertake a Controlled Action under the EPBC Act 1999 (Commonwealth) (if required subject to processes under the EPBC Act). Should the EPBC self-assessment indicate the potential for significant adverse impact on one or more MNES or on Commonwealth land, a referral would be prepared and submitted to DEECCW for assessment. However, this is not expected (refer to **Section 5.1.1**).

Further details about approval requirements and timing are provided in **Section 8.2**.

Table 5-3: Public Reserves Plans of Management – Relevant requirements

Reserve	Part A Section 11 Controlled Activity / Controlled Activity Permit Required	Part B Reserve Plan of Management Permit required	Part B Reserve Plan of Management Other requirements relevant to the Proposal	Part B Reserve Plan of Management Activities Not Permitted (as relevant to the Proposal)
Kingston Common Reserve	No	No	<p>Section 15.6.1.2 Excavations:</p> <ul style="list-style-type: none"> • Archaeological sensitivity plan to guide management of excavations. • Archaeological investigations to precede excavation where appropriate. • All excavations to be supervised by KAVHA Manager and/or Conservator of–Public Reserves. 	<p>Section 15.6.1 - Activities that would significantly impact (relevant selection):</p> <ul style="list-style-type: none"> • Continuing use of the Reserve for recreation. • The Watermill Creek drainage channels. • Commemorative tree plantings, particularly along Country Road and Pier Street. • Archaeological deposits and remains.

6 Consultation

Consultation with various public and private stakeholders has been undertaken during the development of the Proposal to better identify needs and understand issues in relation to the Proposal. The development of the consultation strategy has been guided by the relevant provisions of the *Norfolk Island Community Engagement Framework: A Guide for the Department Working in Partnership with the Community* (DITRDC, 2020).

This section provides an overview of the consultation activities that have been, and will continue to be, carried out for the Proposal.

6.1 Consultation activities to date

Consultation activities undertaken to date are detailed in **Table 6-1**.

6.2 Future consultation

6.2.1 Consultation during public display of the EIS

The EIS will be advertised and placed on public display for a period of not less than 28 days. During the public display period, the EIS will be available for viewing at the following locations:

- Norfolk Island Regional Council, Customer Care Office, Bicentennial Complex, Taylors Road, Norfolk Island, during office hours.
- Norfolk Island Regional Council, Public Library, Bicentennial Complex, Taylors Road, Norfolk Island, during opening hours.
- Norfolk Island Regional Council website, <http://www.norfolkisland.gov.nf/your-council/council-documents/documents-public-exhibition>.

During the display of the EIS, the community, government agencies and other interested parties will be invited to make written submissions on the Proposal to NIRC.

Information on how to make a submission and details of the display dates, times and locations will be advertised in the NIRC Government Gazette, Norfolk Islander newspaper, Norfolk Online News, local radio, a letterbox drop and other Government publications as appropriate.

6.2.2 Consultation following public display of the EIS

During assessment and determination of the Development Application for the Proposal, all public submissions will be considered.

An approval for the Proposal (if granted), may include conditions deemed necessary to address relevant issues raised in public submissions. The approval (if granted) and associated documents would be available for public viewing and details would be published in the NIRC Government Gazette along with the notice of approval.

Subject to approval of the Proposal, identification and management of identified issues would continue through the construction phase of the Proposal.

Table 6-1: Consultation activities and outcomes

Stakeholder	Description of consultation undertaken	Issues raised	Actions taken
Norfolk Island Regional Council (NIRC)			
NIRC – Executive	A formal request for directions from the Chief Executive Officer (CEO) regarding what matters need to be addressed in the environmental impact assessment was lodged with NIRC on 18 May 2023. This request was made in accordance with Section 45(6) of the <i>Planning Act 2002 (NI)</i> .	Nil. CEO Requirements were issued on 30 June 2023 (refer Appendix F).	CEO Requirements were addressed in the EIS.
	An application for a declaration of Significant Development was lodged with NIRC on 18 May 2023. This request was made in accordance with Section 28B of the <i>Planning Act 2002 (NI)</i> .	Nil.	The NIRC CEO referred the application for a declaration of Significant Development to the Administrator of Norfolk Island who made the declaration on 25 June 2023.
NIRC – Planning and Environment	Ongoing, iterative consultation (phone, email and meetings) with NIRC (Building and Planning) Planning Manager and Senior Strategic Planner to confirm local approval processes and requirements in relation to: <ul style="list-style-type: none"> • Development Application. • Significant Development Declaration. • EIS requirements and adequacy. • Approval process and timing. 	Nil. Procedural consultation only.	Nil. Procedural consultation only.
	The DITRDCA Project Manager and Project Director met with the NIRC Manager – Planning and Environment and the Administrator of Norfolk Island on 22 November 2023 during which the Proposal was discussed.	Nil.	Nil.

<p>NIRC – Infrastructure, Services and Environment Team leaders – statutory planning process</p>	<p>NIRC Infrastructure and Services personnel were consulted as required by standard planning process designed to ensure service infrastructure required by a proposal is, or can be made, available, and to identify potential impacts to existing infrastructure:</p> <ul style="list-style-type: none"> • Public Health and Environment Team Leader. • Biodiversity Team Leader. • Public Works and Depot Team Leader. • Fire Service Team Leader. • Electricity Team Leader. • Telecom Team Leader. <p>Emails were issued to each Team Leader on 2 January 2024.</p>	<p>Public Health and Environment:</p> <ul style="list-style-type: none"> • Need for water quality monitoring post commissioning to monitor for downstream impacts of potential operational issues / sewage leaks. • Need for overflow procedures for both public health and reef health. • Assessment of the capacity of the Water Assurance Scheme to receive the flows from the KAVHA Sewerage Scheme. <p>Biodiversity:</p> <ul style="list-style-type: none"> • Potential for the following minor impacts: acid sulfate soils, erosion / sedimentation, biodiversity; impacts of earthworks on protected and significant trees. • If protected trees are to be removed, these should be marked on a plan and a Permit to Take a Protected Tree obtained. • Request for tree protection zone around significant trees. <p>Public Works and Depot:</p> <ul style="list-style-type: none"> • Public Works and Depot has no issues with the Proposal. • Permits are required for activities such as: drilling under roads; encroachments into road verges for driveways. <p>Fire Service:</p> <ul style="list-style-type: none"> • The Fire Service has no comment or concern in relation to the Proposal. <p>Electricity and Telecom:</p> <ul style="list-style-type: none"> • No response was received from Electricity and Telecom. 	<p>Public Health and Environment:</p> <ul style="list-style-type: none"> • Water quality monitoring and overflow procedure requirements were developed in consultation with Public Works and Environment and included in the EIS (refer Section 7.1). • An assessment of the capacity of the Water Assurance Scheme to accept flows from the Project was undertaken by Fluent Solutions. One pinch point was identified as discussed in Section 4.4.2.4. <p>Biodiversity:</p> <ul style="list-style-type: none"> • Minor impacts identified have been addressed in the EIS for the Proposal (refer Section 7.2 and Section 7.3). • The requirement for the following permit has been included in the EIS (refer Section 7.3 and Section 8.2): Permit to 'take' a protected tree. • Erection of a tree protection zone for significant trees has been considered (refer Section 7.3). <p>Public Works and Depot Team Leader:</p> <ul style="list-style-type: none"> • The requirement for the following permits has been included in the EIS (refer Section 8.2): <ul style="list-style-type: none"> - Installation of a pipeline or conduit in a public roadway. - Construction of a driveway/access/entrance from a public roadway. <p>Fire Service, Electricity and Telecom:</p> <ul style="list-style-type: none"> • Nil.
--	--	---	--

Stakeholder	Description of consultation undertaken	Issues raised	Actions taken
NIRC – Infrastructure and Service Manager / Team Leaders – non-statutory consultation	The DITRDCA Project Manager met with the NIRC Manager – Infrastructure and Services on 22 November 2023 to discuss electricity requirements for the Proposal and to find out what is required to ensure electricity is available to power the four sewage pumping stations.	Nil. The NIRC Manager – Infrastructure and Services requested a copy of the final design and electrical drawings prior to DA submission.	DITRDCA provided the final designs and electrical drawings to the NIRC Manager – Infrastructure and Services on 6 February 2024.
Norfolk Island Airport Manager	<p>Clause 86 of the Plan requires that any development application that relates to land identified on the Obstacle Limitation Surfaces Overlay Map must be referred to the Norfolk Island Airport Manager for assessment against the Obstacle Limitation Surfaces.</p> <p>Being underground infrastructure, the Proposal would not impact on the Obstacle Limitation Surfaces, and this consultation was not considered to be necessary.</p>	Not applicable.	Not applicable.
Administrator of Norfolk Island			
Administrator of Norfolk Island	An application for a declaration of Significant Development was lodged with NIRC on 18 May 2023 and forwarded by the NIRC CEO to the Administrator of Norfolk Island for a decision. This was undertaken in accordance with Section 28C(1) of the <i>Planning Act 2002 (NI)</i> .	Nil. The Proposal was declared as a Significant Development on 25 June 2023 (refer Appendix E).	The development application for the Proposal was prepared in accordance with the requirements for Declared Significant Development.
✕	A stakeholder consultation letter outlining the Proposal and predicted potential impacts (pre-EIS) was emailed to the Office of the Administrator on 31 January 2024.	Nil.	Nil.
	The DITRDCA Project Manager and Project Director met with the NIRC Manager – Planning and Environment and the Administrator of Norfolk Island on 5 February 2024 during which the Proposal was discussed.	Nil.	Nil.

Stakeholder	Description of consultation undertaken	Issues raised	Actions taken
Heritage			
KAVHA Advisory Committee	<p>The Proposal was presented to the KAVHA Advisory Committee on 11 December 2023.</p> <p>The presentation was made by the DITRDCA Project Manager.</p>	<p>Further information was sought in relation to:</p> <ul style="list-style-type: none"> • Pumping station numbering. • Why the rising mains would be installed under the road pavement. • How rising mains installed under the road surface would be repaired. • Sizing of sewage pumping stations and rising mains, particularly in relation to visual impacts of PS3 and the emergency storage tanks near the cenotaph. • Impact of road closures generally. • Impact of road closures on shipping traffic. • Impact of road closures during Christmas. • How EPBC Act requirements for heritage would be addressed. 	<p>The Project Manager and KAVHA Archaeologist responded to the design questions at the meeting and the additional information alleviated most concerns.</p> <p>Traffic concerns have been addressed in this EIS.</p> <p>A self-assessment to determine EPBC requirements is being undertaken as a separate process in parallel with the development approval process.</p> <p>The meeting was followed up with a letter (13 December 2023) providing further information about the Proposal and another opportunity for the Advisory Group Members to express any additional concerns. No further concerns were raised.</p>
KAVHA Community Advisory Group	The DITRDCA Project Manager presented the Proposal presented to the KAVHA Community Advisory Group on 13 December 2023.	<p>Further information was sought in relation to:</p> <ul style="list-style-type: none"> • Whether the EPBC Act was being considered. • When the Proposal would be commissioned. 	<p>The Project Manager advised that:</p> <ul style="list-style-type: none"> • An EPBC self-assessment would be undertaken to check for potential impacts on matters of National Environmental Significance, but no impacts are expected. • The Proposal would be commissioned in about September / October 2024.

Stakeholder	Description of consultation undertaken	Issues raised	Actions taken
Commonwealth Heritage Manager	This position is currently vacant. All statutory requirements for consultation with the Commonwealth Heritage Manager have been directed to the KAVHA archaeologist to date.	Not applicable.	Not applicable.
KAVHA / Project Archaeologist	<p>Ongoing, iterative consultation (phone, email and meetings) throughout the development of the Proposal to seek input regarding potential heritage impacts including:</p> <ul style="list-style-type: none"> • Review and adjustment of design revisions to minimise potential heritage impacts. • Development of the HIS. • Assessment of the Proposal against <i>Development Control Plan No. 7 – KAVHA</i>. • Input into the EPBC Referral self-assessment. 	Nil. Input has informed design and resolved potential issues at design stage where possible.	Nil. Input has informed design and resolved potential issues at design stage where possible.
Australian Convict Sites Steering Committee	<p>The Proposal was presented to the Australian Convict Sites Steering Committee on 21 November 2023 whilst they were convened on Norfolk Island.</p> <p>The presentation was made by the KAVHA Archaeologist.</p>	Nil.	Nil.

Stakeholder	Description of consultation undertaken	Issues raised	Actions taken
Environmental			
CSIRO	DITRDCA met with the CSIRO on 18 October 2023 regarding the risk of encountering acid sulfate soils (ASS) and a preferred assessment approach.	<p>All the wet swamp area immediately adjacent to Country Road is considered to be ASS.</p> <p>On the far high side of the road, the risk of encountering ASS is not high, but there is still a risk.</p> <p>Possible options would be to use Stage 1 safeguards and management measures plus either / or:</p> <ol style="list-style-type: none"> 1. Pre-construction core samples along the proposed route in high risk area to test for presence of ASS at construction depths prior to commencement of construction. 2. Supervision of excavation in high risk areas by a qualified and experienced soil scientist conjunction with the CSIRO. 3. Implementation of both Options 1 and Option 2 if ASS is identified in pre-construction core samples. 	Option 1 was selected and subject to development approval, would be undertaken by the CSIRO in conjunction with the Stage 1 safeguards and management measures for ASS (refer Section 7.2).
Water Quality Working Group	<p>The Water Quality Working Group meets every three weeks to discuss water quality in KAVHA and on Norfolk Island.</p> <p>The Project is a standing item on the agenda and DITRDCA's Contracts and Building Supervisor has provided Project updates at each meeting.</p>	<p>Information about possible future private property connections was requested, including how they will be connected and what the timing of the connections would be.</p> <p>The Group is happy that the Project is underway as it will have a positive impact on water quality.</p>	<p>The NIRC Planning Manager and the DITRDCA Contracts and Building Supervisor provided the Group with information about possible future connections from a Council perspective and a from a construction perspective.</p> <p>DITRDCA will keep the group informed on the progress of the Project.</p>

Stakeholder	Description of consultation undertaken	Issues raised	Actions taken
Community			
Freehold / Crown lease properties in the Proposal area	<p>A letter was emailed to landowners of property with main frontage to Middlegate Road, Country Road and Taylors Road on 11 January 2023. The email included information about both the Project and the Proposal, and provided contact details for reply comments.</p> <p>The comment period ended on 25 January 2024 and no comments were received. On 3 February 2024, following closure of the comment period, a request for further information was received from residents (one household) on Taylors Road.</p>	<p>The request was for information in relation to the:</p> <ul style="list-style-type: none"> • Location of the sewage pumping station which would be in the road reserve near the entrance to their property. • Location of the boundary connection point for their property. • Capital cost and annual service fee for private connections to the KAVHA sewer. <p>The questions about the location of the sewage pumping station and the boundary connection appear to be related to potential impacts to the private property during installation of infrastructure for private connections.</p>	<p>A response was provided including information about the location of the sewage pumping station and advice that any future connections would be the responsibility of, and managed by, NIRC.</p> <p>The only aspect of possible future private connections relevant to the Proposal is the installation of boundary connection kits that would be located in the road reserve and capped off so the connection point is in place should possible future connections need to occur. The locations of the boundary connections identified in the drawings at Appendix A of Appendix C have been selected to keep connection points close to sewage pumping stations for ease of maintenance.</p> <p>The following measure has been included in the EIS: <i>Prior to the commencement of construction in the vicinity of each respective property, landowners that may be required to connect in the future would be given the opportunity to liaise with DITRDCA and/or it's Contractor to determine a boundary kit location that better suits the landowner, subject to still meeting technical requirements of the sewerage scheme.</i></p>

6.2.3 Consultation during construction

If the Proposal proceeds, consultation would continue during the construction phase of the Proposal.

At a minimum, consultation during construction would include:

- Develop and implement an Enquiries and Complaints Management Plan for the duration of the construction phase of the Proposal. The Enquiries and Complaints Management Plan would include, but would not be limited to, a process for communicating information to the community about how to make an enquiry or a complaint including: telephone number, email address, postal address, and hours within which enquiries or complaints can be made.
- Develop and implement a Community Consultation Plan to provide timely, regular and transparent information about the Proposal, details of future work programs, changes to access and traffic conditions, and general construction progress throughout the construction phase of the Proposal. The Community Consultation Plan would include, but would not be limited to:
 - Published articles in the Norfolk Islander newspaper, Norfolk Online News and other Government Publications as appropriate, providing updates on the Proposal and details of how to make an enquiry or a complaint.
 - Radio announcements about public road closures as required.
 - Social media announcements about works progress and public road closures as required.
 - Letterbox drop to sensitive receivers (as identified in **Figure 7.5-2**) providing details of how to make an enquiry or a complaint.
 - Ongoing consultation with sensitive receivers (as identified in **Figure 7.5-2**) about upcoming works and potential noise and access impacts.

7 Environmental assessment

This environmental assessment provides a detailed description of the potential environmental impacts associated with the construction and operation of the Proposal. All aspects of the environment potentially impacted upon by the Proposal are considered and site-specific safeguards and management measures are provided to ameliorate the identified potential impacts.

7.1 Water quality

7.1.1 Existing environment

7.1.1.1 Norfolk Island

Numerous investigations into water quality on Norfolk Island have been undertaken over previous years (refer **Section 3.1**). The investigations conclude that:

- Surface waterbodies and groundwater aquifers across Norfolk Island are polluted with sewage (pathogens and nutrients) from animal and human sources via multiple pathways (AECOM, 2017; CSIRO, 2020).
- Prevalence of sewage is higher in ground water than surface water (CSIRO, 2020).
- Groundwater is contaminated, primarily due to island wide use of septic treatment systems with absorption / soakage trenches and defective sewage holding tanks (CSIRO, 2020; Bligh Tanner, 2020).
- The coral reefs in the Emily Bay and Slaughter Bay lagoons are in poor and declining health, with increased coral disease and algae growth which is indicative of contaminated surface water runoff and contaminated groundwater infiltration (Bligh Tanner, 2020; SIMS, 2021).

Contamination sources

Human waste pollution

Outside of the Burnt Pine township which is serviced by the Water Assurance Scheme, sewage across Norfolk Island is predominantly managed using septic treatment systems with disposal to ground via absorption / soakage trenches. It is estimated that Norfolk Island has over 1000 septic treatment systems in operation. Septic treatment systems are known to deliver poor sewage treatment outcomes, and in addition, many septic systems on the island are not maintained appropriately or are failing (NIRC, 2021).

AS / NZ1547:2000 On-site Domestic Wastewater Management and / or the Environment specifies buffer distances from various sewage systems to permanent and intermittent waterways and bores to minimise potential impacts on the environment. **Figure 7.1-1** shows the areas (in red) where the use of septic systems would not be compliant with *AS / NZ1547:2000* buffer distances.

Faecal contamination from animals

Cattle and bird faeces, along with other livestock and domestic pets, contribute to island wide faecal contamination of surface water and groundwater. Animal faecal contamination is both deposited directly, and flushed into the Proposal area via waterways and overland surface water runoff from other areas of the island.

Per- and Polyfluoroalkyl Substances (PFAS)

PFAS contamination originating from firefighting activity at the Norfolk Island Airport is present in the Watermill / Town Creek surface water catchment. The Watermill / Town Creek surface water catchment includes the Burnt Pine township, KAVHA and the discharge at Emily Bay (Senversa, 2021).

Within the Watermill Creek / Town Creek surface water catchment, the highest PFAS concentration was identified just downstream of the airport maintenance sheds.

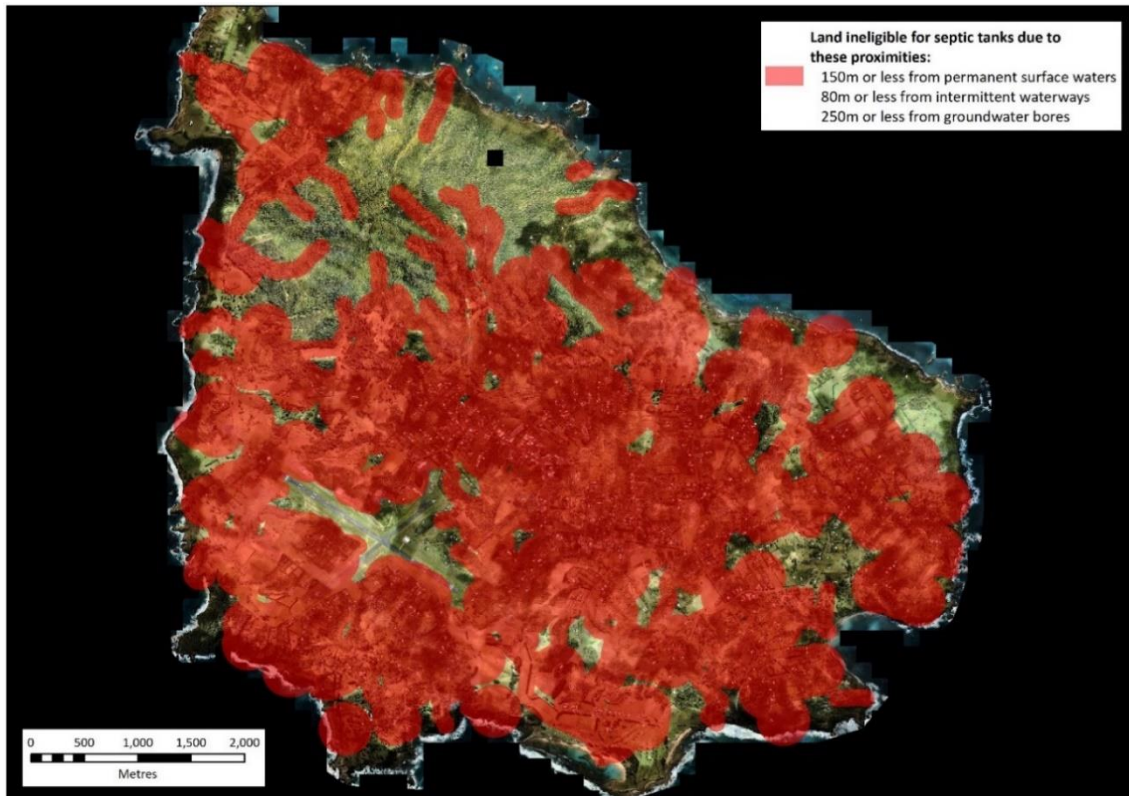


Figure 7.1-1: Areas where septic treatment systems would not be permitted under AS / NZ1547:2000
(Source: NIRC, 2021)

PFAS concentrations consistently decrease at each downstream location away from the airport, however they generally exceed drinking / stock watering water health based guidance values until after Watermill Dam.

Downstream of Watermill Dam, PFAS concentrations in Watermill Creek continue to decrease progressively and are below detection limits at the point of discharge into Emily Bay.

7.1.1.2 Proposal area

Surface water

Water bodies in the vicinity of the Proposal area include:

- Watermill Creek and associated tributaries, wetlands and swampland.
- Watermill Dam.
- A roadside earthen dam that collects water from a hillside seep in the Watermill Creek catchment.

Watermill Creek tributaries run under Country Road in culverts in at least two locations.

Surface water bodies in the vicinity of the Proposal area are shown in **Figure 7.1-2**.

Watermill Creek feeds Watermill Dam, the wetlands / swampland in Kingston and ultimately discharges to Emily Bay via the convict drain at the western end of the bay.

The roadside earthen dam is used as a community water supply.

KAVHA SEWERAGE SCHEME - STAGE 2: SURFACE WATER

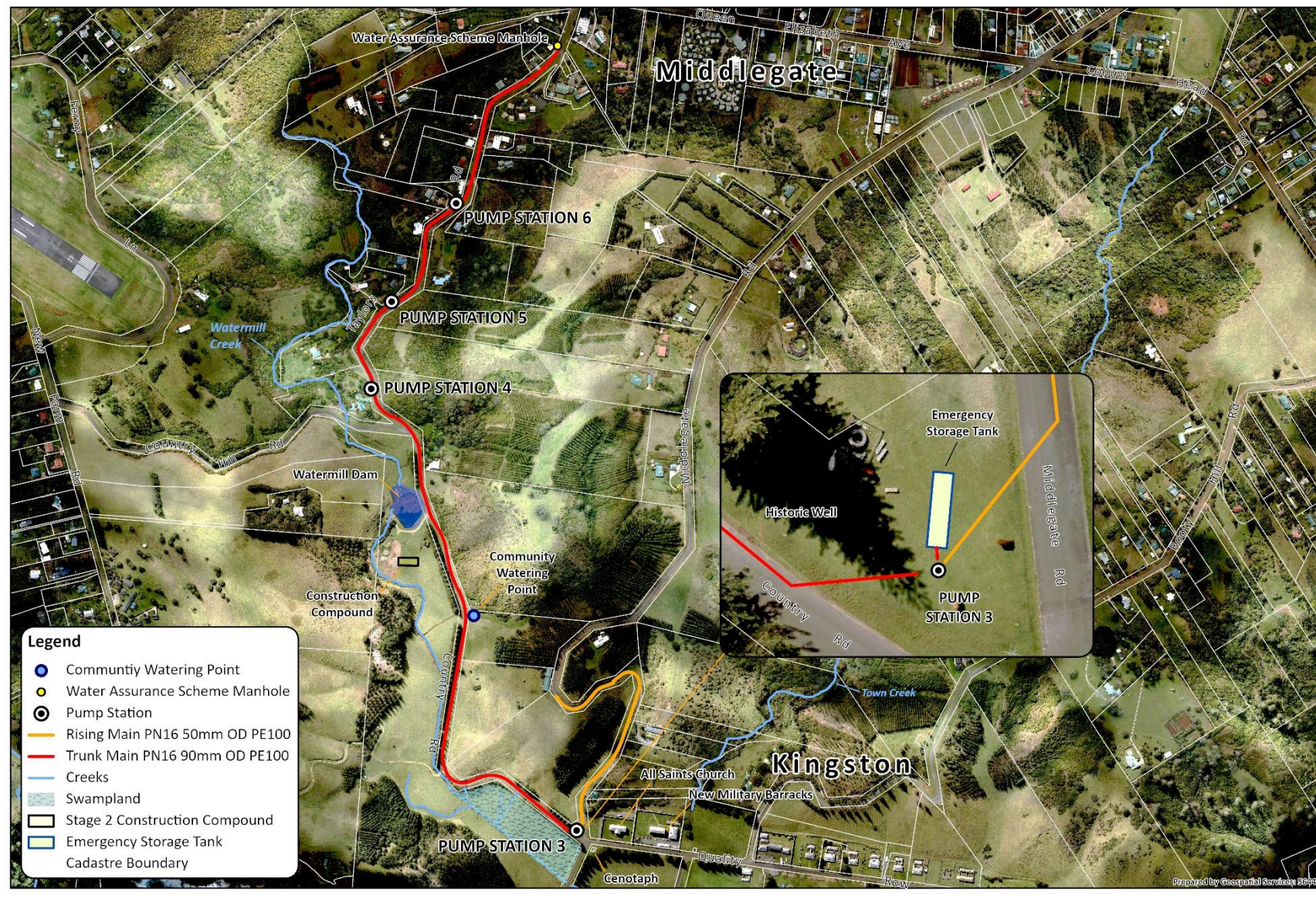


Figure 7.1-2: Surface waterbodies in the vicinity of the Proposal area

During the preparation of the environmental impact assessment for Stage 1 of the Project, DITRDCA and NIRC (Public Health and Environment) undertook surface water testing to measure levels of pathogens and nutrients in waterways in the vicinity of the Stage 1 proposal area in Kingston. This testing was undertaken in an attempt to demonstrate bioremediation of legacy human waste contamination in Kingston, and resultant improvements in surface water quality, following the interim tank sealing remediation works undertaken in 2021 (refer **Section 2.2.1**). Water testing methodology and results are presented in Section 6.1 of the *Kingston and Arthur's Vale Historic Area Sewerage Scheme: Stage 1 Environmental Impact Statement (DITRDCA, 2022)*.

This testing determined that, in addition to human and animal waste pollution generated within Kingston and the Proposal area (Kingston surrounds), surface water bodies in this area also receive human and animal waste pollution from other areas of both the KAVHA catchment and the island, via creeks and overland surface water runoff.

Increases in surface water pollution loads following heavy rainfall events is supported by results of both Stage 1 water quality testing and results of ongoing water testing conducted by NIRC (Public Health and Environment) which consistently shows significant increases in levels of *Enterococci* (an indicator pathogen) in KAVHA waterways following heavy rainfall. The results of ongoing water testing showed high *Enterococci* readings after rain events at all sites tested. After the first flush, pathogen counts slowly decreased as they died off. This indicates that pollution sources upstream are influencing the results and that rain events are associated with the spikes in pathogen levels.

Groundwater

Groundwater underlies the whole of Norfolk Island and generally flows in a southerly direction through Norfolk Island's underground aquifers (Bligh Tanner, 2020).

Groundwater testing in the KAVHA was not undertaken for this assessment because:

- There are no existing groundwater monitoring bores in Kingston or the Proposal area.
- Pollution (human waste contamination) of the groundwater has been established in various recent water quality investigations (Refer **Section 3.1**).

Marine waters

Previous investigations have established long term (historic and ongoing) water pollution issues in Emily Bay and Slaughter Bay resulting predominantly from human waste contamination (AECOM, 2017; Bligh Tanner, 2020).

Polluted surface water enters Emily Bay and Slaughter Bay via general seepage from the nearby Watermill Creek and wetlands and also by direct discharge to Emily Bay via the convict drain at the western end of the bay which acts as a discharge point during periods of heavy rainfall (Bligh Tanner, 2020).

Polluted groundwater upwells naturally into the intertidal zones of Emily Bay and Slaughter Bay (Bligh Tanner, 2020, SIMS, 2021).

Indicative pathways for polluted water entering Emily Bay are shown in **Figure 7.1-3**.

Pollution of the bays has resulted in poor marine ecosystem health. Pollutant nutrient loads directly correlate to the damage to sensitive coral reefs (coral bleaching and disease and algal growth), the health of which is poor and declining (Bligh Tanner, 2020; NIRC, 2021; SIMS, 2021) (refer to **Section 3**).

The pollutant pathogens are causing frequent public health risks to swimmers in Emily Bay (AECOM, 2017). NIRC (Public Health and Environment) undertakes beach water quality monitoring weekly. If pathogens are detected, the water is then tested daily until the bacteria levels drop to a safe level. Public health warnings are published on NIRC's Facebook page and website and via signage erected at the entrance to the beach areas (NIRC, 2022). Public health warnings are most frequent after heavy rainfall events and resultant discharge of Watermill Creek into Emily Bay.

PRESSURES ON EMILY BAY, NORFOLK ISLAND

Emily Bay is a critical tourist and environmental asset for Norfolk Island. However, a chronic loading of polluted groundwater, the uncontrolled release of contaminated surface water, and increased temperatures have resulted in significant algal overgrowth and coral bleaching in the Emily Bay reef. Immediate action is required to protect the reef from further damage.

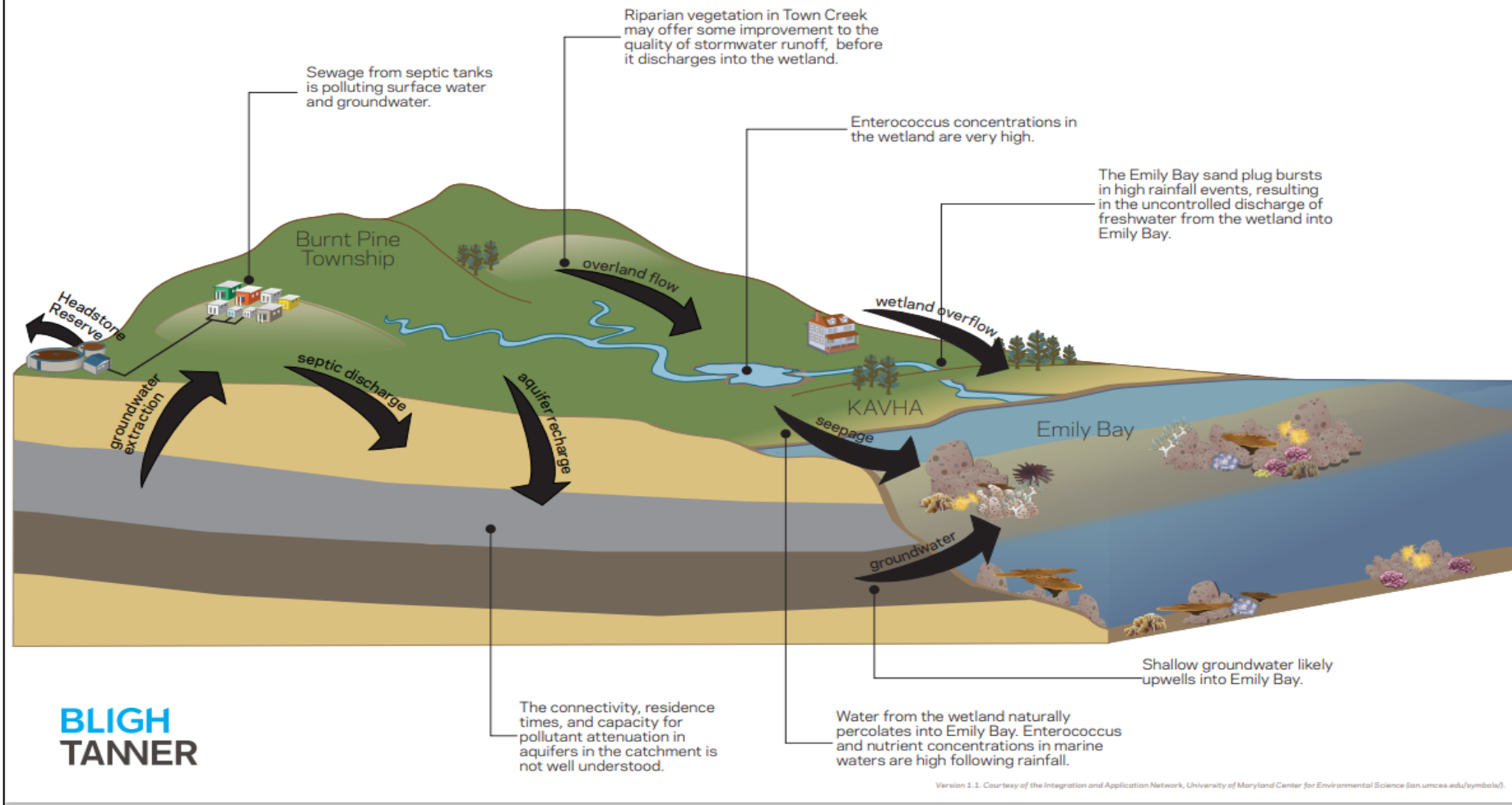


Figure 7.1-3: Indicative pathways for polluted water entering Emily Bay, Norfolk Island
(Source: Bligh Tanner, 2020)

7.1.2 Potential impacts

7.1.2.1 Construction

Erosion and sedimentation

Construction of the Proposal would require disturbance of the soil in the Proposal area. Whilst no waterway would be directly impacted during construction, mobilisation of disturbed soil into adjacent and downstream waterways could result in increased pollution of both freshwater and marine environments. Waterways that could be impacted by erosion and sedimentation during construction are Watermill Dam, Watermill Creek and swampland in the Proposal area and downstream swampland, wetland and marine areas.

The communal watering point is uphill of the construction footprint and the quality of the water collected in this location would not be impacted by construction of the Proposal.

Erosion and sedimentation from the Proposal area would be managed in accordance with the safeguards and management measures detailed in **Section 7.2.3.1**.

Proper implementation of erosion and sedimentation controls is expected to contain all sediment within the construction site and prevent downstream impacts from mobilisation of soil and any potential contaminants. No pollution of waterways is expected.

Other sources of contamination

The following known contaminants would not be impacted by construction of the Proposal and therefore have not been considered further in this assessment:

- **Faecal contamination from cattle and birds** – Faecal contamination from animals is widespread throughout KAVHA which is an area utilised by seabirds and designated for cattle grazing. The Proposal would not increase or decrease levels, or impacts, of animal faecal contamination. Notwithstanding, any animal faecal contamination present in the soil disturbed during construction would be managed by default as a result of the erosion and sedimentation controls that would be implemented to prevent further impact on surface water quality in Kingston / KAVHA.
- **PFAS** – PFAS contamination in or near the Proposal area is located in Watermill Dam and Watermill Creek which are both located outside the construction footprint respectively. PFAS contamination would not be exacerbated by, or have an impact on, the Proposal.

7.1.2.2 Operation

The key operational impact of the Project on water quality would be positive – i.e. the elimination of ongoing human waste contamination (pathogens and nutrients) from occupied buildings on Crown land in Kingston. Whilst this would not solve the water quality issues in Emily Bay and Slaughter Bay which originate from multiple sources island wide, it would, subject to approval and construction of Stage 2 and Stage 3 of the Project, remove 100 percent of the pollution generated on Crown land in Kingston. This is the majority proportion of the human waste pollution generated in immediate proximity to the sensitive waters of the Norfolk Marine Park.

The key operational impact of the Proposal on water quality would also be positive, as the Proposal would remove the requirement for the approved temporary 'end of line' sewage holding tanks (to be constructed if the Proposal does not proceed) and the associated sewage spill risk (refer **Section 4.3.2**).

The potential adverse impacts of operation of the Proposal would be limited to potential sewage spills and possible consequent downstream contamination of surface water, groundwater and marine waters in the event of operational system failure. The Proposal has been designed to minimise the risk of operational spills as (Fluent Solutions, 2023):

- The sewerage system is sealed and is not at risk of infiltration by water during floods or heavy rainfall events.
- Sections of the system can be isolated and emptied for maintenance.
- The sewage pumping stations are alarmed and would issue the following alerts in the event of a pump failure or other maintenance issue:
 - An SMS alert to the system operator.
 - A digital alert to the upstream / downstream sewage pumping station(s) to stop them pumping if required.
- Should any, or all of, PS3 to PS6 or the Water Assurance Scheme pumping stations fail, the PS3 emergency sewage holding tank would have capacity to store incoming sewage from Kingston for a 24 hour period. This would enable sewage collection in Kingston to continue uninterrupted if the trunk main is shut down.
- Sewage pumping stations, including the PS3 emergency sewage holding tank, can be emptied by vacuum into an effluent tanker if required.
- The successful contractor would be required to keep replacement parts in stock at all times.
- The successful contractor would be required to undertake regular inspections and maintenance of the sewerage infrastructure, including the sewage pumping stations, the emergency sewage storage tank and all associated electrical components.

Consequently, no pollution of surface water, groundwater or marine waters is expected subject to proper maintenance of the sewerage scheme. Refer to **Section 4.4** and **Section 4.5** for further information on the design of the Proposal.

NIRC (Public Health and Environment) was consulted about the Proposal in January 2024 as part of the Development Application process (refer **Section 6.1**). NIRC suggested that despite the design and management measures built into the Proposal to minimise the risk of environmental pollution due to operational failure, due to the close proximity to sensitive wetland and marine areas, there is a need for the following:

- Systematic water quality monitoring in the wetlands and the bays for a period of time following commissioning of the Proposal to monitor for downstream impacts of potential operational issues / sewage leaks. Despite Stage 1 water quality monitoring demonstrating flushing of pollutants into the area during periods of heavy rainfall, NIRC considers that there is a risk that an operational failure would produce an even bigger spike in pathogens than heavy rainfall events and would be a good indicator of an operational issue. Water quality monitoring would be undertaken by NIRC as part of their regular water quality monitoring program.
- Development of overflow procedures for public health protection and reef health protection in the event of an overflow.

7.1.3 Safeguards and management measures

Safeguards and management measures would be implemented to avoid, minimise or mitigate the potential adverse impacts of the Proposal on water quality in Kingston and the Proposal area.

7.1.3.1 Construction

- Implement safeguards and management measures to address erosion and sedimentation impacts during construction as described in **Section 7.2.3.1**.

7.1.3.2 Operation

- Keep adequate levels of spare parts and spare components for the entire sewerage scheme in stock on the island at all times.
- Ensure the sewerage scheme infrastructure, including alarm systems, is properly maintained at all times.
- Ensure timely responses to warning alarms from sewage pumping stations.
- Investigate the source of any potential operational failure identified by the NIRC water quality monitoring program and undertake any repair(s) required as soon as practicable.
- Prior to the commencement of operation, develop an overflow procedure for both public health and reef health purposes. These procedures would be prepared in consultation with NIRC (Public Health and Environment) and Marine Parks personnel respectively.
- Implement overflow procedures in the event of an overflow / sewage leak as required.

7.2 Geology and soils

7.2.1 Existing environment

7.2.1.1 Norfolk Island soils

Norfolk Island is volcanic in origin and rock is predominantly comprised of basaltic sheet lavas and pyroclastic tuff (layered volcanic ash). The geological formations vary across the island, but the basaltic lavas are the most common rock type.

These rock formations are subject to erosion, which is evident across Norfolk Island (refer **Figure 7.2- 1**). Erosion on Norfolk Island occurs as a result of three processes: soil creep; slumping (land slips); and sheet erosion, all of which contribute to infill in lower parts of the landscape and drainage lines (Parsons Brinkerhoff, 2005).



Figure 7.2-1: Examples of erosion on Norfolk Island

(Source: Parsons Brinkerhoff, 2005)

In the southern part of the island (Kingston), a pocket of sandy soil has developed over a small pocket of calcarenite (a marine rock made up of sand, coral and shell fragments cemented with lime) (Parsons Brinkerhoff, 2005).

7.2.1.2 Soils in the Proposal area

Soil types

Soil types on Norfolk Island are classified in *A Soils and Land Use Study of the Australian Territory of Norfolk Island, South Pacific Ocean* (Stephens and Hutton, 1954), and *Norfolk Island Report on Geotechnical Soils Investigation* (Parsons Brinkerhoff, 2005).

Four soil types have been identified in KAVHA in the vicinity of the Proposal area. These are shown in **Figure 7.2-2** and are described below.

Basaltic Colluvium Mixed with Calcareous Sand

Colluvium is a general name for loose, unconsolidated sediments that have been deposited at the base of hillslopes by either rainwash, sheetwash, slow continuous downslope creep, or a variable combination of these processes (Wikipedia, 2022). In simple terms, it is sediment deposited at the base of a hillslope by surface water runoff or sheet erosion / landslides.

Basaltic colluvium mixed with calcareous sand typically has unrestricted drainage.

Rooty Hill Clay

Rooty Hill Clay originates from basalt and occurs on steep to moderate convex slopes and ridge tops. It is prone to slumping on the steeper slopes and typically has unrestricted drainage.

KAVHA SEWERAGE SCHEME - STAGE 2: SOIL TYPES

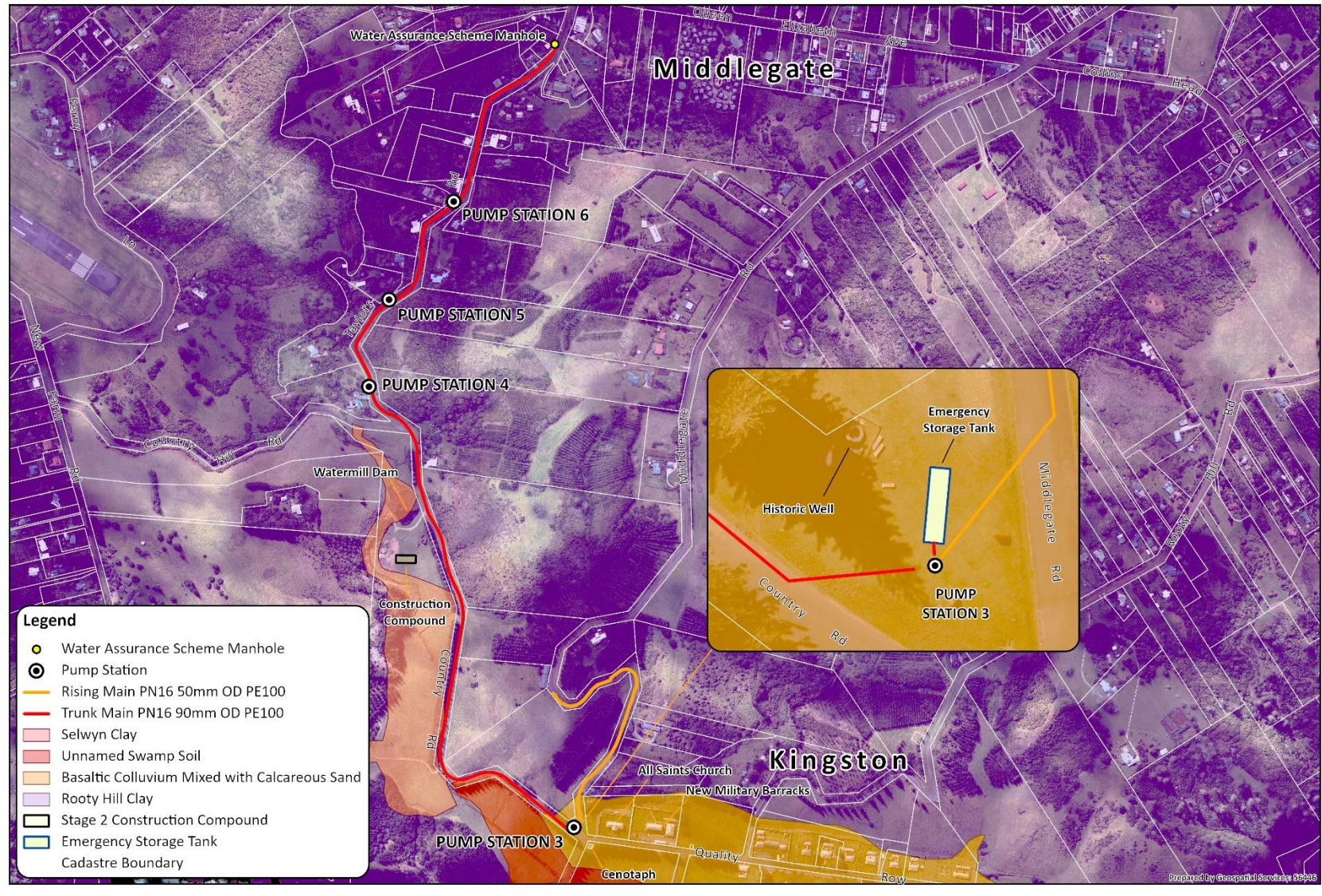


Figure 7.2-2: Soil types in the Proposal area

(Source: Parsons Brinkerhoff, 2005; Note: this figure has been recreated and soil type boundary lines may vary marginally from the original.)

Unnamed Swamp Soil

Unnamed Swamp Soil is also known as Peaty Swamp Soil. Unnamed Swamp Soil is heavily textured organic soil which has restricted drainage. It is generally found on valley floors and has acid sulfate soil potential.

Selwyn Clay

Selwyn Clay originates from basalt and generally occurs on gently undulating areas on cliff tops. It typically has unrestricted drainage.

Acid sulfate soils

Acid Sulfate Soils (ASS) are naturally occurring soils and sediments that contain iron sulfides. The majority of acid sulfate sediments were formed by natural conditions in historic times.

ASS can be classified into two types, being Potential ASS and Actual ASS. Actual ASS is often close to the soil surface with underlying Potential ASS (in deeper soil sublayers).

Potential ASS is waterlogged soil containing iron sulfides (commonly pyrite) which has the potential to produce sulfuric acid if it is drained or excavated and exposed to oxygen. Potential ASS is harmless to the environment if it is kept in this state or under water.

Actual ASS is formed when Potential ASS is exposed to air causing a chemical reaction between the iron sulphides and oxygen. The reaction of the exposed Potential ASS with oxygen produces sulphuric acid, which can lead to a range of environmental issues and degradation of infrastructure (corrosion).

Standard impacts that may result from Actual ASS include (Department of Water and Environmental Regulation, no date; and CSIRO, 2020):

- Acidification of water bodies and associated water quality issues.
- Deoxygenation of water bodies (kills aquatic life).
- Noxious gas release.
- Damage to human and animal health (direct contact with sulfuric material can cause skin irritation or burns in extreme cases).
- Impacts to soil including soil acidification, release and mobilisation of heavy metals (can be toxic), nutrient deficiencies and decreased soil microbes.
- Structural damage and corrosion of steel and concrete structures due to acidity, resulting in considerable ongoing maintenance costs.

A number of soil investigations have been undertaken on Norfolk Island over previous decades. These investigations have all identified the possibility of Potential ASS or Actual ASS in areas of KAVHA. More recently the presence of ASS has been confirmed in various locations:

- *A Soils and Land Use Study of the Australian Territory of Norfolk Island, South Pacific Ocean* (Stephens and Hutton, 1954).

This study did not identify or map ASS¹. However, it did document that, in some places where drainage is restricted, Acid Swamp Soils (Unnamed Peaty Swamp Soils) have developed. An area of Acid Swamp Soils was mapped in KAVHA – refer **Figure 7.2-3**

- *Norfolk Island Report on Geotechnical Soils Investigations* (Parsons Brinkerhoff, 2005)

This study adopted the Acid Swamp Soils (Unnamed Peaty Swamp Soils) mapping from Stephens and Hutton (1954) and included the area of Unnamed Swamp Soil on the KAVHA valley floor in their soil classifications (refer **Figure 7.2-2**). The Unnamed Swamp Soil was described as ‘soil with restricted drainage and potential for ASS’.

¹ ASS was only formally recognised in 1973

- *Norfolk Island Water Resource Assessment: Options for Improving the Resilience of Norfolk Island to Extended Dry Spells* (CSIRO, 2020)

This study identified and mapped soil types across Norfolk Island. Investigations in KAVHA were limited by constraints to disturbance of a World Heritage site and the investigation was limited to eight geotechnical core samples with a maximum depth of two metres.

During the investigation of soils in KAVHA, the Acid Swamp Soils / Unnamed Peaty Swamp Soils that were identified by Stephens and Hutton (1954) and adopted by Parsons Brinkerhoff (2005) were not identified. The eight inspection sites showed the whole area has been filled with sediment and other man made materials.

Whilst ASS was identified in other lower landscape positions in creek lines on Norfolk Island (refer **Figure 7.2-4**), it was not identified in KAVHA. This indicates that if peat soil, Potential ASS or Actual ASS is present, it would be contained in creek beds and located at depths greater than two metres.

- *Acid Sulfate Soil Management in the Kingston and Arthur's Vale Historic Area (KAVHA) on Norfolk Island* (CSIRO, 2023)

Further to the CSIRO 2020 study, this study identified ASS in Watermill Dam (two locations), Watermill Creek downstream of Watermill Dam and Watermill Creek adjacent to the Pier Street Bridge. It also identified extensive areas of ASS along Watermill Creek in the wetland / swampland areas associated with the creek (refer **Figure 7.2-5**). This area aligns with the area of Acid Swamp Soil / Unnamed Swamp Soil identified in previous studies

The three subtypes of ASS identified in the Proposal area and surrounds are:

- Hypersulfidic material (Potential ASS) – This material is black peaty loam with high levels of organic plant material that has formed under waterlogged or saturated conditions. If exposed to air, this material will become acidic sulfuric material (Actual ASS). Exposure to air could be caused by either physical disturbance of the soil or by natural wetting and drying that occurs during flooding / drought cycles.
- Monosulfidic material (Potential ASS) – This material is a black peaty loam with gel consistency commonly found in shallow dams and wetlands. It is formed under waterlogged conditions. When monosulfidic soils are disturbed in dams and streams, this material will become Actual ASS which removes most of the oxygen from the water. Monosulfidic material is more volatile than Hypersulfidic material and oxidises rapidly to produce free iron and acidity (Actual ASS).
- Sulfuric materials (Actual ASS) – This material is located in the upper levels of the soil profile and contains high levels of sulfuric acid. It is formed by the exposure to air and consequent oxidation of the hypersulfidic material and / or monosulfidic material when disturbed or drained or drying during droughts. The pH of this material is less than four (very acidic on the pH scale).

The location of the subtypes of ASS in the Proposal area are:

- Watermill Dam has Dominant ASS with hypersulfidic and monosulfidic materials (Potential for occurrence of Dominant ASS is greater than 80 percent).
- Watermill Creek drain with wetland vegetation has Moderate ASS with hypersulfidic material (Potential for occurrence of Moderate ASS is 20 to 50 percent).
- Watermill Creek and the adjacent Kingston Commons area when flooded has Minor ASS with hypersulfidic material (Potential for occurrence of Minor ASS is less than 20 percent).

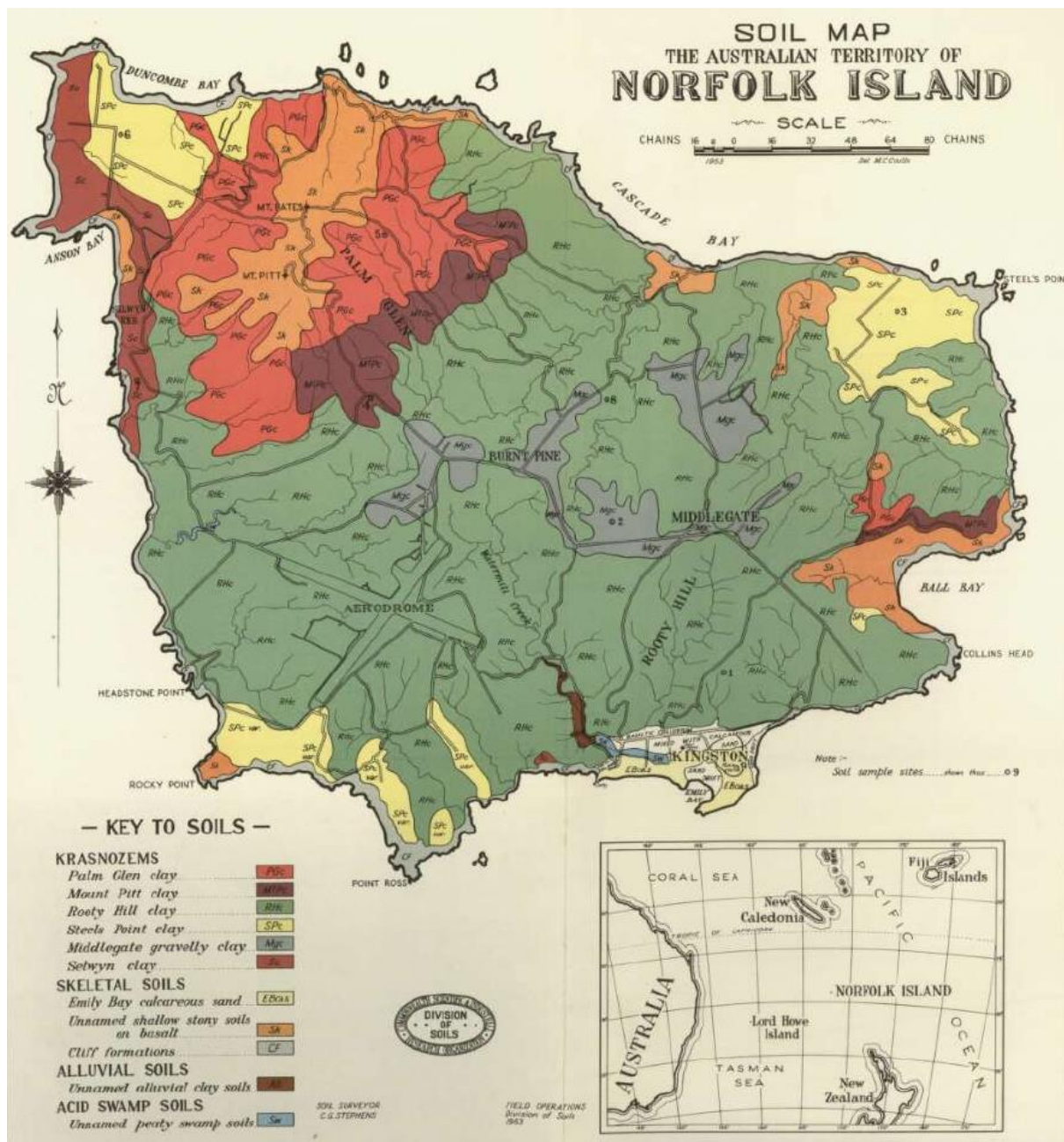


Figure 7.2-3: Soil mapping showing acid swamp soils in KAVHA
(Source: Stephens and Hutton, 1954)



Figure 7.2-4: Location of acid peat soils mapped by on-ground observations and air photo interpretation of 2019 light detection and ranging (LiDAR) imagery
(Source: CSIRO, 2020)

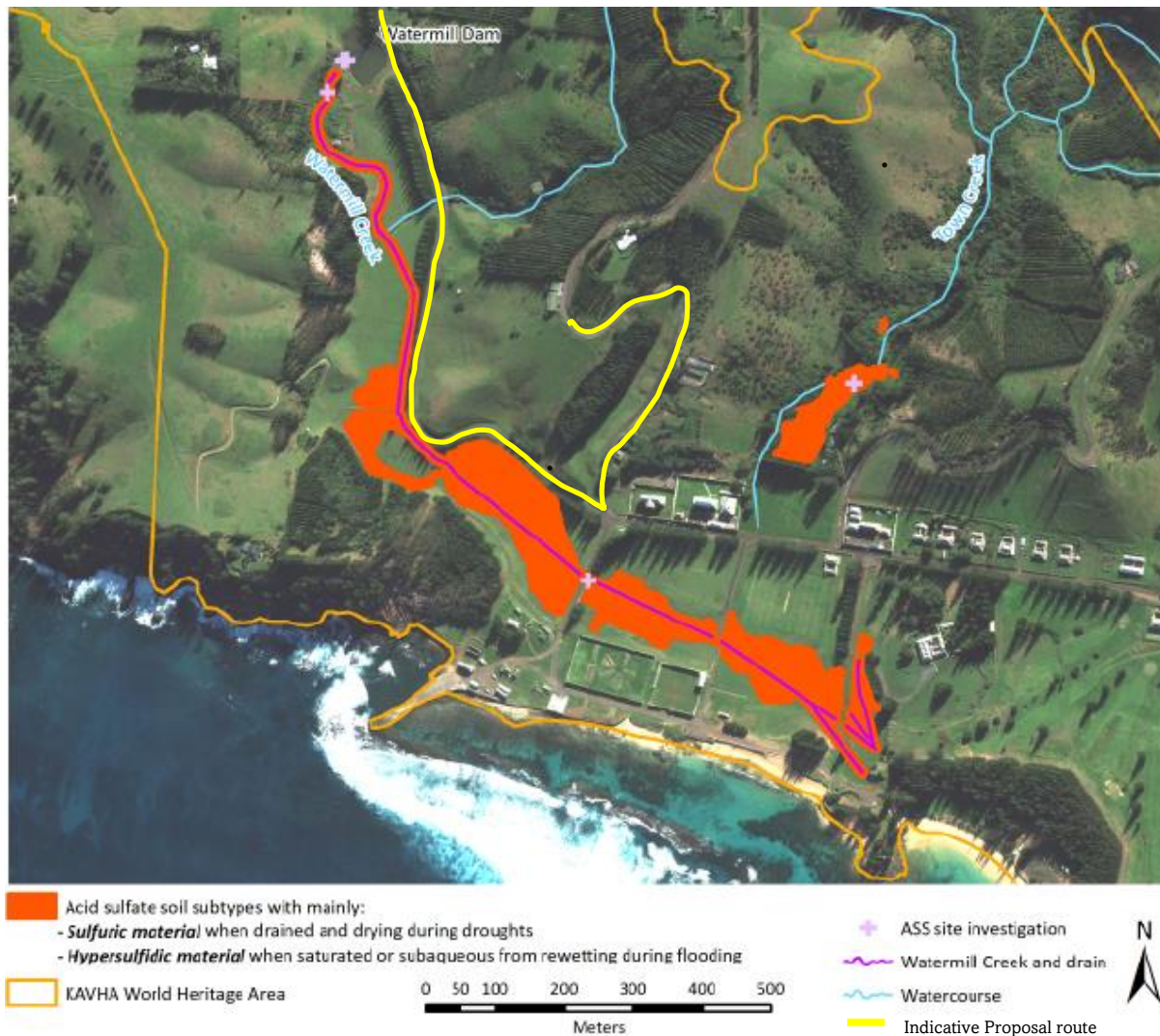


Figure 7.2-5: Location of acid sulfate soil subtypes mapped in KAVHA

(Source: CSIRO, 2023)

7.2.1.3 Soil contamination

Contamination sources in the Proposal area

Human waste pollution

Sewage has been leaking and leeching from septic treatment systems and defective sewage holding tanks in KAVHA for many years resulting in localised soil contamination.

Most septic treatment systems and sewage holding tanks on Crown land in Kingston were sealed during interim remediation works in 2021 (refer **Section 2.2.1**) and are currently being sewered under Stage 1 of the Project. These properties have not been a source of human waste pollution since that time.

During the preparation of the environmental impact assessment for Stage 1 of the Project, DITRDCA and NIRC (Public Health and Environment) undertook surface soil testing to measure levels of pathogens and nutrients in soil around existing septic tanks and sewage holding tanks in Kingston. This testing was undertaken in an attempt to demonstrate bioremediation of legacy human waste contamination, and resultant improvements in soil quality, following the interim tank sealing remediation works undertaken in 2021 (refer **Section 2.2.1**).

The soil testing methodology and results are presented in Section 6.2 of the *Kingston and Arthur's Vale Historic Area Sewerage Scheme: Stage 1 Environmental Impact Statement (DITRDCA, 2022)*.

This testing determined that, in addition to human and animal waste pollution generated within Kingston and the Proposal area (Kingston surrounds), soil in this area also receives human and animal waste pollution, and nutrient loads (likely agricultural) from other areas of both the KAVHA catchment and the island, via overland surface water runoff during high rainfall events.

Some of this human waste pollution that flushes into Kingston would originate from freehold properties in and near the Proposal area which are serviced by septic treatment systems or sewage holding tanks. Many of these systems are expected to be poorly maintained and defective (NIRC, 2021).

Faecal contamination from cattle and birds

Faecal contamination from animals (cattle, birds, domestic animals etc.) is widespread across Norfolk Island. Animal faecal contamination is both deposited directly, and flushed into the Proposal area via overland surface water runoff from other areas of the island.

7.2.2 Potential impacts

7.2.2.1 Construction

Erosion and sedimentation

Construction of the Proposal would require disturbance of the soil in the construction footprint. The construction footprint would be located primarily in Rooty Hill Clay with a small section near the PS3 site located in Basaltic Colluvium mixed with Calcareous Sand. The Proposal area (outside the construction footprint) also includes Unnamed Swamp Soil (ASS) and Selwyn Clay soil types.

During excavation, these soil types may be susceptible to erosion and sedimentation as a result of high winds and surface water runoff during heavy rainfall events. Disturbed soil is expected to be contaminated with human waste and measures would be required to prevent mobilisation of soil and any contaminants it may contain.

Earthworks and excavations are described in **Section 4.6.2**.

Impacts of wind erosion are addressed in **Section 7.8** and would be managed using standard construction methods and standard mitigation and management measures.

Excessive surface water runoff during periods of high rainfall could inundate the construction site causing erosion and sediment runoff toward downstream waterbodies including Watermill Dam, Watermill Creek, associated wetlands / swampland and ultimately, Emily Bay and Slaughter Bay in the Norfolk Marine Park.

Watermill Dam and sections of Watermill Creek and associated swampland are located in the Proposal area immediately adjacent to the construction footprint. Particular care would be taken to prevent erosion and sedimentation into these water bodies.

Impacts of erosion and sedimentation caused by surface water runoff would be mitigated and managed using standard construction methods and standard mitigation and management measures implemented in accordance with the 'Blue Book', the NSW Department of Environment and Climate Change's *Managing Urban Stormwater: Soils and Construction - Volume 2A Installation of Services* (Landcom, 2008).

As recommended in the 'Blue Book', an Erosion and Sediment Control Plan has been prepared for the Proposal as shown in **Figure 7.2-6** to **Figure 7.2-9**. Further detail is available at Section 9.0 and Appendix 2 - Sheets for PS3, PS4, PS5 and PS6 at pages Appendix 2 of **Appendix C**.



Figure 7.2-6: Erosion and Sediment Control Plan (indicative) - PS3 site

(Source: Fluent Solutions, 2023b, Section 9.0 and Appendix 2 - Sheet for PS3 of Appendix 2 of **Appendix C**)

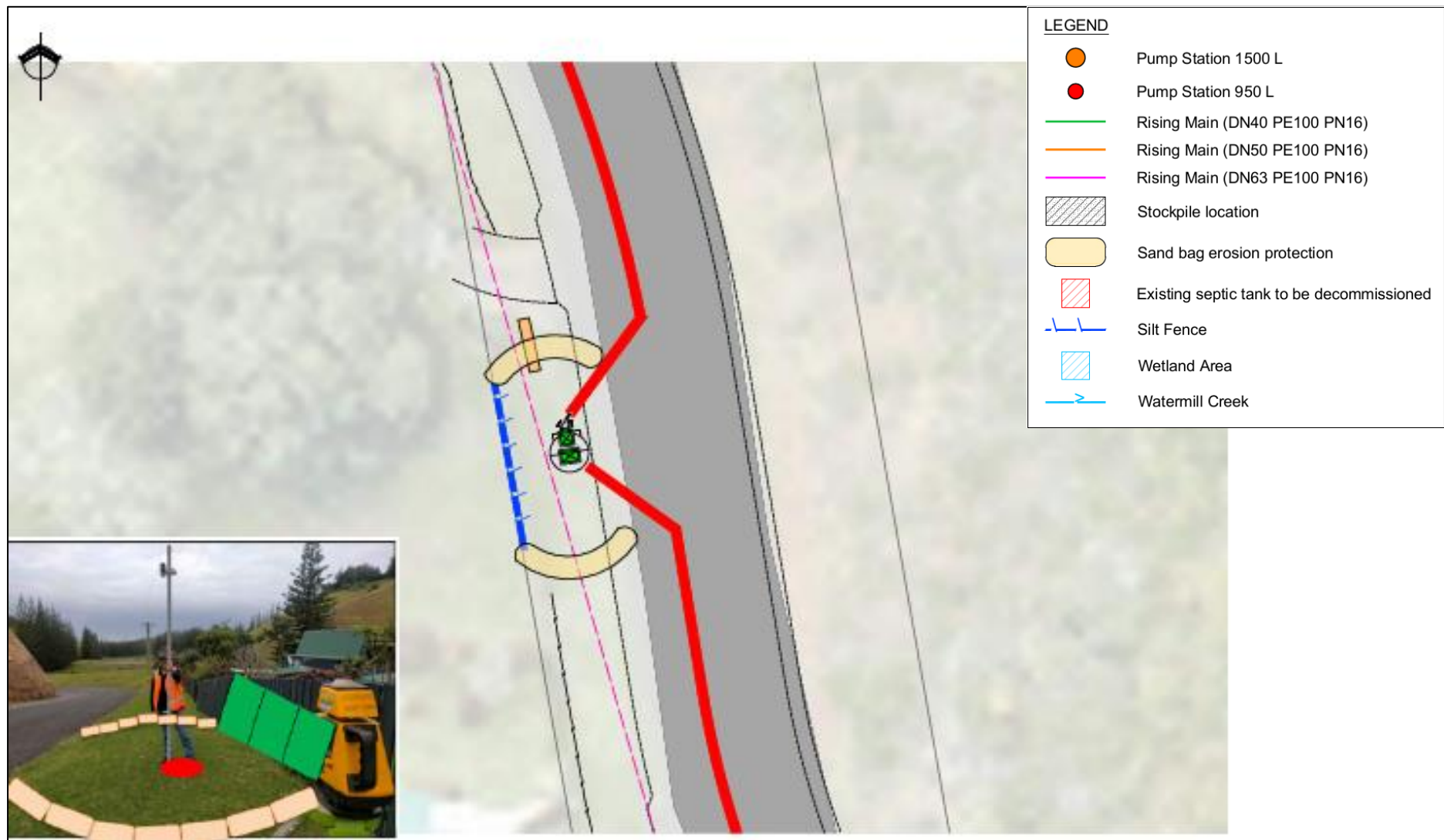


Figure 7.2-7: Erosion and Sediment Control Plan (indicative) – PS4 site

(Source: Fluent Solutions, 2023b, Section 9.0 and Appendix 2 - Sheet for PS4 of Appendix 2 of **Appendix C**)



Figure 7.2-8: Erosion and Sediment Control Plan (indicative) – PS5 site

(Source: Fluent Solutions, 2023b, Section 9.0 and Appendix 2 - Sheet for PS5 of Appendix 2 of **Appendix C**)



Figure 7.2-9 : Erosion and Sediment Control Plan (indicative) – PS6 site

(Source: Fluent Solutions, 2023b, Section 9.0 and Appendix 2 - Sheet for PS6 of Appendix 2 of **Appendix C**)

In addition to the controls included in the Erosion and Sediment Control Plan (**Figure 7.2-6 to Figure 7.2-9**), sandbags would be used as needed to prevent stormwater from uphill areas eroding soil from the construction site and causing sedimentation into downstream environments. Subject to implementation of the Erosion and Sediment Control Plan and the safeguards and mitigation measures detailed in **Section 7.2.3.1** it is expected that sediment (and any soil contaminants) would be contained within the construction site and that there would be no impact to downstream environments.

Acid sulfate soils

The construction footprint for the Proposal is located outside areas of identified ASS materials.

However, sections of the construction footprint would be located in the Country Road reserve immediately adjacent to the following areas which have all been identified as ASS:

- Watermill Dam.
- Watermill Creek.
- The currently flooded swampland that aligns with the area of Unnamed Swamp Soil with documented ASS potential (refer **Figure 7.2-2**).

Although the construction footprint is located outside areas of ASS identified by the CSIRO (CSIRO, 2023) (refer **Figure 7.2-5**), given the close proximity of the construction footprint to areas of known ASS, it has been assumed that interaction with ASS during construction of the Proposal is possible. For example, areas of ASS may extend beyond the swampland and underneath the sealed roadway of Country Road which would be disturbed during construction.

In the event that Potential ASS or Actual ASS was disturbed during construction, the sulphuric acid and iron rich leachate resulting from the development of Actual ASS could have environmental and structural impacts in affected areas if not adequately managed.

Whilst this scenario is considered unlikely, DITRDCA met with the CSIRO on 18 October 2023 regarding the risk of encountering ASS during construction of the Proposal and a preferred assessment / management approach. During the meeting it was agreed that:

- All the swampland immediately adjacent to Country Road is considered to be ASS – This is the area mapped in previous studies as Acid Swamp Soils / Unnamed Peaty Swamp Soils.
- The risk of encountering ASS under the road surface or on the opposite side of Country Road to the swamp area is not high, but there is still a risk.
- Possible options to assess / manage this risk would be to use safeguards and management measures implemented for Stage 1² of the Project plus either / or:
 - Option 1: Pre-construction core samples along the proposed route in high risk area to test for presence of ASS at construction depths prior to commencement of construction.
 - Option 2: Supervision of excavation in high risk areas by a qualified and experienced soil scientist conjunction with the CSIRO.
 - Option 3: Implementation of both Options 1 and 2 if ASS is identified in pre-construction core samples.

DITRDCA has engaged the CSIRO to undertake Option 1 (pre-construction core samples). The outcomes of the analysis of the core samples will clarify the risk of encountering ASS and identify the

² In the unlikely event that pre-construction core samples do not identify the presence of Potential ASS or Actual ASS, and Potential ASS or Actual ASS is encountered during construction:

- Stop work in the affected area.
- Apply lime, or another appropriate alkaline product, to the site to lower the pH of the soil.
- Backfill the affected area to minimise further exposure to oxygen.
- Contact a suitably qualified soil scientist to seek guidance on required soil management actions.

need for the development of an ASS Management Plan. Core sample testing is scheduled to commence in the week starting 11 March 2023.

To minimise risk of encountering unexpected ASS (Potential or Actual), additional mitigation measures from the Queensland Government Science Division *Acid Sulfate Soil Technical Manual, Soil Management Guidelines v4.0*. have been incorporated into the construction methodology 'just in case'. Measures incorporated include:

- Open excavations would be small scale (no longer than 30 cumulative linear metres) to minimise the time in which soils are exposed to oxygen.
- Trenches would be shallow (less than one metre deep) to avoid any need for draining or dewatering thereby avoiding groundwater fluctuations which could expose Potential ASS to oxygen.
- Only clean fill would be used, sourced from the site and supplemented (if required) with soil from the KAVHA materials stockpile (currently located adjacent to Watermill Dam).

Soil contamination

- Human waste contamination

The Proposal area is subject to ongoing human waste contamination originating from both within the Proposal area and from external sources, especially during periods of high rainfall.

Any human waste contamination present in the soil disturbed during construction would be managed by default as a result of management of erosion and sedimentation.

- Faecal contamination from cattle and birds

Faecal contamination from animals is widespread across Norfolk Island and is not contained to the Proposal area. Notwithstanding, any animal faecal contamination present in the soil disturbed during construction would be managed by default as a result of management of erosion and sedimentation.

- Fuels and oils

Construction activities have the potential to cause soil contamination from accidental spills of fuels and oils. Spillages could result in adverse impacts on soils and on the surrounding environment. Fuels and oils would be managed as detailed in **Section 7.10.2** to minimise this risk.

7.2.2.2 Operation

The key operational impact of the Project on soil in Kingston would be positive – i.e. the elimination of ongoing human waste contamination (pathogens and nutrients) from occupied buildings on Crown land in Kingston. The Proposal (Stage 2 of the Project) would convey sewage collected from Kingston directly to the NIRC Water Assurance Scheme, removing the need for the 'end of line' sewage holding tanks (and associated risks of sewage spills and consequent soil pollution) that were approved as part of Stage 1 of the Project (refer **Section 4.3.2**).

The potential adverse impacts of operation of the Proposal would be limited to potential sewage spills and consequent soil contamination in the event of operational system failure. The Proposal has been designed to minimise the risk of operational spills (Fluent Solutions, 2023):

- The sewerage system is sealed and is not at risk of infiltration by water during heavy rainfall events or floods.
- Sections of the system can be isolated and emptied for maintenance.
- The sewage pumping stations are alarmed and would issue the following alerts in the event of a pump failure or other maintenance issue:
 - An SMS alert to the system operator.
 - A digital alert to the upstream / downstream sewage pumping station(s) to stop them pumping if required.

- the following alerts in the event of a pump failure or other maintenance issue:
 - An SMS alert to the system operator.
 - A digital alert to the upstream / downstream sewage pumping station(s) to stop them pumping if required.

Consequently, no pollution of soil is expected subject to proper maintenance of the sewerage scheme. Refer to **Section 4.4** for further information on the design of the Proposal.

7.2.3 Safeguards and management measures

Safeguards and management measures would be implemented to avoid, minimise or mitigate the potential impacts of the Proposal on geology and soils.

7.2.3.1 Construction

Erosion and sedimentation

- Implement safeguards and management measures to address air quality (wind blown dust) impacts during construction as described in **Section 7.8.3**.
- Implement the Erosion and Sediment Control Plan including:

Site management

- Keep roads and access tracks clear of soil or sediment.
- Limit vehicle and machinery movements to existing roads and access tracks where possible.

Erosion and sediment control measures

- Monitor weather forecasts regularly.
- Do not undertake construction activities if rainfall is forecast for that day.
- Do not undertake construction activities during or immediately following wet weather.
- Install erosion and sediment control measures progressively along the construction route in areas where there is potential for sediment movement or surface water runoff. Erosion and sediment control measures include, but are not limited to:
 - Sandbag walls about 0.5 – 1 metre high.
 - Wind erosion protection fencing in less protected areas of the construction site (if required).
- Install erosion and sediment control measures as shown in **Figure 7.2-6** to **Figure 7.2-9** prior to the commencement of each area of excavation.
- Supplement erosion and sediment control measures as required to prevent sediment leaving the construction site.
- Maintain erosion and sediment control measures in good working order until excavations are backfilled, all stockpiles are removed from the impacted area and the site is cleaned up.
- Limit excavations to a linear length of about 30 cumulative linear metres at any one time.
- Locate excavated soil away from drains and creeks.
- Store excavated soil uphill of excavations and downhill of sandbag walls (refer **Figure 7.2- 10**).
- Backfill open excavations at the end of every working day with the exception of small areas that must be left open to enable work to continue the next day (maximum 2.5 square metres) or to enable proper management of an unexpected archaeological find (refer to **Section 4.6.2**).

- Sandbag, cover and fence any excavated area left open at the end of the day for erosion protection, and safety.
- Cover any piles of soil that have not been depleted at the end of each day to prevent erosion or movement of sediment (wind and water protection).

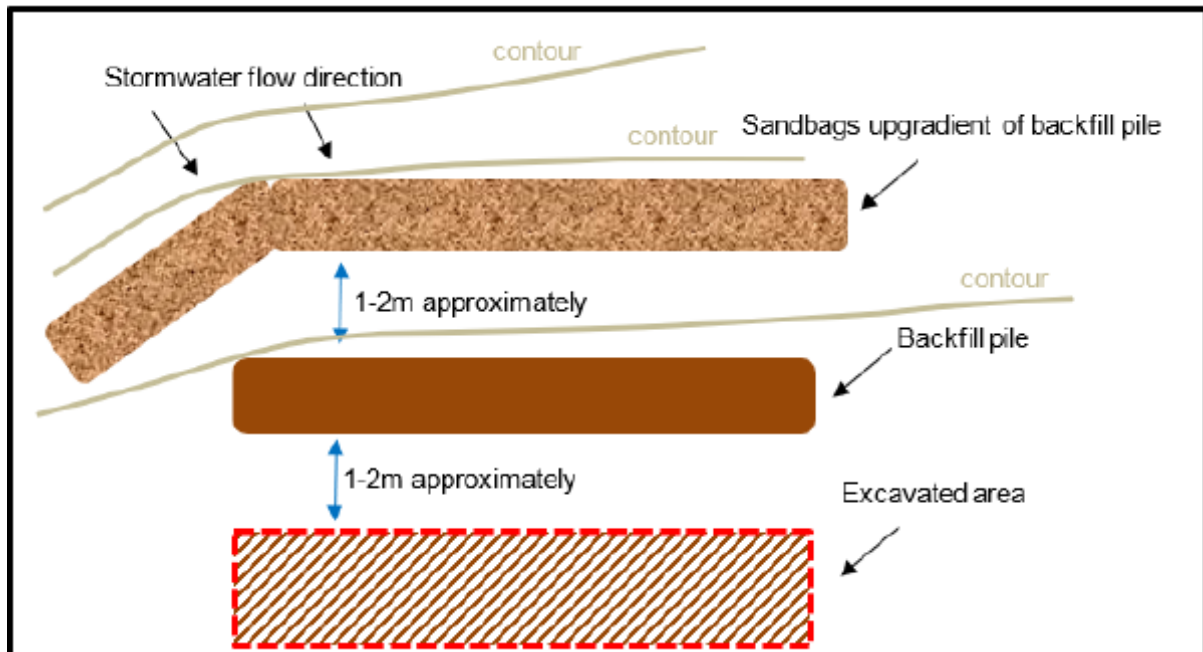


Figure 7.2-10 Site specific example layout of typical trench / excavation working section

Acid sulfate soils

Construction would not be commenced in the section of Country Road adjacent to areas of known ASS until the pre-construction core samples have been taken at construction depths and analysed for presence of ASS (refer **Section 7.2.2.1**).

Should pre-construction core samples in the Country Road construction footprint identify the presence of Potential ASS or Actual ASS, an ASS Management Plan would be developed prior to the commencement of construction in the affected area. This plan would be developed by suitably qualified personnel with acid sulfate soils expertise, such as a Registered Soil Practitioner – Acid Sulfate Soil by accreditation through Soil Science Australia (<https://www.soilscienceaustralia.org.au/rsp/acid-sulfate-soil-accreditation>).

In the unlikely event that pre-construction core samples do not identify the presence of Potential ASS or Actual ASS, and Potential ASS or Actual ASS is encountered during construction:

- Stop work in the affected area.
- Apply lime, or another appropriate alkaline product, to the site to lower the pH of the soil.
- Backfill the affected area to minimise further exposure to oxygen.
- Contact a suitably qualified soil scientist with acid sulfate soils experience (such as a Registered Soil Practitioner – Acid Sulfate Soil by accreditation through Soil Science Australia (<https://www.soilscienceaustralia.org.au/rsp/acid-sulfate-soil-accreditation>)) to seek guidance on required soil management actions.

7.2.3.2 Operation

- Implement safeguards and management measures to address potential impacts of soil contamination resulting from operational failure of the Proposal as described in **Section 7.1.3**.

7.3 Biodiversity

7.3.1 Methodology

A desktop assessment of biodiversity in the Proposal area and surrounds was undertaken to inform this environmental assessment. Documents reviewed during this assessment include:

- Plans of Management for Norfolk Island Public Reserves including Kingston Common Reserve; Kingston Recreation Reserve; Government House Grounds Reserve; War Memorial Reserve and Point Hunter Reserve (Norfolk Island Parks and Forestry Service, 2003).
- *Norfolk Island Region Threatened Species Recovery Plan* (Director of National Parks, Commonwealth of Australia, 2010).
- *Draft Norfolk Island Region Threatened Species Recovery Plan* (Director of National Parks, Commonwealth of Australia, 2023). Note: This draft report has been referenced as it contains the most current information.
- *The Native Plant Communities of Norfolk Island* (Invasive Species Council and TierraMar, 2021).
- Australian Marine Parks, Temperate East Marine Parks Network Management Plan 2018 (Director of National Parks, Commonwealth of Australia, 2018).
- An assessment of impacts on threatened species and threatened ecological communities protected under the EPBC Act which was undertaken by DITRDCA to inform the EPBC Referral for Stage 1 of the Project in 2022 (DITRDCA 2022a).

The following environments have been included in the assessment due to potential for direct impact to flora and fauna in the Proposal area and indirect impact to flora and fauna outside the Proposal area in downstream environments:

- Construction footprint and Proposal area.
- Freshwater aquatic environment.
- Coastal environment
- Marine environment.

7.3.2 Existing environment

7.3.2.1 The construction footprint

The construction footprint for the Proposal is located wholly within the road reserves of Country Road / Taylors Road and Middlegate Road, with the following exceptions:

- Sewage pumping station (PS3) and the associated underground emergency sewage storage tank which would be installed in the Kingston Common Reserve near the intersection of Middlegate Road, Country Road, Quality Row and Pier Street.
- The temporary construction compound which would be located next to the existing KAVHA materials stockpile and near Watermill Dam.

The construction footprint would be contained within the road pavement except at the four sewage pumping station locations and the construction compound site.

All areas of the construction footprint that are located outside the road pavement are highly disturbed and grassed (refer **Figure 7.3-1**).

No native or threatened flora or fauna inhabit the area included in the construction footprint.

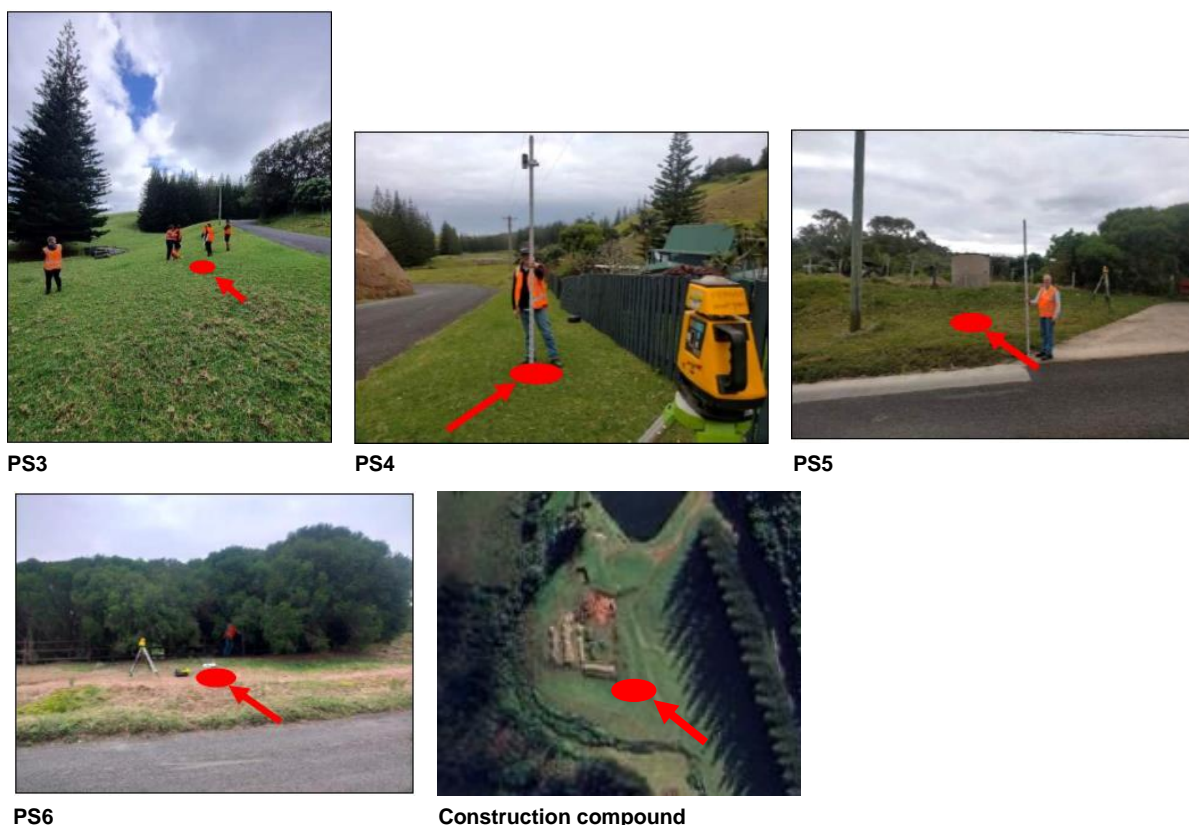


Figure 7.3-1: Sewage pumping station and construction compound sites
(Source: Fluent solutions, 2023)

7.3.2.2 The Proposal area

The Proposal area is highly modified and comprises paved roadways surrounded by mown and / or grazed exotic grassland (generally Kikuyu (*Pennisetum clandestinum*)) and a freshwater swamp at the southern end of the Proposal area and residential developments which increase in density toward the northern end of the Proposal area (refer **Figure 4.1**).

All three road reserves are highly disturbed and the areas outside the road pavement generally comprise either grassy slopes or rocky cuttings.

Grassed areas are either regularly mowed for grounds maintenance purposes or grazed by cattle and have no significant habitat value (Norfolk Island Parks and Forestry Service, 2003).

Flora

Significant vegetation in the Proposal area includes:

- Norfolk Island Pine (*Araucaria heterophylla*)¹ plantings along Country Road (refer **Figure 7.3-2**).
- Areas of non-remnant vegetation which includes plantations of Norfolk Island Pine trees (*Araucaria heterophylla*)¹ in the valleys on either side of Middlegate Road (refer **Figure 7.3-3**).
- Native Freshwater Swamp Plant Community in the swampland that adjoins Country Road at the southern end of the Proposal area. (refer **Figure 7.3.3** and **Section 7.3.2.3**).

¹ The Norfolk Island Pine tree (*Araucaria heterophylla*) is protected under the *Trees Act 1997 (NI)* and the *Trees Regulation 1999 (NI)*.



Figure 7.3-2: Norfolk Island Pine tree plantings along Country Road

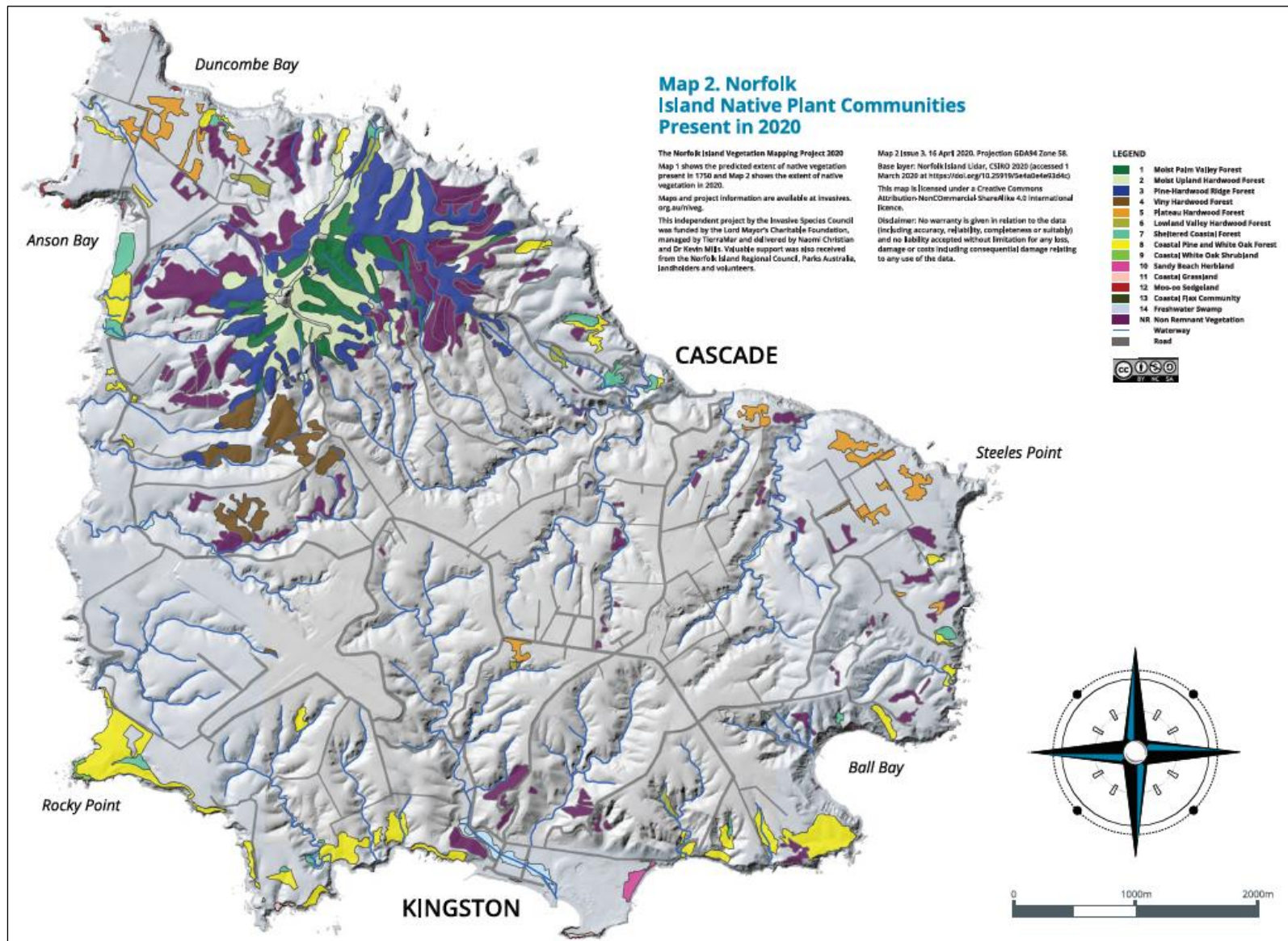


Figure 7.3-3: Location of Norfolk Island plant communities in 2020
 (Source: Invasive Species Council and TerraMar, 2021)

Vegetation throughout the remainder of the Proposal area generally comprises woody weeds, pastures and exotic gardens. Grassed areas are either regularly mowed for grounds maintenance purposes or grazed by cattle and have no significant habitat value (Norfolk Island Parks and Forestry Service, 2003).

Three threatened EPBC listed plant species have been recorded in the Kingston Common Reserve (Director of National Parks, 2023):

- Coastal coprosma (*Coprosma baueri*): Endangered.
- Ti (*Cordyline oblecta*): Vulnerable.
- Beech (*Myrsine ralstoniae*): Vulnerable.

These species are all located outside the Proposal area in the Coastal Pines and White Oak Forest to the south and would not be impacted by the Proposal (refer **Figure 7.3-4**). No other threatened plant species are located in or near the Proposal area (refer **Figure 7.3-5**).

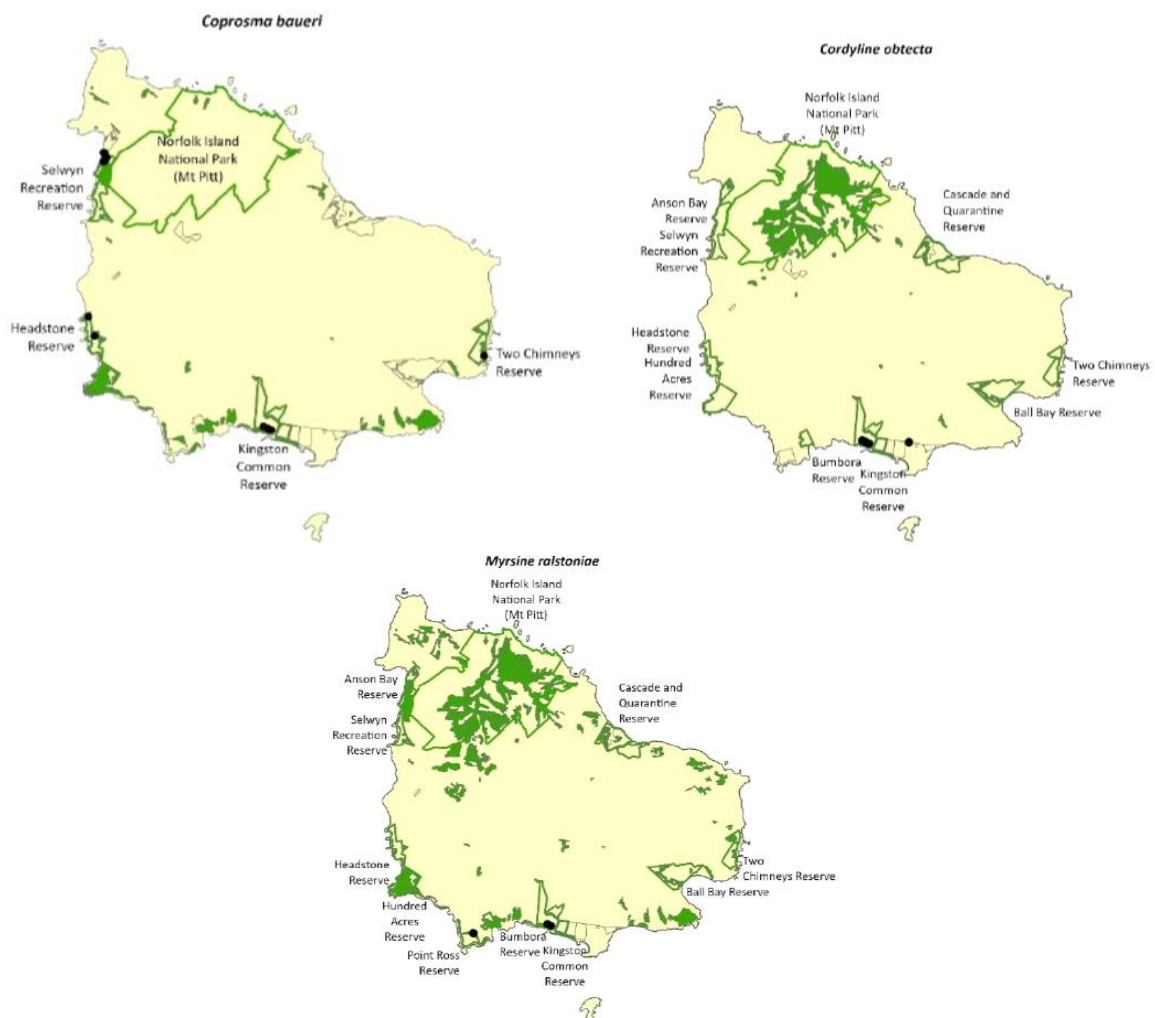


Figure 7.3-4 Location of threatened plant species in Kingston Common Reserve

Note: Black dots represent threatened species distribution
(Source: Director of National Parks, 2023)

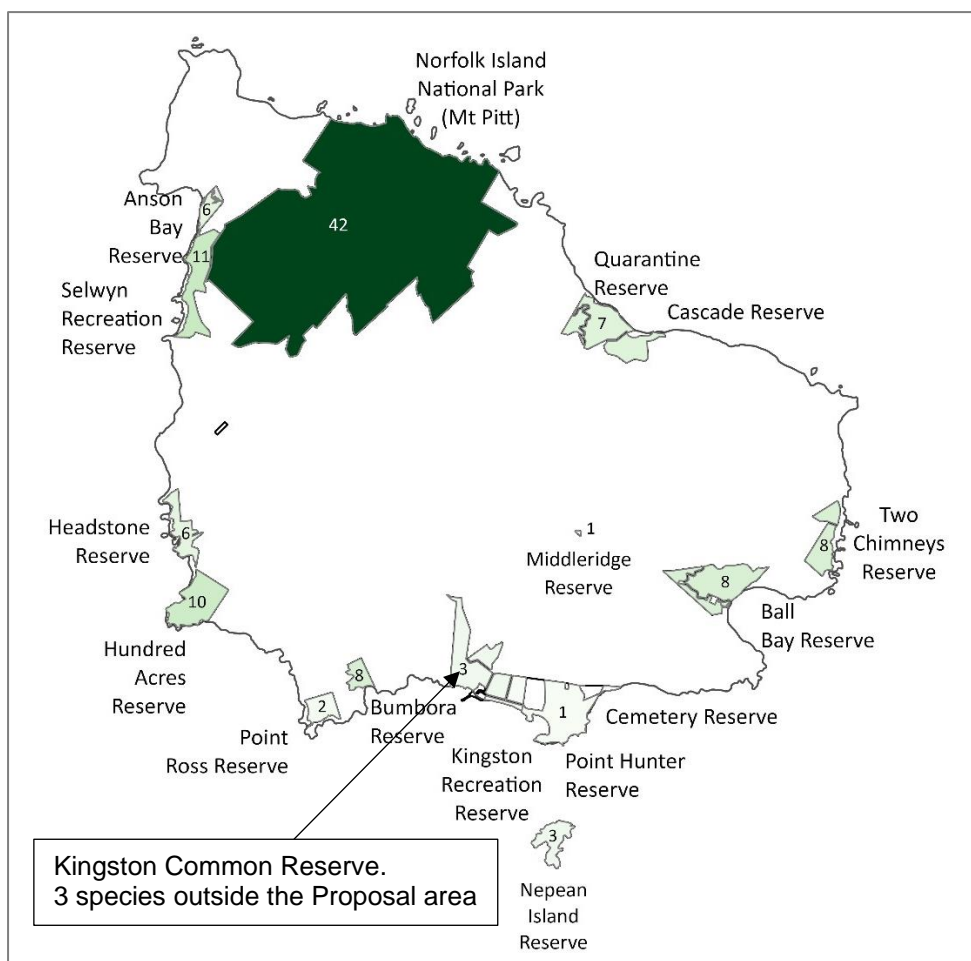


Figure 7.3-5: Number of threatened plant species in each park and reserve on the Norfolk Island.
(Source: Director of National Parks, 2023)

Fauna

Cattle graze throughout the Proposal area, except areas from which they are excluded.

The grassy areas in and around the Proposal area are predominantly frequented by introduced bird species including but not limited to: Mallard (*Anas platyrhynchos*); Feral Chicken (*Gallus gallus*), Feral Goose (*Anser domesticus*); Australian Kestrel (*Falco cenchroides*); European Goldfinch (*Carduelis carduelis*), House Sparrow (*Passer domesticus*) and Common Starling (*Sternus vulgaris*).

The introduced Crimson Rosella (*Platycercus elegans*) and the native: Sacred Kingfisher (*Halcyon sancta*); Grey-breasted Silvereye (*Zosterops lateralis*); and Grey Gerygone (*Gerygone madesta*) have also been sighted in the open area, although less frequently (Norfolk Island Parks and Forestry Service, 2003).

No threatened or protected bird species inhabit the Proposal area (refer **Figure 7.3-6**), with the possible exception of the Endangered EPBC listed Norfolk Island Morepork (*Ninox novaeseelandiae undulata*) who's range movement covers the whole of Norfolk Island (Director of National Parks, 2023).

No threatened molluscs or threatened reptiles inhabit the Proposal area and surrounds (Director of National Parks, 2023).

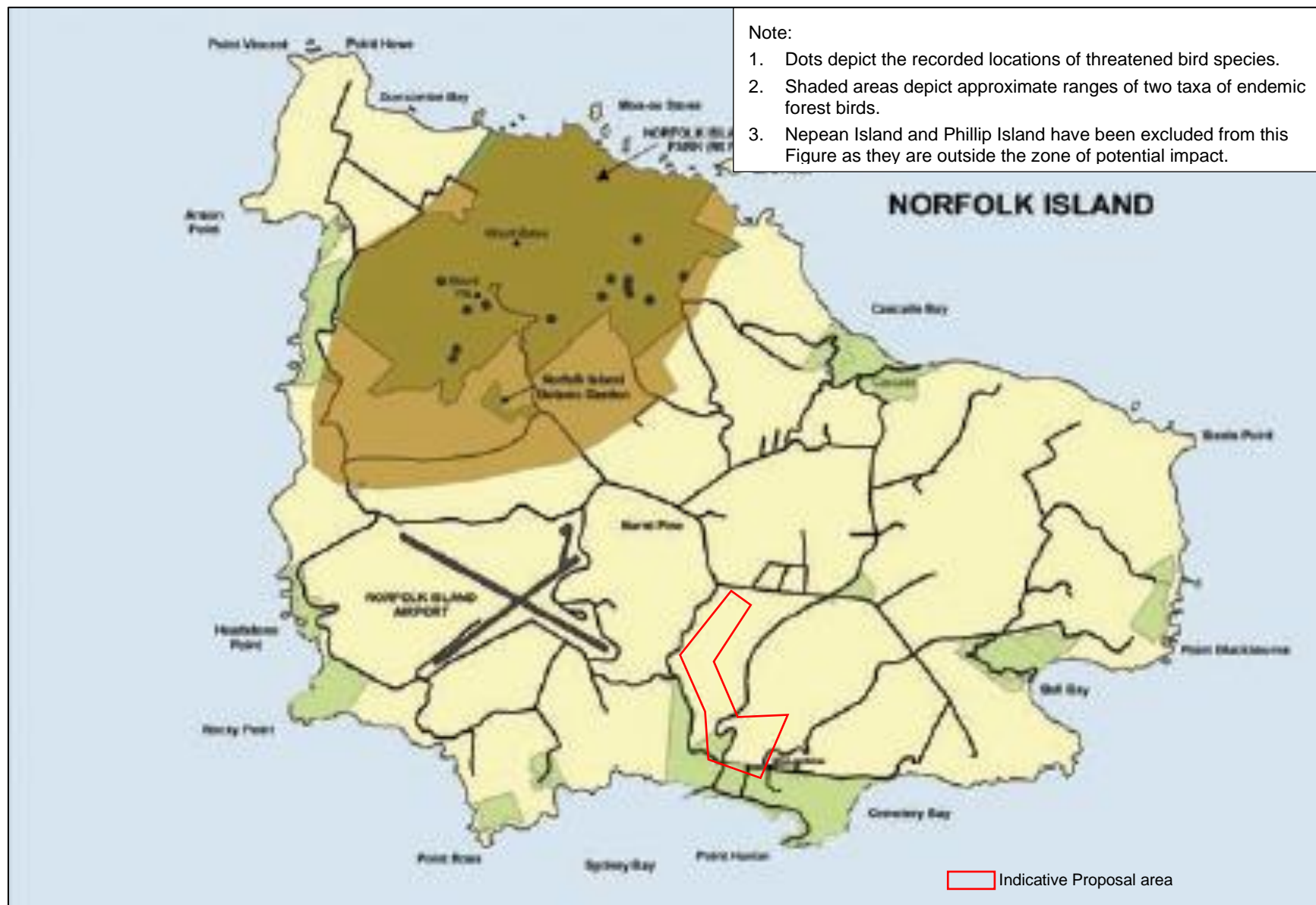


Figure 7.3-6: Distribution of threatened bird species (excluding migratory species)
 (Source: Director of National Parks, Commonwealth of Australia, 2010).

7.3.2.3 Freshwater aquatic environment.

The freshwater aquatic environment discussed in this section includes Watermill Dam, Watermill Creek and the wetland / swampland.

Flora

Recent mapping of the native plant communities of Norfolk Island (Invasive Species Council and TierraMar, 2021) identifies the vegetation in the wetland / swampland areas of Kingston as the Freshwater Swamp Plant Community (refer to **Figure 7.3-3**).

Key species in this community include: Club Rush (*Schoenoplectus tabernaemontani*); Drain Flax (*Typha orientalis*); Bull Rush (*Juncus continuus*); and Common Spike-rush (*Eleocharis acuta*). Other species include: Batwing Fern (*Histiopteris incisa*); Swamp Hibiscus (*Hibiscus diversifolius*), Slender Knotweed (*Persicaria decipiens*) and Crinum (*Crinum pedunculatum*). It is expected that this vegetation type would extend along Watermill Creek.

The Freshwater Swamp Plant Community does not include any threatened plant species (Invasive Species Council and TierraMar, 2021 and Director of National Parks, 2023).

No threatened plant species have been recorded in the freshwater aquatic environment (Director of National Parks, Commonwealth of Australia, 2023).

Fauna

Cattle graze throughout the swampland.

Watermill Creek supports two species of eel (Long-finned Eel (*Anguilla reinhardtii*) and Short-finned Eel (*Anguilla australis*)) and two species of endemic freshwater shrimp. Little else is known about native freshwater invertebrate and fish species in the area (Norfolk Island Parks and Forestry Service, 2003).

Small exotic pest fish species, mostly *Gambusia holbrooki* (Gambusia, mosquito fish) and *Poecilia reticulata* (guppies) have been found in most creek systems on Norfolk Island (Director of National Parks, 2023). It is unknown whether any of these species inhabit the freshwater wetland / swampland or Watermill Creek.

The wetland / swampland area is frequented by birds such as the White-faced Heron (*Ardea novaehollandiar*), Sacred Kingfisher (*Halcyon sancta*), and migratory waders, including but not limited to, the Ruddy Turnstone (*Arenaria interpres*), Pacific Golden Plover (*Pluvias fulva*), Bar Tailed Godwit (*Limosa lapponica*), Sharp-tailed Sandpiper (*Calidris acuminata*), Pectoral Sandpiper (*Calidris melanotos*); Red Knot (*Calidris canutus*) and Greenshank (*Tringa nebularia*) (Norfolk Island Parks and Forestry Service, 2003).

Other waterbirds, including some vagrants, that have also been observed in the freshwater environment include: Little Black Cormorant (*Phalacrocorax sulcirostris*), Cattle Egret (*Bubulcus Ibis*), South Island Pied Oyster Catcher (*Haematopus ostralegus finschchi*); Curlew Sandpiper (*Calidris ferruginea*), Terek Sandpiper (*Xenus cinereus*), Whimbrel (*Numenius phaeopus*), Masked Lapwing (*Vanellus miles*); Purple Swamphen (Tarler Bird) (*Porphyrio porphyrio*) and Silver Gull (*Larus novaehollandiae*) (Norfolk Island Parks and Forestry Service, 2003).

The following species are protected under the EPBC Act:

- Bar Tailed Godwit (*Limosa lapponica*): Threatened migratory species.
- Sharp-tailed Sandpiper (*Calidris acuminata*): Migratory species.
- Pectoral Sandpiper (*Calidris melanotos*): Migratory species.
- Red Knot (*Calidris canutus*): Threatened migratory species.
- Purple Swamphen (Tarler Bird) (*Porphyrio porphyrio*): Migratory species.

This list is not exhaustive but is intended to demonstrate that threatened and protected species inhabit and / or utilise the freshwater aquatic environment downstream of the Proposal area.

7.3.2.4 Coastal environment

The coastal environment discussed in this section includes Emily Bay, Slaughter Bay and the adjoining sand dunes and rocky outcrops.

Flora

Recent mapping of the native plant communities of Norfolk Island (Invasive Species Council and TierraMar, 2021) identifies the following native plant communities in coastal areas of Kingston downstream of the Proposal area (refer to **Figure 7.3-3**):

- Sandy Beach Herbland Plant Community: A small patch of vegetation growing in the sand at Slaughter Bay which is made up of typical sandy beach species (low growing non-woody plants).
Species in this community include: Salt Couch (*Sporobolus virginicus*); Coastal Spurge (*Euphorbia obliqua*); Native Vigna (*Vigna marina*); Norfolk Island Bean (*Canavalia rosea*); and Club Rush (*Ficinia nodosa*).
- Coastal Grassland Plant Community: A small patch of vegetation growing on the southern tip of Point Hunter which is made up of thick, salt tolerant grasses and sedges and grows in sandy coastal areas.
Species in this community may include: Salt Couch (*Sporobolus virginicus*); Chaff-flower (*Achyranthes aspera*), Pigface (*Carpobrotus glaucescens*), Native Spinach (*Tetragonia tetragonioides*), Chaff-flower (*Achyranthes aspera*), Pigface (*Carpobrotus glaucescens*), Yellow Daisy (*Senecio australis*) and Club Rush (*Ficinia nodosa*).

The *Norfolk Island Region Threatened Species Recovery Plan* (Director of National Parks, 2010) identifies the following additional coastal plant species in the coastal area of Kingston: Goats-foot Morning Glory (*Ipomoea pes-caprae*), and Knobby Club-rush (*Isolepsis nodosa*), although these were not identified in the 2023 draft recovery plan (Director of National Parks, 2023).

The only threatened plant species currently recorded in the coastal area of Kingston is the vulnerable Coastal Spurge (*Euphorbia obliqua*) (Director of National Parks, 2023). The vulnerable yellow daisy (*Senecio hooglandii*) was recorded in 2003 (Norfolk Island Parks and Forestry Service, 2003), but was not recorded during the recent development of the *Draft Norfolk Island Region Threatened Species Recovery Plan 2023* (Director of National Parks, 2023).

The following species are protected under the EPBC Act:

- Coastal Spurge (*Euphorbia obliqua*): Threatened species – Vulnerable.
- Daisy (*Senecio hooglandii*): Threatened species – Vulnerable (no longer recorded in the area).

The distribution of Coastal Spurge (*Euphorbia obliqua*) is shown in **Figure 7.3-7**.

The Norfolk Island Pine tree (*Araucaria heterophylla*) is common in the coastal environment, particularly in the sand dunes at the rear of Emily Bay. The Norfolk Island Pine tree is protected under the *Trees Act 1997 (NI)* and the *Trees Regulation 1999 (NI)*.

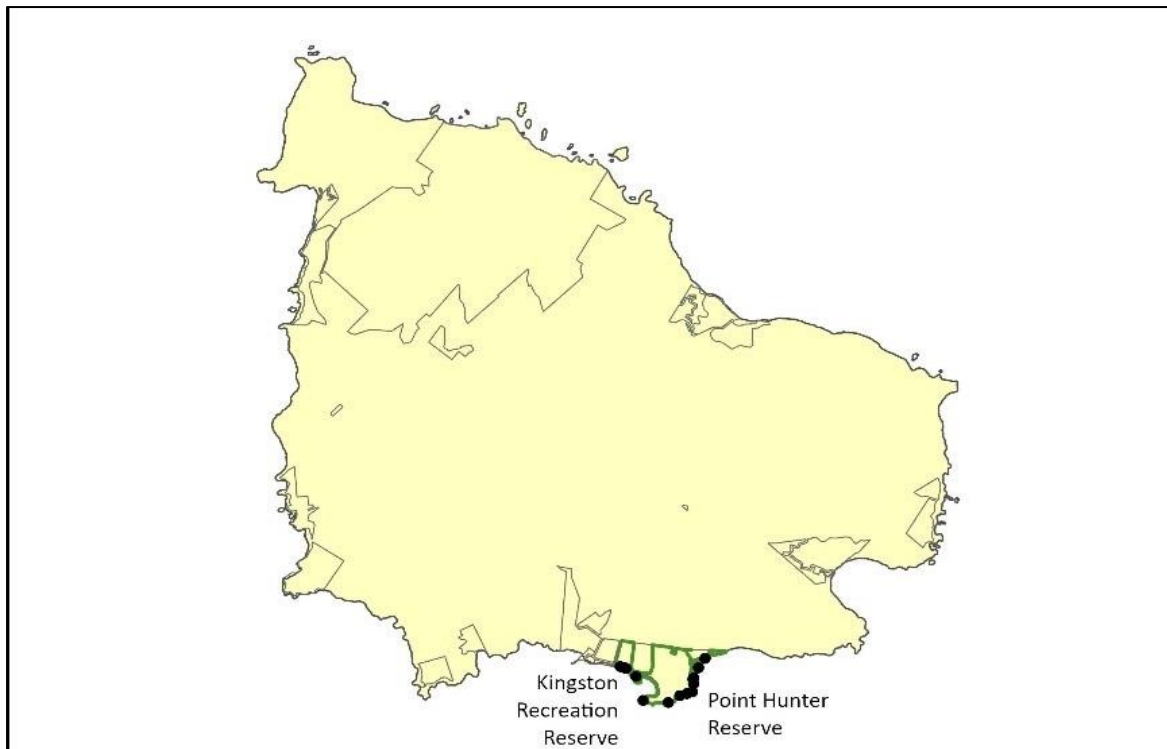


Figure 7.3-7 Distribution of Coastal Spurge (*Euphorbia obliqua*)

(Source: Director of National Parks, 2023)

Fauna

The only suitable seabird nesting habitat in Kingston is at Emily Bay and Cemetery Bay where migratory seabirds including: Wedge-tailed Shearwater (*Ardenna pacifica*) (Ghostbird); and Little Shearwater (*Puffinus assimilis*); have been known to burrow under the Norfolk Island Pine (*Araucaria heterophylla*) and White Oak (*Lagunaria patersonia* subsp. *patersonia*) trees during the October to May breeding season (Norfolk Island Parks and Forestry Service, 2003).

The following species are protected under the EPBC Act:

- Wedge-tailed Shearwaters (Ghostbirds) (*Ardenna pacifica*): Migratory species.
- Little Shearwater (*Puffinus assimilis*): Migratory species.

7.3.2.5 Marine environment

“The Norfolk Marine Park is significant because it contains habitats, species and ecological communities associated with the Norfolk Island Province. It includes two key ecological features: Norfolk Ridge, and the Tasman Front and eddy field, both valued for high productivity, aggregations of marine life, biodiversity and endemism.” (Director of National Parks, Commonwealth of Australia, 2018).

The mixing of warm-water and cold-water currents and eddies, and their interactions with underwater geological features transport Coral Sea biota including corals, crustaceans and molluscs to the Norfolk Marine Park and generate high biological productivity.

The Norfolk Marine Park includes the shallow waters up to the mean high water mark on Norfolk Island and adjoins the coastal environment of Kingston / KAVHA.

“The shallow-water habitats of Norfolk Island support diverse tropical and temperate species of fish, corals and other marine organisms similar to those found in the reefs surrounding Lord Howe Island, but with a unique reef fish assemblage of endemic, sub-tropical and temperate species. The coral reefs in Emily Bay and Slaughter Bay are the eastern-most coral reefs in Australian waters.” (Director of National Parks, 2018).

On shore activities in KAVHA are currently polluting (including human waste pollution) the near shore shallow waters of the Marine Park and adversely impacting the unique coral reefs and marine species that inhabit the area.

Human waste pollution contains nutrients and pathogens that are causing potentially irreversible coral bleaching and algae outbreaks (refer **Section 3**) and adversely impacting the coral reefs and the species they support, including species that are listed as threatened, migratory, marine or cetacean under the EPBC Act (Director of National Parks, 2018).

7.3.3 Potential impacts

7.3.3.1 Construction

No vegetation other than exotic grass would need to be removed during construction of the Proposal.

Potential adverse impacts of the Proposal on biodiversity within the Proposal area and Kingston generally could include:

- Mobilisation of soil (sedimentation) into any of Watermill Dam, Watermill Creek and the swampland / wetland and consequent impact to the Freshwater Swamp Native Plant Community and fauna (fish and birds) that utilise these waterbodies.
- Damage to Norfolk Island Pine trees (*Araucaria heterophylla*) that line Country Road (refer **Figure 7.3-2**).

Sedimentation

The key potential adverse impact of the Proposal in the Proposal area would be the mobilisation of soil into terrestrial and aquatic environments (sedimentation). Impacts of sedimentation may include:

- Increase of sediment loads.
- Increase of pollutants that the sediment may contain or transport with it from the Proposal area.

Both these scenarios have the potential to change terrestrial and aquatic habitat conditions and adversely impact flora and fauna that utilise it, including native, threatened and protected bird species, the Freshwater Swamp Plant Community and marine biodiversity

Approximate distances between the construction footprint and waterbodies in the Proposal area are:

- Watermill Dam: about 6 metres.
- Watermill Creek (closest point): about 6 metres.
- Swampland / wetland: about 6 metres.
- Coastline: about 315 metres.
- Emily Bay outlet: about 640 metres.

These distances are derived from **Figure 7.1-2**. They reflect the shortest distance between the construction footprint and the nominated waterbody at a particular point. Distances are greater along the remainder of the route.

If left uncontrolled, there is potential for soil from the construction site to mobilise and be transported downstream via surface water flows into drainage lines and creeks, the swampland / wetland area and ultimately Emily Bay, especially during heavy rain events.

However, if sediment is controlled and prevented from leaving the construction site, the associated risks to sensitive downstream areas would be removed.

Safeguards and management measures to firstly minimise, and then manage, residual risk of erosion and sedimentation to prevent movement of soil from the construction site into downstream Watermill Dam, Watermill Creek, swampland / wetlands, coastal and marine areas have been built into the

construction methodology for the Proposal. These measures include limiting the size and duration of open excavations and installing and maintaining erosion and sediment controls for the duration of potential impact. The construction methodology is detailed in **Section 4.6**. Built in safeguards and management measures are detailed in **Section 7.1.3** and **Section 7.2.3**.

Damage to trees

During consultation undertaken during the environmental impact assessment for the Proposal, NIRC's Biodiversity Team Leader suggested it would be good to have tree protection zones around the Norfolk Island Pine trees along Country Road. This suggestion was considered in this assessment, and was generally not considered necessary because:

- The construction footprint for the trunk main would be contained within the sealed surface of Country Road, on the northern side of the road as far from the southern side trees and swampland as possible. Maximum trench depth would be one metre.
- As per the construction methodology implemented for Stage 1 of the Project in areas adjacent to roadside Norfolk Island Pine tree plantings, the northern half of the road would be closed to traffic and would contain the construction site to the far side of the road from the trees lining the southern edge of the road.
- Construction would be physically separated from the trees by the requirement to keep southern half the road open to traffic.

There is a short row of trees on the northern side of Country Road near the PS3 site (refer **Figure 7.3-2**). The eastern most tree in this row would be located next to the temporary construction access track that would be created to access the PS3 site in Kingston Common Reserve. The lower branches of this tree may need to be trimmed to enable vehicle access underneath and would require a permit to take a protected tree ('take' includes trimming'. If tree protection is required for this tree, it would be determined in consultation with NIRC at the time the permit application is lodged.

The design of the Proposal has been modified to locate the construction footprint as far from Norfolk Island Pine trees as possible, within other site constraints, to minimise potential impact to tree root systems.

As no damage to trees is expected (except some minor trimming of the lower branches of the Norfolk Island Pine tree next to the PS3 construction access track) there would be no impact on the transient utilisation of trees by birds, including the Norfolk Island Morepork² whose range movement includes the Proposal area.

Although unlikely and unexpected, should any protected tree need to be impacted during construction of the Proposal, the design of the Proposal would be further modified to avoid, or if avoidance is not possible, minimise damage to protected trees. For any unavoidable damage to a protected tree, a permit would be sought as required by the *Trees Act 1997 (NI)* (refer **Section 5.5** and **Section 8.2**).

Likelihood of impact

Subject to the implementation of the safeguards and management measures proposed for both erosion and sedimentation and impact to protected trees, no adverse impact to biodiversity in the Proposal area is anticipated.

Adverse impacts to terrestrial and aquatic environments, flora, fauna or native plant communities downstream of the Proposal area are not anticipated due to the small scale of the Proposal, the physical distance between the Proposal area and the wetland, coastal and marine environments and the proposed safeguards and management measures that would be implemented, including the proposed construction methodology.

² The Norfolk Island Morepork prefers native woody vegetation, introduced guava or Eucalyptus plantation to open land and other woody weeds. They also prefer canopy height above 10 metres. Moreporks mostly roost at the top of the canopy underneath foliage (Director of National Parks, 2023).

7.3.3.2 Operation

Once commissioned, the Project (including the Proposal) would have a positive impact on the biodiversity of KAVHA and the Norfolk Marine Park. Containment and removal of sewage generated on Crown land in Kingston would minimise human waste pollution of surface water and groundwater in KAVHA and reduce the levels of harmful nutrients and pathogens that are currently being carried downstream and ultimately released into Emily Bay and the Norfolk Marine Park where it is damaging the health of shallow water marine biodiversity including the coral reefs.

7.3.4 Safeguards and management measures

Safeguards and management measures would be implemented to avoid, minimise or mitigate the identified impacts of the Proposal on biodiversity.

7.3.4.1 Construction

- Implement the proposed construction methodology and erosion and sedimentation safeguards and management measures described in **Section 4.6**, **Section 7.1.3** and **Section 7.2.3** to prevent movement of soil from Proposal area and into any freshwater water body (including Watermill Dam, Watermill Creek and the swampland).
- Modify the design during the detailed design and construction phases of the Proposal to avoid damage to protected or significant trees if required.
- Erect tree protection barriers to prevent unnecessary damage to the Norfolk Island Pine tree located next to the temporary construction access track to the PS3 site if required by NIRC.
- Obtain a permit to 'take' a protected tree in accordance with the *Trees Act 1997(NI)* prior to any unavoidable damage (felling, ring barking, removing, injuring or destroying) to a tree protected under the *Trees Act 1997 (NI)* (refer **Section 8.2**), including the trimming of the branches of the Norfolk Island Pine tree located next to the temporary construction access track to the PS3 site.

7.3.4.2 Operation

- Nil.

7.4 Heritage

7.4.1 Heritage significance

KAVHA is a site with significant heritage value to Norfolk Island, Australia and the world. This is reflected in the listing of the site on multiple heritage registers (refer **Table 7.4-1**)

Table 7.4-1: Heritage listings for KAVHA

Heritage Register	Listing	Listing date
World Heritage List	106209	2010
National Heritage List	105962	2007
Commonwealth Heritage List	105606	2004
Norfolk Island Heritage Register	Listed	2003
Register of the National Estate	103650; 13637	Early 1980s

The significance of KAVHA is summarised in the *KAVHA Heritage Management Plan* (Jean Rice Architects et al., 2016) as:

- **Historical** significance for its evidence of the four settlement periods—reflected in the buildings, ruins, archaeology, landscape, the HMS Sirius wreck, and for its archaeological research potential in relation to each settlement period.
- **Aesthetic** significance as a picturesque and romantic cultural landscape set against a dramatic land and seascape.
- **Social** significance to the Norfolk Island community for its continuous use by Pitcairners and their descendants, and its contribution to the formation of the Norfolk Island community, giving it symbolic, ceremonial, religious, lifestyle and cultural importance.
- **Social** significance to the Australian community as a landmark in Australia's historical development.
- **Natural** significance for its diverse land and water forms, its biodiversity and wetland values, and rare species.

The full Statement of Significance for KAVHA from the *Norfolk Island Heritage Register* 2003 is reproduced below.

“KAVHA is significant for its association with four distinct settlement periods in one place: the pre-European Polynesian occupation, the First and Second settlements during the convict era (1788-1814, 1825-1855); and the Pitcairn period (1856-present), referred to as the Third Settlement.

KAVHA comprises a large group of buildings from the convict era, some modified during the Pitcairn period. The substantial ruins and standing structures, archaeological sub-surface remains, landform and cultural landscape elements are significant as an outstanding example of the development of global convict transportation.

KAVHA is significant for its close association with the wreck of the Sirius in 1790.

KAVHA is significant for its association with the settlement of the Pitcairners and the evolution and the development of the Norfolk Island community.

It is highly valued by the Australian community, being one of a relatively small number of sites identified by a wide variety of Australians as landmarks of Australia's historical development.

KAVHA is significant for its rare association with pre-European Polynesian settlement. It is rare for the site of the earliest European settlement of Australia and the southwest Pacific (1788), containing areas and individual elements of First Settlement buildings and activities. KAVHA is the primary site of the Second Settlement period and contains the landform, layout, extensive buildings, standing

structures, archaeological remains and remnant landscape features of the period. It is an outstanding rare example of a place of secondary punishment for nineteenth century British convicts.

Since 1856, KAVHA has been the administrative centre for the social, religious and political development of an Australian island community. It contains rare evidence of this Third Settlement period and contains elements, groups of elements, and continuing uses that illustrate aspects of this significance.

KAVHA is important for its aesthetic qualities, which are valued by the Norfolk Island community and visitors. The combination of cultural expression, natural forces and their patterns enable a perception and interpretation of the place as a picturesque and romantic landscape. The drama of its landform, sea, and panoramic view creates a picturesque setting enhanced by visual links integral to the functioning of the First and Second penal settlements. Whereas, the subsequently undeveloped character and part ruinous configuration contribute to the romantic landscape, as does the strong streetscape quality of the built elements in Quality Row.

Norfolk Island is first and foremost home to its residents who value KAVHA as a site of continuous and active use as a place of residence, of work, and of recreation since the arrival at Kingston Pier in 1856 of the Pitcairn Islanders, from whom one third of the island's population is descended. KAVHA holds significant symbolic, ceremonial, religious, lifestyle and cultural association in this unique built and natural environment.

KAVHA is significant for its archaeological research potential to contribute to a wider understanding of the history of pre-European Polynesian occupation of Norfolk Island. It has archaeological research potential to contribute to a wider understanding of the history of the First and Second Settlements of Norfolk Island and Australia.

KAVHA is also significant for its archaeological research potential to contribute to the history of the Third Settlement period. It is valued by the Norfolk Island, Australian and International communities as a place of education potential.

KAVHA contains important wetland habitat and remnant vegetation. The wetlands are particularly valuable as a resting place for migratory birds and in supporting a population of rare crustaceans found only on Norfolk Island.

KAVHA is significant for its topography, the littoral, the watercourse and its connection to the lagoon and marine environment. The Watermill Dam and inshore marine areas of KAVHA have been listed as an important Commonwealth wetland."

KAVHA is a World Heritage Site, listed as one of the eleven penal sites established on Australian soil in the 18th and 19th centuries that together make up the serial listing for 'Australian Convict Sites'.

7.4.2 Statutory context

KAVHA's heritage values are protected under both Norfolk Island and Commonwealth legislation. The statutory requirements of relevant legislation are addressed in **Section 5** and summarised in **Table 7.4-2**.

Table 7.4-2: Statutory requirements for protection of the heritage values of KAVHA

Statutory Instrument	Requirement	Action taken	Relevant section of EIS
Norfolk Island <i>Heritage Act 2002 (NI)</i> Section 28	Requirement for the preparation of a Heritage Impact Statement (HIS) for development in relation to, or likely to affect, heritage item listed in the <i>Norfolk Island Heritage Register 2003</i> .	A HIS was prepared for the Proposal.	Section 5.4.1 and Appendix G

Statutory Instrument	Requirement	Action taken	Relevant section of EIS
<i>Norfolk Island Planning Act 2002 (NI)</i>	Requirement for the Chief Executive Officer to provide directions regarding matters to be addressed in an Environmental Impact Statement (EIS): Inclusion of a HIS that addresses the requirements of <i>the Heritage Act 2002 (NI)</i> (Section 28) and the EPBC Act.	A HIS was prepared for the Proposal.	Section 5.2.1.3 and Appendix F And Appendix G
<i>Norfolk Island Plan 2002</i>	Requirement to prepare a HIS for places identified in the Heritage Overlay Requirement to refer a development application involving places identified in the Heritage Overlay to the KAVHA Board of Management (now the KAVHA Advisory Committee).	A HIS was prepared for the Proposal. The Proposal was presented to the KAVHA Advisory Committee at a meeting in November 2021.	Section 5.3.1.3 and Appendix G and Table 6-1
<i>Norfolk Island Development Control Plan No. 7 – KAVHA</i>	Requirement to comply with specified controls to: <ul style="list-style-type: none"> • Ensure that the Proposal would not have an adverse impact on the setting, streetscape or views associated with the heritage precinct. • Ensure that new development is compatible with the significance of heritage precincts. 	The Proposal was assessed against all relevant controls and is considered compliant.	Section 5.3.1.4 and Appendix D
<i>Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)</i>	Requirement to obtain approval for the Proposal if it is likely to have a significant impact on <ul style="list-style-type: none"> • World Heritage Properties: Australian Convict Sites (KAVHA). • National Heritage Places: KAVHA and HMS Sirius Shipwreck. 	A self-assessment undertaken in accordance with the EPBC Significant Impact Guidelines is in progress.	Section 5.1.1

7.4.3 Management context

7.4.3.1 Kingston and Arthurs Vale Historic Area (KAVHA) Heritage Management Plan

The Kingston and Arthurs Vale Historic Area (KAVHA) Heritage Management Plan (HMP) (Jean Rice Architects, et. al., 2016) guides the management of KAVHA.

KAVHA is divided into 13 precincts for site management purposes (refer **Table 7.4-3** and **Figure 7.4-1**). The precincts are referred to throughout this assessment.

Management issues identified in the HMP that have specific relevance to the Project include water quality, waste management and archaeology.

The policies and priorities which relate to water quality and waste management are presented in **Table 7.4-4**. These policies and priorities support the environmental objectives of the Project (refer **Section 4.3**) and have informed the need and justification for the Project.

Table 7.4-3: KAVHA management precincts

Precinct	Description
A	Government House Reserve
B	Lowlands
C	Cemetery Reserve
D	Quality Row
E	Uplands (land above the 100ft/30m contour) and Stockyard Valley
F	Swamp (known as Kingston Common)
G	Prisoners' Compounds
H	Landing Place Ridge (known as Kingston Pier)
I	<i>Not used</i>
J	Beachfront (known as Slaughter Bay and Emily Bay)
K	Windmill Ridge
L	Chimney Hill
M	Arthur's Vale / Watermill Valley
N	Bloody Bridge, Cemetery Road and Garden

Note: Precincts that are relevant to the Proposal are written in bold black text

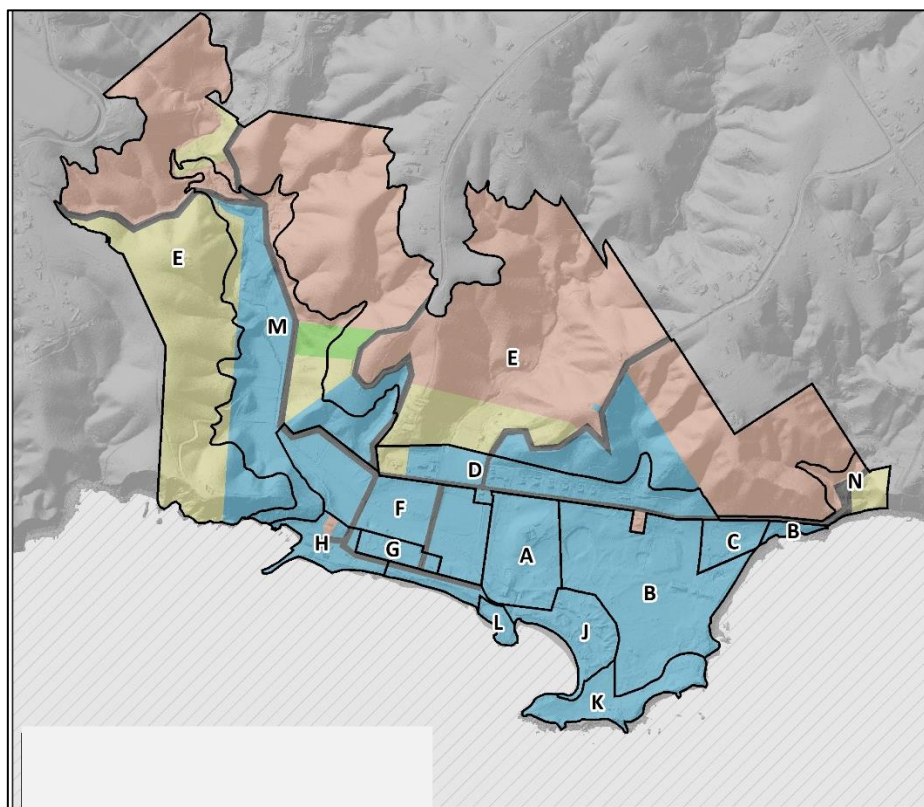


Figure 7.4-1: The KAVHA area and management precincts

(Source: Extent Heritage Advisors, 2020)

Table 7.4-4: Policies and priorities relevant to water quality and waste management

Reference	Description
Natural Environment Policies: Water	
Policy 8.1.2	<p>Water resources will be managed to sustain diverse marine and terrestrial ecosystems and habitats.</p> <p>In line with both good heritage management practices and safe water quality practices, aquatic weeds and excessive water-borne nutrient and sediment loads within or from the site will be controlled and reduced.</p>
Policy 8.1.5	<p>Waste will be managed so as not to impact on the natural and cultural values of the KAVHA site.</p> <p>Sewage and other liquid waste will be managed to prevent pollution of groundwater or surface water.</p>
Heritage Conservation Priorities	
Policy 9.2	<p>The natural environment of the KAVHA site will be conserved, protected and managed to sustain natural systems and heritage values.</p> <p>Environmental management and physical works should ensure an appropriate level of water quality in Watermill Valley and throughout the KAVHA site, while conserving heritage values.</p> <p>Renew and, where necessary, upgrade sewerage infrastructure for all occupied buildings.</p>

The archaeological policies and priorities relevant to both the Project and the Proposal are presented in **Table 7.4-5**. These policies and priorities have informed the concept design (avoidance of potential impacts) and the safeguards and management measures (management of potential impacts that could not be avoided by design) for the Proposal (refer **Section 7.4-7**).

Table 7.4-5: HMP policies and priorities relevant to archaeology during construction of the Proposal

Reference	Description
Policy 8.4.1	<p>Archaeological sites and features will be identified, protected and conserved. These include relics, ruins and standing structures, as well as subsurface deposits and artefacts.</p> <p>Damage or intervention to archaeological sites will be avoided and any impact will be strictly managed through approved works only, in conjunction with archaeological supervision.</p> <p>New development works and maintenance activities which involve substantial ground disturbance will be preceded by a site-specific assessment of archaeological sensitivity informed by the Archaeological Zoning Plan (AZMP).</p> <p>New development works and maintenance will be designed and managed to avoid or minimise impact on archaeological resources. This will include a willingness to make changes during works when archaeological features are encountered.</p> <p>Impact on archaeological resources will be considered in assessing the overall heritage and environmental impacts of development and works proposals.</p>
Policy 8.4.2	<p>Archaeological investigation and research into potential Polynesian occupation of the KAVHA site will be encouraged.</p> <p>Pre-colonial sites will be accorded the same level of protection and management as historical archaeological sites.</p> <p>Pre-colonial archaeological sites and stories will be included in the KAVHA site interpretation.</p>
Policy 8.4.3	<p>Colonial and post-colonial archaeological research projects will be encouraged.</p> <p>All colonial and post-colonial archaeological research projects will be preceded by the preparation of a thorough archaeological assessment which gathers and considers information already available from previous research or documentary sources.</p> <p>Colonial and post-colonial archaeological sites and stories will be included in the KAVHA site interpretation.</p>

Reference	Description
Policy 8.4.4	<p>Archaeological artefacts will be managed as part of the authentic significant fabric and movable heritage of the KAVHA site.</p> <p>Excavated artefacts will be analysed, catalogued and physically conserved, consistent with best practice museum standards.</p> <p>Budgets for archaeological investigations (whether undertaken in conjunction with works or as research projects) will include up-front budgetary provisions for artefact analysis, cataloguing, conservation and long-term curation.</p>
Policy 8.4.5	<p>Archaeological research will be encouraged and facilitated, with preference given to projects that contribute to current heritage management or interpretation needs and priorities.</p> <p>All archaeological research projects will be approved and undertaken in accordance with an archaeological research design which sets out an agreed methodology and demonstrates how the proposed research will benefit current and future generations.</p>
Policy 8.4.6	<p>Comprehensive archival records, including text, photographs and sketches, will be made in all cases where archaeological features or deposits are disturbed.</p> <p>Archaeological investigations (whether undertaken in conjunction with works or as research projects) will include the preparation of post-investigation reports, including comprehensive research archives of all relevant records, responses to research design questions and recommendations for future archaeological heritage management.</p> <p>All investigations will be carried out according to an approved specific research design and methodology.</p> <p>Information gained from archaeological activities will be made available to the Commonwealth Heritage Manager and integrated into site management inventories and other resources.</p>
Recommendation No. 25 Priority: Essential	<p>A 'Code of Practice' should be developed for all archaeological investigations at the KAVHA site, including both research investigations and conservation and development programs.</p>
Recommendation No. 26 Priority: Essential	<p>Written guidelines for ground disturbance should be prepared for the design and management of works in a way which avoids or minimises impact on archaeological resources.</p>
Recommendation No. 27 Priority: High	<p>An integrated Archaeological Zoning Plan will be prepared for the KAVHA site, incorporating the existing CAD plan and other data, to document known and predicted areas of archaeological sensitivity and known disturbed areas. This plan will be updated as new information becomes available.</p>

7.4.3.2 Kingston and Arthurs Vale Historic Area Archaeological Zoning and Management Plan

The Kingston and Arthur's Vale Historic Area (KAVHA) Archaeological Zoning and Management Plan (Extent, 2020) (AZMP) provides an overview of KAVHA's archaeological resources and their potential, and outlines strategies and policy guidelines for appropriate management of the archaeological heritage values of the site. It establishes spatial zones to assist in the identification of areas of high, medium and low archaeological potential.

The key management guidelines considered in the AZMP include:

- Minimising adverse impact on the archaeological resource.
- Statutory obligations and the requirement for necessary consents and approvals accompanied by relevant support documentation prior to any ground disturbance works.
- Obligations of contractors or other persons involved in works within KAVHA regarding an awareness of both the site's heritage significance and the potential for archaeological resources to be present across the site and in the vicinity of works.

In addition to procedures for effective management, the AZMP also includes a research framework, investigation strategies and methods to guide archaeological research and physical investigations.

The AZMP divides KAVHA into four zones for archaeological management purposes (refer **Table 7.4- 6** and **Figure 7.4-2**).

Table 7.4-6: KAVHA archaeological management zones

Zone	Description
1	Identifies areas of high archaeological potential where impact and/or removal is generally unacceptable. The management process for this zone emphasizes retention in situ and avoidance of ground disturbance whenever possible. Archaeological interventions may include test excavation, monitoring or full salvage with conservation. Impacts with potential to damage and/or remove fabric would be tolerated only in situations involving public safety or where loss is imminent due to environmental factors.
2	Identifies locations for the management of archaeological fabric with contributory heritage values, or locations assessed as having moderate archaeological potential. The archaeological investigation methods undertaken in this zone depend on the nature and extent of proposed works and could involve testing; monitoring and recording; and open area excavation with salvage, if appropriate.
3	Identifies locations for management of archaeological fabric in areas of low archaeological potential. The recommended archaeological methods to be undertaken in this zone would be commensurate with the level of preservation and significance of the exposed fabric. These methods are likely to involve monitoring and recording. Areas of the site where archaeological fabric is unlikely to be present (due to the absence of historical development or high levels of disturbance), would likely be subject to 'no action'. Any archaeology identified in this zone would be subject to management under the Unexpected Finds Procedures provided in Section 6.3.8 of Volume 1.
4	Specifically related to the Cemetery reserve and Murderer's Mound and is not relevant to the Proposal.

The archaeological potential, or the likelihood of survival of potential archaeological fabric from each phase of human occupancy, is graded in accordance with the following classifications:

- Extant:** Archaeological remains associated with a particular historical phase or features that survive intact or have been recognised through previous investigations or exposures and have been retained in situ.
- High:** It is likely that archaeological fabric associated with a particular historical phase or features survive intact.
- Moderate:** It is possible that some archaeological fabric associated with a particular historical phase or features survive, but they may have been subject to some disturbance and some loss of integrity.
- Low:** It is unlikely that archaeological fabric associated with a particular historical phase or features survive.

The areas of archaeological potential are shown in **Figure 7.4-3**.

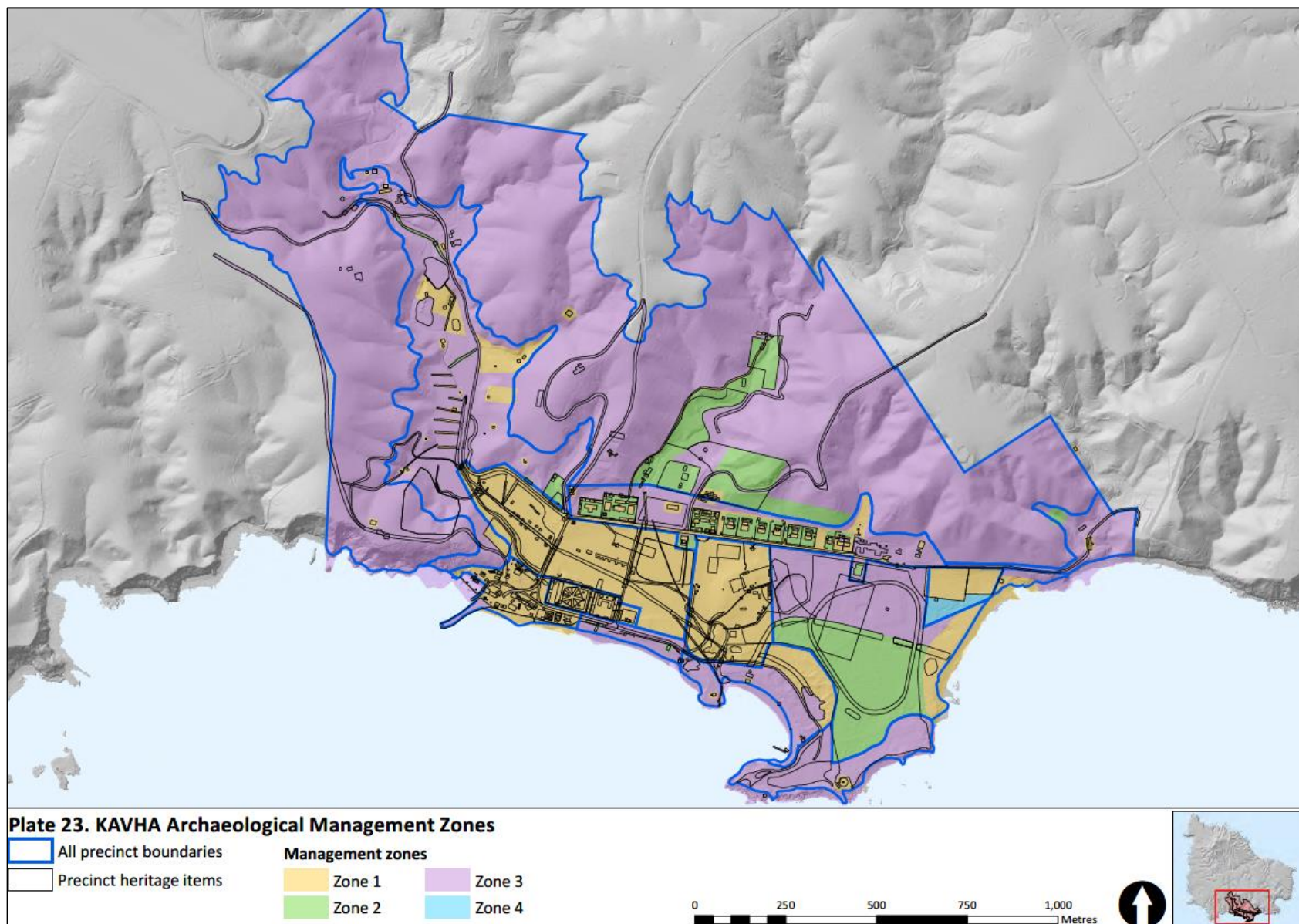


Figure 7.4-2 KAVHA archaeological management zones (Source Extent, 2020)

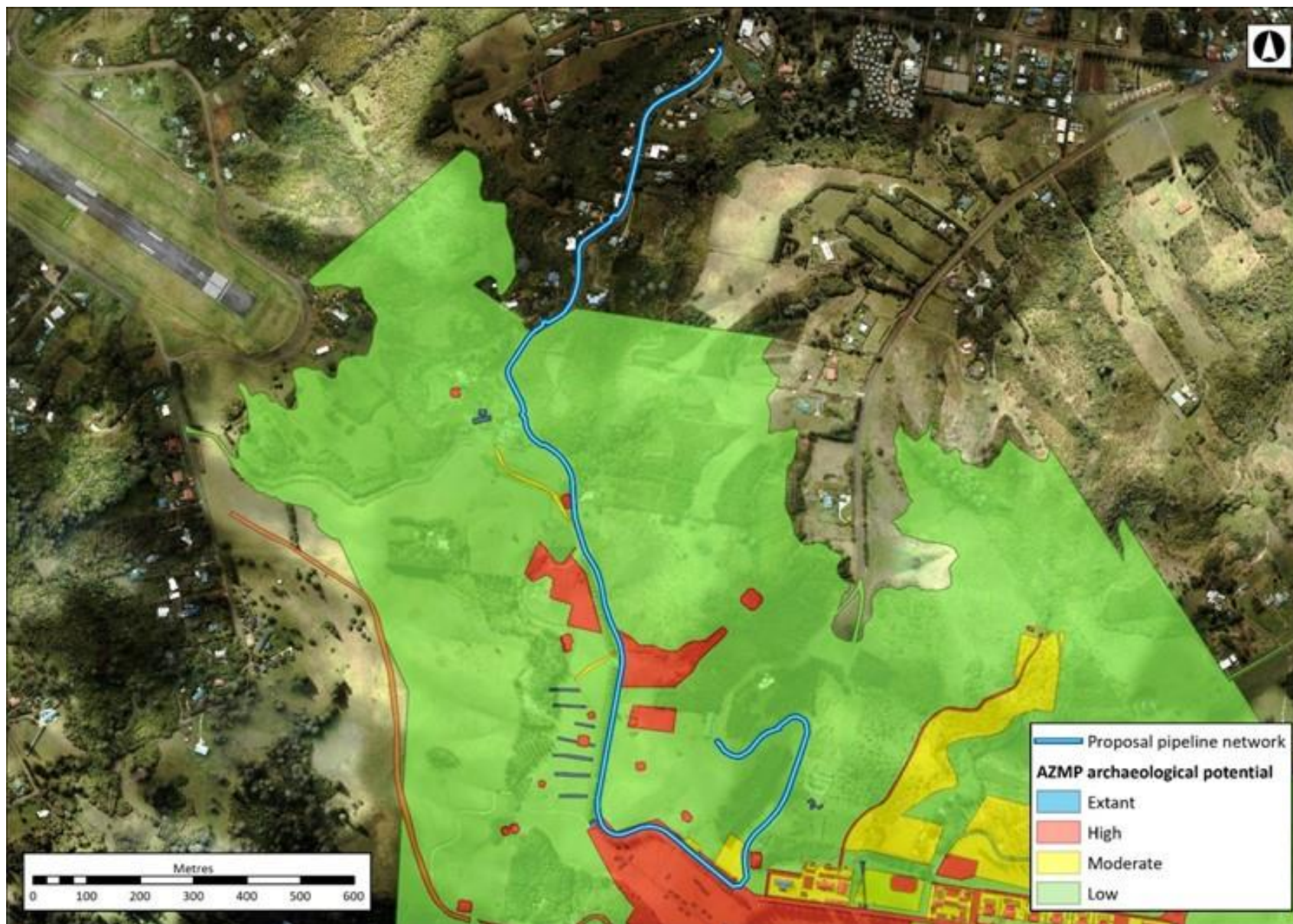


Figure 7.4-3: Archaeological potential in the Proposal area (Source: DITRDCA, 2022 and Extent, 2020))

The archaeological management zones and the archaeological potential identified in the AZMP have informed the concept design (avoidance of potential impacts) and the safeguards and management measures for the Proposal (management of potential impacts that could not be avoided by design) (refer **Section 7.4.7**).

7.4.3.3 Kingston and Arthurs Vale Historic Area Cultural Landscape Management Plan

The *Kingston and Arthurs Vale Historic Area Cultural Landscape Management Plan* (GML Heritage + Context, 2019) (CLMP) builds on and further develops management strategies outlined in the HMP and other relevant reports that relate to cultural landscapes.

Cultural landscapes are the result of the natural environment, human activity and the relationship between these two things. KAVHA is a cultural landscape comprising a large group of buildings from the convict era, some modified during the Pitcairn period, substantial ruins and standing structures, archaeological remains, landform and landscape elements.

Relevant to the Proposal, the CLMP includes policies and conservation actions for the conservation of the visual setting, built heritage (walls, buildings, ruins and standing structures) and significant plantings. Relevant policies and conservation actions have informed the concept design (avoidance of potential impacts) and the safeguards and management measures for the Proposal (management of potential impacts that could not be avoided by design) (refer **Section 7.4.7**).

7.4.3.4 The Burra Charter

The Burra Charter: The Australian ICOMOS charter for places of cultural significance (ICOMOS (Australia) 2013) sets a standard of practice and offers guidelines for those who provide advice, make decisions about, or undertake works to places of cultural significance including owners, managers and custodians. The Charter provides specific guidance for physical and procedural actions that should occur in relation to significant places. The Proposal would be managed in accordance with the Burra Charter.

7.4.4 Approach to heritage impact assessment

The scope of the heritage impact assessment for Proposal was determined based on an assessment of the Proposal against the Official World / National and Commonwealth Heritage Values Criterion. The assessment is documented in full in Section 4 of the HIS (**Appendix G**). In summary, the assessment found that:

- The Proposal is almost entirely located within previously disturbed roadways.
- No development activity would be undertaken within, or in close proximity to, any heritage building.
- Potential impact to one heritage structure (an intact well near the PS3 site in the Kingston Common Reserve) would need to be avoided.
- No alteration would be made to the existing landscape or to the Kingston Swamp.
- Disruption to cultural or peak visitor events would be minimised and managed.
- Impact to aesthetic characteristics would be limited to the construction period (with the exception of minor above-ground components (sewage pumping station lids and electrical control cabinets) associated with the three pumping stations that would be located within KAVHA (PS3, PS4 and PS5) which would be visible in the long-term (refer **Section 7.7.2.2**).
- Impacts to water quality, marine areas and ongoing public use of the area would be positive.
- Associations with historically significant people would not be impacted.
- Without mitigation, there is low potential to disturb archaeological resources and destroy valuable remains and research potential.

Based on this assessment, it was determined that the primary objective of the HIS needed to be the assessment, management and mitigation of the potential impacts on the archaeological values of KAVHA.

In order to minimise the potential impacts of the Proposal on the archaeology of KAVHA, the relevant requirements of the HMP and the AZMP, along with the following data sets, informed the selection of the route for the Proposal and guided the approach taken to construction methodologies, supervision of excavation and the management of excavated heritage materials:

- 1858 survey data.

The 1858 survey of KAVHA was recently reproduced as high resolution digital data by the National Archives of Australia. The data includes survey field books completed by surveyors working on Norfolk Island for much of 1858 which record the location of all of the site's structures and features at an approximate 200 millimetre resolution. These field books have revealed the location of many structures and features that were not recorded in the 1980 survey of KAVHA.

- 2019 light detection and ranging (LiDAR) data.

The LiDAR data, which comprises detailed elevation information, was collected as part of a CSIRO hydrological research project. This data has revealed a number of potential new features within KAVHA, including unnatural rectilinear patterns in the ground surface that may indicate the location of former structures and other features. It is possible that some of the features identified from LiDAR data may be the result of post-1940s ground disturbance.

A Heritage Impact Statement (HIS) was prepared for the Proposal to address the requirements of all controlling documents in relation to archaeology. The HIS is provided at **Appendix G**.

In addition to the HIS, which primarily assesses impacts on archaeological values, an assessment of potential impacts on the heritage significance of the visual setting, built heritage and significant plantings in KAVHA was undertaken in accordance with the requirements of the CLMP and documented in **Section 7.4.6** and **Section 7.4.7**.

Consideration was also given to the possibility that significant archaeological features may be uncovered outside of the KAVHA boundaries during the construction of the Proposal along Taylors Road north of the KAVHA boundary.

7.4.5 Existing environment

Aspects of the existing environment in KAVHA that have heritage significance relevant to the Proposal include:

- Visual setting.
- Built heritage.
- Significant plantings.
- Archaeology.

7.4.5.1 Visual setting

The visual setting of KAVHA includes a picturesque and romantic cultural landscape set against a dramatic land and seascape (Jean Rice Architects, *et. al.*, 2016). The evocative and picturesque setting affords dramatic views, particularly the vista out to sea towards Phillip Island, as well as the backdrop provided by natural vegetation such as Norfolk Island pines (GML Heritage + Context, 2019).

The visual setting includes significant views and important visual relationships in KAVHA that have significance in the cultural landscape as shown in **Figure 7.4-4**.

7.4.5.2 Built heritage

The Proposal would be constructed in an area that is outside the historically developed area of Kingston which is characterised by Georgian buildings and associated structures and grounds. It would commence at the P3 site which is across Middlegate Road from the All Saint's Church. There is an intact historic well on the site.

There are various heritage structures / ruins along the sewerage route up Country Road and in Kingston Common Reserve. However, these are located outside the road reserve and are adequately distanced from the construction footprint / access roads.

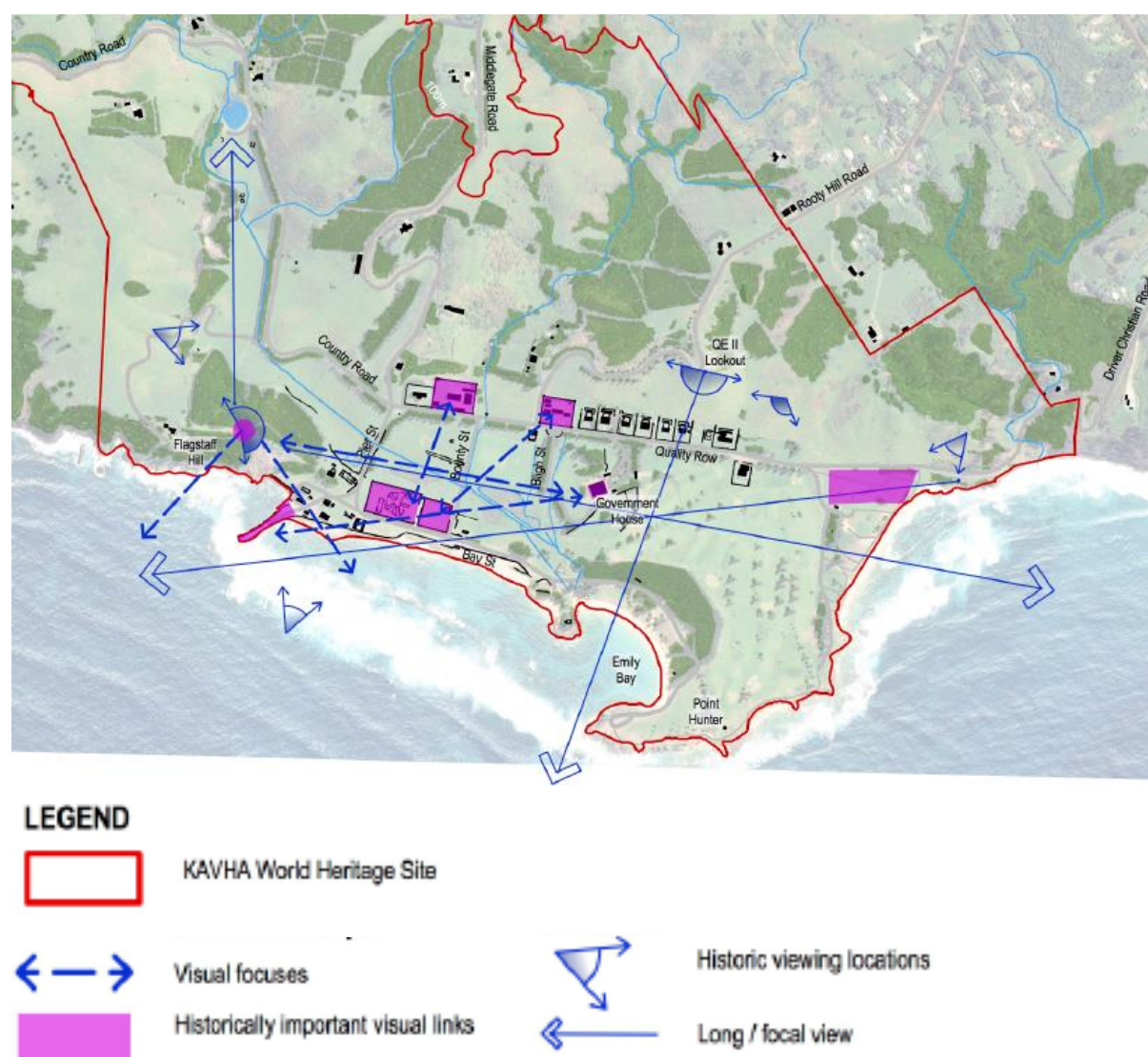


Figure 7.4-4: Significant views and important visual relationships in KAVHA

(Source: GML Heritage + Context, 2019)

7.4.5.3 Significant plantings

Culturally significant plantings in KAVHA include significant memorial and commemorative trees and trees that are significant due to age. Culturally significant plantings within 50 metres of the construction footprint are shown in **Figure 7.4-5** and include:

- Aunt Jemima memorial plantings: Norfolk Island Pine trees along the southern side of Country Road opposite the PS3 site.
- Various trees aged between 80 and greater than 180 years old.

KAVHA SEWERAGE SCHEME - STAGE 2: SIGNIFICANT TREES

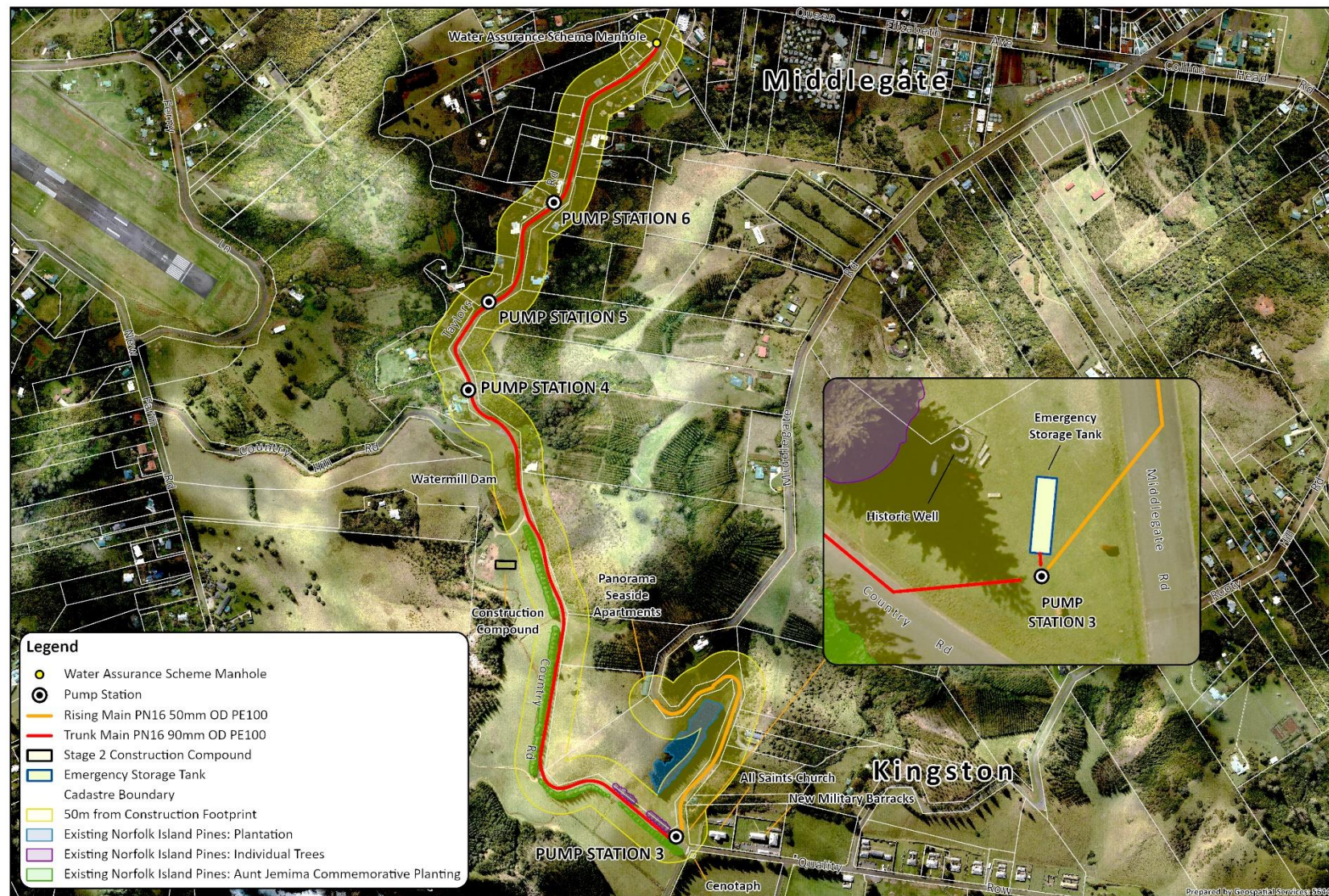


Figure 7.4-5: Significant plantings within 50 metres of the construction footprint

7.4.5.4 Archaeology

A summary of the archaeological potential in each of the KAVHA precincts that would be affected by the Proposal is provided in **Table 7.4-7**. The likelihood of survival is graded in accordance with the archaeological potential classifications from **Figure 7.4.3**.

Table 7.4-7: Summary of archaeological potential in precincts affected by the Proposal

Site feature or site activities	Potential Remains	Precinct and likelihood of survival
Evidence of Polynesian settlement	<ul style="list-style-type: none"> Stone paving Building platforms Ditches Latrines Burials Earth ovens Scoop hearths Postholes Shell middens Isolated artefacts (stone or shell tools) Evidence of early forest clearance (charcoal-enriched deposits) The presence of the remains of introduced dietary/commensal species (e.g. <i>Rattus exulans</i>) 	E – Low F – Low M - Low
Colonial and post-colonial occupation and use of structures	<ul style="list-style-type: none"> Structural remains (post holes, footings, piers, foundation trenches, earlier floor surfaces; e.g. cobbles/flagging/compacted earth). Underfloor artefacts and deposits within and near structures (artefacts relating to domestic or occupational activity, artefacts relating to use of structure, building materials) Yard surfaces and deposits 	E – High F – High M - High
Animal husbandry	<ul style="list-style-type: none"> Structural remains of enclosures (post holes, footings, earlier surfaces; e.g. cobbles or flagging, packed earth, paving) Fencing (post holes) 	M - High
Cultivation	<ul style="list-style-type: none"> Field Boundaries 	M - Extant
Evidence of industrial activities	<ul style="list-style-type: none"> Structural remains of infrastructure and workshops (post holes, footings, piers, foundation trenches, earlier floor surfaces; e.g. cobbles/flagging/compacted earth, forge base) Underfloor artefacts and deposits within and near structures (artefacts relating to industrial activity, by-products of industrial processes; e.g. ash, slag, bones) 	M - High
Service infrastructure and water supply	<ul style="list-style-type: none"> Wells Service infrastructure (dams, reservoirs, receiving tanks, air chambers, aqueduct footings, drains, pipes, service trenches) 	E – High F – High M - High
Evidence of settlement layout	<ul style="list-style-type: none"> Palisade (ditch cut, backfills) Fencing (postholes) Lighting (lamp bases) Roads (former surfaces, kerbing, drainage channels, cart tracks) 	E – Moderate F – High M - High

Site feature or site activities	Potential Remains	Precinct and likelihood of survival
Evidence of former landscaping and gardens	<ul style="list-style-type: none"> • Paths, looped drive (compacted deposits, former surfaces, paving, edging/kerbing, drainage channels) • Garden beds (excavated areas for planting, garden edging, furrows) • Evidence of plantings (pits from removal of tree stumps, remains of plant roots, archaeo-botanical remains) • Introduced soils 	E – Moderate F – High M – Moderate
Waste disposal	<ul style="list-style-type: none"> • Privy deposits • Rubbish pits • Isolated artefacts that have been lost or discarded (e.g. ceramic, glass, bone), tools, building material etc. 	E – Moderate F – High M – High
Environmental management	<ul style="list-style-type: none"> • Water management (cuts of excavated and modified channels and drains, stone facing of drains) • Causeway (deposits of introduced soil over sand banks to arrest sand drift) • Afforestation (44-gallon drums in sand banks to stabilise dunes) 	F – High M – High

7.4.6 Potential impacts

Potential impacts of the Proposal have been avoided, where possible, through the design of the Proposal including:

- The type of sewerage scheme selected: A pressure sewerage scheme was selected as it requires shallower trenching than a gravity sewerage scheme.
- Careful route selection guided by the requirements of relevant heritage management documents and iteratively modified during design development to avoid or minimise impact to known and potential heritage values.

7.4.6.1 Construction

Visual setting

The proposed infrastructure would be primarily installed underground. Consequently, visual impacts of the Proposal would largely be limited to the construction phase of the Proposal (excavation, soil stockpiles, construction vehicles etc.), would be short term and temporary, and would not have a significant impact on the heritage significance of the visual setting, significant views and / or important visual relationship values of KAVHA in the longer term.

Above-ground components that would be visible in the long term are discussed in **Section 7.4.6.2**.

A visual impact assessment is provided in **Section 7.7**.

Built heritage

The Proposal has been designed to avoid heritage buildings and structures where possible. The closest heritage structure would be the intact heritage well located in the Kingston Common Reserve at the PS3 site.

The use of a Wacker Neuson BS65-4As stroke vibrator rammer or similar (foot compactor) to compact backfilled trenches (electrical) in the vicinity of the heritage well at the PS3 site has potential to cause vibrational damage. Safeguards and management measures have been included in the noise and vibration assessment to monitor and manage this risk (refer to **Section 7.5.5.1**).

Subject to implementation of the recommended safeguards and mitigation measures (refer **Section 7.4.7**), it is not expected that the Proposal would have an adverse impact on built heritage.

Significant plantings

Plantings with heritage significance within 50 metres of the construction footprint are shown in **Figure 7.4-5**.

During the development of the concept design for the Proposal, the route alignment was selected, and then further adjusted, to locate the construction footprint as far from significant plantings as possible, within other site constraints, to minimise potential impact to tree root systems (refer **Section 7.3.2.1**).

Further adjustments would be made during construction if required to avoid impacts to significant plantings.

Archaeology

Inside KAVHA

Potential impacts to archaeological values of KAVHA have been avoided by design where practicable (refer **Section 7.4.4**).

Where avoidance of areas with known archaeological potential is not practicable, the likelihood of impact has been assessed in accordance with guidance provided in the AZMP archaeological management zones and the likelihood of survival. Potential impacts to archaeology are detailed for each relevant management precinct in **Table 7.4-8** to **Table 7.4-10**. These tables should be read in conjunction with **Table 7.4-7**.

Outside KAVHA

There is a real, albeit small, possibility that construction of the Proposal may result in the discovery of pre-1856 culverts and drains in the section of Taylors Road reserve outside of KAVHA. Culverts and drains were built all around the island, so it's not unexpected. Whilst areas outside KAVHA are not afforded the same protection as area within KAVHA, any archaeological finds would be managed using the same methodology.

Table 7.4.8: Precinct E – Uplands (land above the 100ft/30m contour) and Stockyard Valley

Site feature or site activities	Level of survival	Likelihood of impact	Explanation of likelihood of impact
Evidence of Polynesian settlement	Low	Improbable	<p>No traces of Polynesian settlement nor artefacts are known to have been found in Precinct E. It is highly unlikely that any such remains, if present, would still have subsurface traces in the roadways. Such remains would likely have been demolished during initial road construction or removed during subsequent 20th century grading.</p> <p>Despite the very low probability, should Polynesian materials be encountered, they would be managed and mitigated in the same manner as any other unexpected finds (refer Section 7.4.7.1).</p>
Colonial and post-colonial occupation and use of structures	High	Unlikely	<p>The only structures that may have ever existed on the site of the present roadways would be those from the First British Settlement, of which there is little to no documentary evidence.</p> <p>Even if any such structures ever once stood on ground that is now part of the roadways, it is likely that the traces of these buildings were demolished either during initial road construction or during 20th century road grading.</p>
Service infrastructure and water supply	High / Extant	Unlikely	<p>There is no record of such service infrastructure and water supply features existing near the construction footprint and there is a low potential that unknown drains and culverts may exist under the short stretch of road that the Proposal impacts in Precinct E. Such features are more commonly found near structures and near permanent or ephemeral watercourses.</p> <p>There is a moderate likelihood that any convict-era drains or culverts constructed along the roadway were damaged or destroyed by 20th century roadworks</p>
Evidence of settlement layout	Moderate	Unlikely	<p>The only evidence of settlement layouts that may exist in Precinct E are old road surfaces.</p> <p>Based on the initial evidence from Stage 1 construction works, it is likely that 20th century road grading has destroyed most of the traces of older road surfaces.</p>
Evidence of former landscaping and gardens	Moderate	Improbable	<p>The construction footprint would traverse the roadways, far away from any locations at which landscaping or gardening activities may have taken place.</p>
Waste disposal	Moderate	Unlikely	<p>The construction footprint is located within areas that have been actively used as roads for 180-200 years.</p> <p>These are not areas in which waste disposal would have taken place.</p> <p>There is a low probability of significant finds, but individual isolated items (such as glass shards from broken bottles or ceramic sherds from smashed crockery) are likely.</p>

Table 7.4.9: Precinct F – Swamp (known as Kingston Common)

Site feature or site activities	Level of Survival	Likelihood of impact	Explanation of likelihood of impact
Evidence of Polynesian settlement	Low	Improbable	<p>No traces of Polynesian settlement nor artefacts are known to have been found in Precinct F.</p> <p>It is highly unlikely that any such remains, if present, would still have subsurface traces in the roadways. Such remains would likely have been demolished during initial road construction or removed during subsequent 20th century grading.</p> <p>Despite the very low probability, should Polynesian materials be encountered, they would be managed and mitigated in the same manner as any other unexpected finds (refer Section 7.4.7.1).</p>
Colonial and post-colonial occupation and use of structures	High	Unlikely	<p>The only structures that may have ever existed on the site of the present roadways would be those from the First British Settlement, of which there is little to no documentary evidence.</p> <p>Even if any such structures ever once stood on ground that is now part of the roadways, it is likely that the traces of these buildings were demolished either during initial road construction or during 20th century road grading.</p>
Service infrastructure and water supply	High	Possible	<p>There is a moderate potential that unknown drains or culverts may exist under the roadway in Precinct F.</p> <p>Most of the drains and culverts in Kingston fell into disuse by the 1860s, and their ends were covered by soil deposited through landscaping, construction and erosion. There is a moderate likelihood that any convict-era drains or culverts constructed along the roadway were damaged or destroyed by 20th century roadworks.</p> <p>A pair of wells (one intact and open, and one filled and covered by the mid-20th century) are within 10 metres of the construction footprint. The intact / open well can be seen immediately northwest of the intersection of Quality Row, Pier Street, Middlegate Road and Country Road at the PS3 site.</p> <p>The filled well is known from the 1858 survey. It is about 100 metres along Country Road from the intersection of Quality Row, Pier Street, Middlegate Road and Country Road, on the south side of the road. It is now covered by a pine tree planting and there's no evidence of it visible from the surface. It is only known from documentary evidence.</p> <p>Potential impacts to the intact / open well at the PS3 site would be managed and mitigated (refer Section 7.5 and Section 7.7) Consequently, the Proposal would have no impact on either of these wells.</p> <p>It is very unlikely that any earlier wells would exist in the roadways.</p>
Evidence of settlement layout	High	Unlikely	<p>The only evidence of settlement layouts that may exist in Precinct E are old road surfaces.</p> <p>Based on the initial evidence from Stage 1 construction works, it is likely that 20th century road grading has destroyed most of the traces of older road surfaces.</p>

Site feature or site activities	Level of Survival	Likelihood of impact	Explanation of likelihood of impact
Evidence of former landscaping and gardens	High	Possible	<p>The easternmost 10 metres of the sewer main in Precinct F would directly intersect an area used as a stockyard and garden during the 2nd settlement.</p> <p>There is the possibility that artefacts (metal tools, animal bones, etc.) related to such uses may remain in the area.</p>
Waste disposal	High	Unlikely	<p>The construction footprint is located within areas that have been actively used as roads for 180-200 years.</p> <p>These are not areas in which waste disposal would have taken place.</p> <p>There is a low probability of significant finds, but individual isolated items (such as glass shards from broken bottles or ceramic sherds from smashed crockery) are likely.</p>
Environmental management	High	Likely	<p>The potential for impacts upon the stone facing of drains depends on the possibility of encountering drains; see water supply and service infrastructure, above.</p> <p>The construction footprint would run through the location of a former natural waterway that was filled in the early 20th century.</p>

Table 7.4.10: Precinct M – Arthur's Vale / Watermill Valley

Site feature or site activities	Level of Survival	Likelihood of impact	Explanation of likelihood of impact
Evidence of Polynesian settlement	Low	Unlikely	<p>The traces of Polynesian settlement that are known to have been found in Precinct M were on the western side of Arthur's Vale, no closer than 100 metres from Country Road.</p> <p>Should any such remains be located on the eastern side of the valley, it is unlikely that there would still be subsurface traces in the roadways. Such remains would likely have been demolished during initial road construction or removed during subsequent 20th century grading.</p> <p>Despite the low likelihood, should Polynesian materials be encountered, they would be managed and mitigated in the same manner as any other unexpected finds (refer Section 7.4.7.1).</p>
Colonial and post-colonial occupation and use of structures	High	Unlikely	<p>The only structures that may have ever existed on the site of the present roadways in Precinct M would be those from the First British Settlement, of which there is little to no documentary evidence.</p> <p>Even if any such structures ever once stood on ground that is now part of the roadways, it is likely that the traces of these buildings were demolished either during initial road construction or during 20th century road grading.</p>

Site feature or site activities	Level of Survival	Likelihood of impact	Explanation of likelihood of impact
Animal Husbandry	High	Possible	<p>The easternmost eight metres of the sewer main in Precinct M would directly intersect an area used as a stockyard and garden during the 2nd settlement.</p> <p>There is the possibility that artefacts (metal tools, animal bones, etc.) related to such uses may remain in the area.</p>
Cultivation	High	Possible	<p>The easternmost eight metres of the sewerage main in Precinct M would directly intersect an area used as a stockyard and garden during the 2nd settlement.</p> <p>There is the possibility that artefacts (metal tools, animal bones, etc.) related to such uses may remain in the area.</p>
Evidence of industrial activities	High	Unlikely	<p>There are no known industrial activities that took place within the areas intersected by the proposed sewer main.</p> <p>It is unlikely any remains related to industrial activities would be located during construction of the Proposal.</p>
Service infrastructure and water supply	Moderate	Possible	<p>Most of the drains and culverts in Kingston fell into disuse by the 1860s, and their ends were covered by soil deposited through landscaping, construction and erosion.</p> <p>There is a moderate potential that unknown drains or culverts may exist under the roadway in Precinct M.</p> <p>There is a moderate likelihood that any convict-era drains or culverts constructed along the roadway were damaged or destroyed by 20th century roadworks.</p> <p>A pair of wells (one intact and open, and one filled and covered by the mid-20th century) are within 10 metres of the construction footprint. The intact / open well can be seen immediately northwest of the intersection of Quality Row, Pier Street, Middlegate Road and Country Road at the PS3 site.</p> <p>The filled well is known from the 1858 survey. It is about 100 metres along Country Road from the intersection of Quality Row, Pier Street, Middlegate Road and Country Road, on the south side of the road. It is now covered by a pine tree planting and there's no evidence of it visible from the surface. It is only known from documentary evidence.</p> <p>Potential impacts to the intact / open well at the PS3 site would be managed and mitigated (refer Section 7.5 and Section 7.7) Consequently, the Proposal would have no impact on either of these wells.</p> <p>It is very unlikely that any earlier wells would exist in the roadways.</p>
Evidence of settlement layout	High	Unlikely	<p>The only evidence of settlement layouts that may exist in Precinct M are old road surfaces.</p> <p>Based on the initial evidence from Stage 1 construction works, it is likely that 20th century road grading has destroyed most of the traces of older road surfaces.</p>

Site feature or site activities	Level of Survival	Likelihood of impact	Explanation of likelihood of impact
Evidence of former landscaping and gardens	Moderate	Possible	<p>The easternmost eight metres of the pipeline in this precinct would directly intersect an area used as a stockyard and garden during the 2nd settlement.</p> <p>There is the possibility that artefacts (metal tools, animal bones, etc.) related to such uses may remain in the area.</p>
Waste disposal	High	Unlikely	<p>The construction footprint is located within areas that have been actively used as roads for 180-200 years.</p> <p>These are not areas in which waste disposal would have taken place.</p> <p>There is a low probability of significant finds, but individual isolated items (such as glass shards from broken bottles or ceramic sherds from smashed crockery) are likely.</p>
Environmental management	High / Extant	Likely	<p>The potential for impacts upon the stone facing of drains depends on the possibility of encountering drains; see water supply and service infrastructure, above.</p> <p>The construction footprint would run through the location of a former natural waterway that was filled in the early 20th century.</p>

7.4.6.2 Operation

Visual setting

Most of the infrastructure for the Proposal would be located underground.

Above-ground components of the proposed infrastructure that would be visible in the long term include sewage pumping station lids and electrical control cabinets associated with the three pumping stations located in KAVHA. The lids would be at ground level and are inconspicuous. The control cabinets would be about 1.8 metres high, 0.8 metres wide and 0.45 metres deep. Given their size, they would be located out of clear sight lines to minimise visual intrusion.

No above ground component would impact the significant views and important visual relationships in KAVHA (refer **Figure 7.4-4**).

Built heritage

Operation of the Proposal would have no impact on built heritage.

Significant plantings

Operation of the Proposal would not impact significant planting(s).

Archaeology

Operation of the Proposal would have no impact on archaeology.

7.4.7 Safeguards and mitigation measures

Safeguards and management measures would be implemented to avoid, minimise or mitigate the identified impacts on heritage values.

7.4.7.1 Construction

Visual setting

- Implement safeguards and management measures to address visual impacts during construction as described in **Section 7.7.3**.

Built heritage

- Implement safeguards and management measures to address vibration impacts during construction as described in **Section 7.5.5 (vibration)**.
- Implement safeguards and management measures to address visual impacts during construction as described in **Section 7.7.3**.
- Prior to the commencement of construction of PS3, consult with the KAVHA Archaeologist, NIRC and Fluent Solutions to determine an appropriate alternate site for the PS3 control cabinet that would minimise the visual impact of the control cabinet.
- Dig any excavation that would be in close proximity to the heritage well at the PS3 site by hand or using non-vibratory equipment, as advised by the KAVHA Archaeologist.
- Erect a barrier around the heritage well at the PS3 site to prevent accidental damage during construction.

Significant plantings

- Prevent, or if prevention is not possible, minimise damage to significant plantings identified in **Figure 7.4-5**.
- Implement safeguards and management measures to address potential impacts to significant plantings during construction as described in **Section 7.3.3**.

Archaeology

- Provide the KAVHA archaeologist with a minimum of two weeks notice of the commencement of construction.
- Dig all excavations close to foundations or remains of heritage structures by hand under supervision of the KAVHA archaeologist.
- Cease mechanical excavation and commence manual excavation as instructed by the KAVHA archaeologist.
- Stop work immediately if accidental damage occurs to any heritage item, and immediately notify the Commonwealth Heritage Manager or the KAVHA Archaeologist. Work would not recommence until the Commonwealth Heritage Manager or the KAVHA Archaeologist has provided approval to do so.
- Stop work immediately if any unexpected heritage item is found and immediately notify the Commonwealth Heritage Manager or the KAVHA Archaeologist. Work would not recommence until the Commonwealth Heritage Manager or the KAVHA archaeologist has provided approval to do so.

The Commonwealth Heritage Manager and / or KAVHA Archaeologist would, in accordance with the requirements of the HMP and the AZMP, implement the following safeguards and management measures for all land in KAVHA. They would also be applied to land in the Proposal area that is outside KAVHA, as required:

- Prepare an archaeological research design and methodology for the Proposal prior to the commencement of construction.
- Complete test excavations where ground disturbance is proposed in areas of high archaeological potential prior to the commencement of, and during construction as required.
- Adjust the construction footprint as required if test excavations identify potential archaeological impact that should be avoided prior to the commencement of construction.
- Consult data collected from non-invasive investigations (LiDAR and geophysical surveys) to refine/adjust the construction footprint in areas of high archaeological potential prior to the commencement of construction.
- Designate areas of known heritage values as no-go zones on site maps prior to the commencement of construction and during construction as required.
- Undertake induction training to inform workers and contractors of the importance of safeguarding heritage values including, laydown restrictions (construction compound only), unexpected finds procedure and other moveable cultural heritage requirements prior to the commencement of, and during construction as required.
- Supervise all excavation works in areas zoned as high and moderate archaeological potential in order to be able to guarantee appropriate management and mitigation measures are implemented as works progress.
- Where possible, supervise all excavation works in areas zoned as low archaeological potential in order to be able to guarantee appropriate management and mitigation measures are implemented as works progress.
- Undertake archaeological sieving if required during construction.
- Maintain photographic records of the works for the duration of construction.
- Accurately map the location of works undertaken.

- Record and conserve to archival standard (set by the NSW Heritage Office) all archaeological features encountered.
- In the event that potential archaeological material is encountered during construction, implement the Unexpected Finds Procedure documented at Section 6.3.8 of the AZMP.
- Should significant fabric and/or findings be uncovered during the course of investigations, undertake additional recording to capture high-quality photogrammetric data regarding the fabric or findings. Capture the data to a degree that would allow it to be used for the generation of high-resolution 3D models.
- If archaeological materials are discovered during construction, mechanical investigations would be undertaken with a flat bladed bucket – toothed buckets are unsuitable for fine scrapes and cause damage to remains.
- Invite staff from the Norfolk Island Museum to attend excavations and assist with the recording of any materials encountered.
- Prepare a post-construction report including comprehensive research archives of all relevant records, responses to research design and recommendations for future archaeological heritage management.

7.4.7.2 Operation

Nil. Operation of the Proposal would not impact on the heritage values of KAVHA.

7.5 Noise and vibration

7.5.1 Construction noise assessment methodology

There are no noise policies or guidelines applicable to Norfolk Island. In the absence of local guidance, the NSW *Draft Construction Noise Guideline* (EPA, 2021)¹ has been adopted for the purposes of this assessment. The *Draft Construction Noise Guideline* makes the following statement which has guided the development of the construction noise assessment methodology for the Proposal:

“Construction noise is caused by many activities, and at different parts of a worksite as work progresses. This means that noise levels can change over the construction period and affect adjoining residents and other sensitive receivers over different periods. Because of this, construction projects are not usually amenable to purpose-built noise control measures typically applied to industrial processes.

With this in mind, the Construction Noise Guideline ensures that all feasible and reasonable work practices are applied to minimise construction noise impacts, rather than setting numeric noise limits (EPA 2021).”

NSW *Draft Construction Noise Guideline* (EPA, 2021) provides two pathways to assess and manage construction noise impacts:

- Quantitative assessment for infrastructure construction – major activities that are listed as scheduled activities under the NSW *Protection of the Environment Operation Act 1997*.
- Qualitative assessment for routine construction and maintenance - smaller infrastructure projects such as construction, maintenance or repair of sub-surface utilities (such as water supply pipelines or telecommunication cables).

A qualitative assessment is considered appropriate where work is unlikely to result in significant noise impacts. It is usually applicable for short-term infrastructure projects or minor construction works regulated by a local council.

The Proposal was assessed against work attributes, community considerations and likelihood of noise impact as listed in Table 2 of the *Draft Construction Noise Guideline* (EPA, 2021) to check and confirm the suitability of undertaking a qualitative assessment for the Proposal. This assessment is presented in **Table 7.5-1**.

Table 7.5-1: Assessment of the Proposal against work attributes and community considerations

Work attributes and community considerations (copied from Table 2)	Likelihood of noise impact applicable to the Proposal (copied from Table 2)	Risk level (copied from Table 2)	Applicability to the Proposal
Time of construction	Majority of work during recommended standard hours	Low	All work (except any emergency work) would be undertaken during NIRC standard construction hours. Assessed Risk Level: Low

¹ The NSW *Draft Construction Noise Guideline* (EPA, 2021) was publicly exhibited in April 2021. When finalised and adopted, it will supersede the *Interim Construction Noise Guideline* (DECC 2009). The *Draft Construction Noise Policy* (EPA, 2021) was selected as the preferable document for use in this assessment as it is more current than the *Interim Construction Noise Guideline* (DECC 2009). As neither document applies in the Norfolk Island jurisdiction, this is considered reasonable.

Work attributes and community considerations (copied from Table 2)	Likelihood of noise impact applicable to the Proposal (copied from Table 2)	Risk level (copied from Table 2)	Applicability to the Proposal
Duration of works	Short-duration of the work (e.g. lasting several days): For linear projects such as sewerage schemes, the duration is related to the total time the work is adjacent to sensitive receivers	Low	<p>Due to the progression of construction along the linear route, the duration of works adjacent to any sensitive receiver would be days not weeks.</p> <p>Assessed Risk Level: Low</p>
Noise-making equipment process	<p>Use of light equipment (e.g. hand-held tools).</p> <p>Infrequent use of hand saws or drills. Light vehicles on the worksite. Infrequent deliveries and removals.</p>	Low	<p>The likelihood of noise impact due to noise making equipment falls between the low and medium risk categories.</p> <p>Whilst medium size equipment would be used, jack hammers and rock breakers for example would not.</p>
	<p>Use of medium sized equipment (e.g. light excavators, graders and loaders).</p> <p>Use of hand-held jack-hammers and small rock breakers and medium-sized drills and cutting machines. Light and medium-sized vehicles on the worksite; Occasional deliveries and removals by large vehicles</p>	Medium	<p>Although medium size vehicles may be used for occasional deliveries, use of these vehicles would be occasional. Large vehicles would not be used.</p> <p>Due to the small scale of the Proposal, the restriction of the construction area to about 30 cumulative linear metres at any one time and proposed safeguards and management measures (refer Section 7.5.5), the impact from the 'noise-making equipment process' is considered to be low.</p> <p>Assessed Risk Level: Low</p>
Proximity to sensitive receivers	Minimal distances between sensitive receivers (e.g. tens of metres)	High	<p>A number of the sensitive receivers are in close proximity to the construction footprint. As the proximity cannot be changed, management measures would be required to manage noise impacts as detailed in Section 7.5.5. Communication is considered to be the key mitigation and management measure.</p> <p>Assessed Risk Level: High</p>

Work attributes and community considerations (copied from Table 2)	Likelihood of noise impact applicable to the Proposal (copied from Table 2)	Risk level (copied from Table 2)	Applicability to the Proposal
Containment of noise	Outdoor work with minimal isolation or containment from sensitive receivers.	High	<p>Sensitive receivers such as All Saints Church and the New Military Barracks are surrounded by high stone walls that would act as a noise barrier and provide some protection from noise impacts. Many of the residential sensitive receivers along the route of the Proposal are located close to the road with little isolation or containment from the construction site. The potential for noise impact is higher at these receivers than for others that are either further away or have some noise barrier protection, or both. The worst case scenario of 'high' noise risk has been adopted to ensure noise impacts at the most sensitive receivers are implemented.</p> <p>However, there are also opportunities to control noise at the source using standard management measures as detailed in Section 7.5.5, which act to reduce the noise risk factor.</p> <p>Given the small scale of the Proposal and the short term nature of construction in the vicinity of any one receiver (days), it is considered that the high to medium risk of noise impact at the most sensitive receivers would be appropriately managed through feasible and reasonable work practices.</p> <p>Assessed Risk Level: Medium / High</p>
	Some opportunities available to control noise at the source and in the path	Medium	
Number of people affected	Low number of sensitive receivers (e.g. less than 25 residences)	Low	<p>There are 28 residences, four tourist accommodation businesses and two other businesses located within 150 metres of the construction footprint. Other than the two other businesses (hardware shop and joinery), these are all considered to be sensitive residential receivers.</p> <p>While the risk is categorised as Medium in the <i>Draft Construction Noise Guideline</i> due to the number of receivers within 150 metres of the construction footprint, the linear nature of the Proposal means that only a small number of receivers would be close to the works at any point in time which effectively lowers the risk.</p> <p>Assessed Risk Level: Medium / Low</p>
	Moderate numbers of sensitive receivers (e.g. 25 to 100 residences)	Medium	

Work attributes and community considerations (copied from Table 2)	Likelihood of noise impact applicable to the Proposal (copied from Table 2)	Risk level (copied from Table 2)	Applicability to the Proposal
Community views – is the Proposal perceived as contentious	The community and consent authority or regulator consider the work uncontroversial or routine.	Low	<p>A development application for Stage 1 of the Project was placed on public exhibition. No submissions were received in response to the exhibition. Stage 1 was approved with no project specific conditions. Construction of Stage 1 is underway, and no noise complaints have been received at the time of writing (5 March 2024).</p> <p>In light of the above, it is assumed that the Proposal is not perceived as contentious.</p> <p>Assessed Risk Level: Low</p>

Of these criteria, four have a low risk of impact, one has a low / medium risk, one has a medium to high risk and one has a high risk. Despite this, it is considered that given the small scale of the Proposal, and the progressive movement of construction along the linear construction route, these impacts would be manageable using standard mitigation and management measures. Standard measures would include reasonable and feasible work practices as outlined in **Section 7.5.5**.

Consequently, a qualitative assessment is considered appropriate for the Proposal and has been undertaken in accordance with the process set out in Section 4 of the *Draft Construction Noise Guideline* (EPA, 2021).

7.5.2 Construction vibration assessment methodology

One piece of plant that would be used during the construction of the Proposal may generate vibration - Wacker Neuson BS65-4As stroke vibrator rammer (foot compactor) or similar (refer **Figure 7.5-1**). The operator manual for this plant is provided at **Appendix H**.



Figure 7.5-1: Wacker Neuson BS65-4As vibrator rammer

Source: (Sydney Tools, 2022)

The rammer would be used to compact soil during the backfilling of the trenches. This would minimise the risk of slumping of the soil as it settles resulting in a 'dip' in the ground surface above the trench which would then require filling. This is particularly important for trenches within the roadway which will be repaved when the site is reinstated.

The operator manual for the rammer states that compaction work in the vicinity of buildings can lead to building damage and possible effects should be checked in advance. Whilst this warning is precautionary, this matter was referred to GHD's Senior Project Manager and qualified Professional Engineer for advice during Stage 1 of the Project.

The advice provided by GHD was that, if used correctly during construction of the Proposal, the rammer would be unlikely to cause vibration damage to nearby buildings / structures.

However, it was noted that vibration damage is dependent upon many variables (e.g. type of soil, area of compaction, location of vibrating equipment relative to a building / structure) and that possible mitigation against potential vibration damage could include: pre-dilapidation building survey; monitoring for damage; and ceasing use of the rammer if damage occurs, or is likely to occur.

Based on the following, vibration impacts from construction of the Proposal are not expected:

- The rammer has been utilised frequently by many of the construction contractors on the island without known incidence of damage to roads or buildings from vibration (A. Barnett, pers. comm, 7 June 2022).
- Certain heritage structures in the Stage 1 Proposal area were closer to the construction footprint than the houses and structures in the Stage 2 Proposal area would be. The KAVHA Archaeologist who has supervised the Stage 1 construction from a heritage perspective has not observed, or been notified of, any impact to heritage structures or buildings resulting from Stage 1 construction (T Sapienza, email dated 13 February 2024).

As a precautionary measure, a pre-dilapidation survey of the condition of the road reserves within the Proposal area would be undertaken prior to the commencement of construction. This would include, but would not be limited to, the assessment of all private surfaces and structures that encroach into the road reserves.

7.5.3 Existing environment

7.5.3.1 Noise

Key human generated daytime noise sources in the Proposal area include:

- Vehicular traffic on the local road network.
- Noise from residential uses.

The impacts of this noise are very low and the area is generally quiet.

Sensitive receivers within 150 metres of the construction footprint are shown in **Figure 7.5-2**. These include:

- Residences:
 - Country Road / Taylors Road: 26 residences and two tourist accommodation properties.
 - Middlegate Road: Two residences and two tourist accommodation properties.
- Other Businesses: Taylors Road – Two (building and homewares shop and joinery)
- Place of worship: All Saint's Church.
- Other - Public: Commissariat Store Museum; New Military Barracks (NIRC government offices).

Ten of these sensitive receivers are located within the Proposal area.

7.5.3.2 Vibration

Vibration generated in the Proposal area at present would generally be limited to vibration generated by road traffic.

7.5.4 Potential impacts

7.5.4.1 Construction

Noise

All work would be undertaken within the construction hours specified in **Section 4.6.7**. These are NIRC's standard construction hours.

It is expected that construction would commence at the intersection of Middlegate Road, Country Road, Quality Row and Pier Street and then generally progress along Country Road / Taylors Road and then Middlegate Road in increments of about 30 metres. The construction methodology is detailed in **Section 4.6**.

This means that, whilst the duration of construction is estimated to be about 4-6 months, the duration of noise impact in the immediate vicinity of any sensitive receiver would be significantly shorter and is expected to be days rather than weeks.

Given the low background noise levels in the Proposal area, any noise generated during construction of the Proposal is likely to be intrusive. Construction works in the vicinity of each receiver are shown in **Figure 7.5-2**. Potential noise impacts at sensitive receivers include:

Receiver 1 – All Saints Church and Commissariat Store Museum, Quality Row

All Saint's Church and the associated Commissariat Store Museum are set back from both Quality Row and Middlegate Road and are physically shielded from the proposed construction footprint by a tall stone perimeter wall.

Services at All Saints Church are held at 9am on the first Sunday of each month (Norfolk Island Church of England, 2022). This service would not be impacted by noise from the Proposal as no construction work would be undertaken on Sundays.

Irregular services, such as funerals or weddings, would be likely to be impacted by noise if held during standard construction hours.

The Commissariat Store Museum is open between 11 am and 3 pm Monday to Saturday. Noise impacts at the Museum are not expected to be significant as the museum is indoors on the lower level of the building, is shielded on all sides by the stone perimeter wall and the stone walls of the building and only operates for four hours per day. The use is not considered to be as sensitive as the use of All Saints Church for weddings and funerals.

Receiver 2 – New Military Barracks

The New Military Barracks provides office space for a total of about 12 government employees (two NIRC employees and 10 Commonwealth employees).

The main building of the New Military Barracks (closest to the construction footprint) is currently used as the NIRC Registry Office (2 staff). It is expected that this building will be vacated in March / April 2024, which would be prior to the commencement of construction, should the Proposal proceed.

The other buildings in the New Military Barracks complex would be further away from the construction site and are used as the Office of the Administrator of Norfolk Island (10 staff) and a toilet block.

The office building occupied by the Commonwealth Office of the Administrator is located outside the 150 metre buffer zone around the construction footprint and is shielded from the construction site by the main building of the New Military Barracks, the surrounding tall stone perimeter walls and the All Saint's Church.

KAVHA SEWERAGE SCHEME - STAGE 2: NOISE RECEIVERS

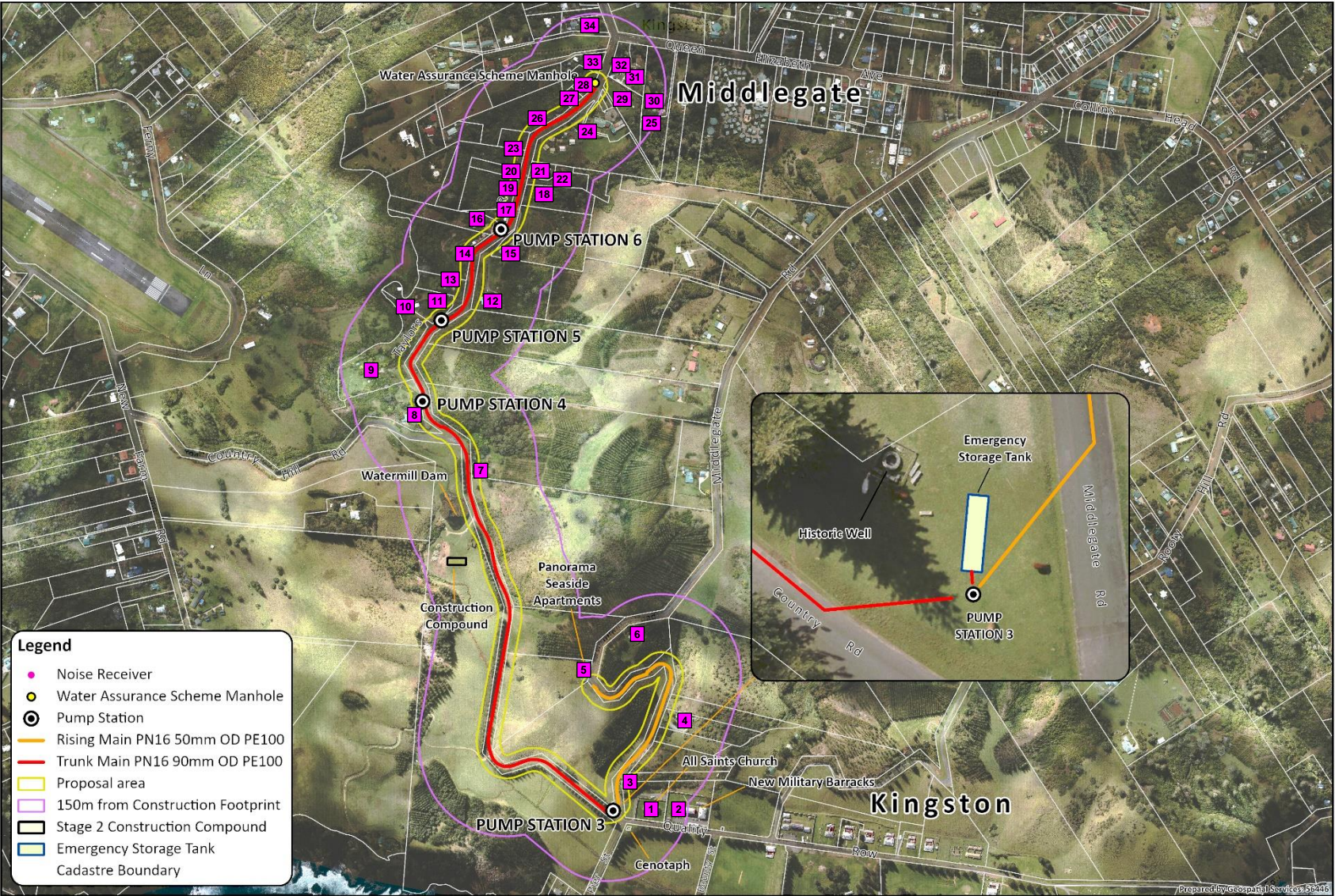


Figure 7.5-2: Sensitive receivers within 150 metres of the construction footprint

Whilst some construction noise impacts may be experienced, it is expected that this would be negligible

Receiver 3 – Residence, Middlegate Road

Receiver 3 is the only freehold residential receiver which would be exposed to two periods of construction – the construction of PS3 and the associated emergency storage tank at the commencement of construction of the Country Road / Taylors Road route, and following completion of the Country Road / Middlegate Road route, the construction of the start of the Middlegate Road route.

The residence is not physically shielded from the PS3 site or Middlegate Road and would be subject to noise impacts during site preparation and installation of the sewage pumping station, emergency storage tank and control cabinet and the installation of the Middlegate Road rising main in the vicinity of the residence.

Receivers 4-30 and 33-34 – Residences and tourist accommodation, Country Road / Taylors Road and Middlegate Road

Receivers 4 – 30 and receivers 33 - 34 are located within 150 metres of the construction footprint. Generally, for the ten sensitive receivers located in the Proposal area, physical shielding from the construction footprint is absent. For the purposes of the Proposal, it has been assumed (worst case scenario) that all residential and tourist accommodation receivers would be adversely impacted by noise for the period of time construction is in the vicinity of the respective property. Given the short period of construction in proximity to each building (days), it is anticipated impacts on each receiver would be manageable using standard mitigation and management measures (refer **Section 7.5.5**).

Receivers 31 and 32 – Businesses, Taylors Road and Middlegate Road

Receivers 31 and 32 are a building and homewares store and a joinery. Both these receivers operate businesses within large colourbond sheds which would shield them from the road. Due to the nature of the businesses, these receivers are not considered to be sensitive for the purposes of this assessment. Notwithstanding, impacts on each of these receivers would be managed using standard mitigation and management measures (refer **Section 7.5.5**).

Vibration

Vibration impacts are not expected during construction of the Proposal.

7.5.4.2 Operation

Noise

All sewage pumping stations and rising pressure mains would be located underground. This would avoid operational noise impacts (Fluent Solutions, 2023b).

Noise impacts expected during operation of the Proposal include:

- Pump out of the sewage pumping stations (including the emergency storage tank associated with PS3) to enable access to infrastructure during routine maintenance or emergency repairs. Pump out would take about 15 minutes per effluent tanker load. The number of tanker loads would be dependent on the particular situation.
- System alarms (sewage pumping stations).

Noise generated during pump-out of the sewage pumping station cannot be avoided, but would be infrequent.

The sewage pumping stations would all have a 90dB audible alarm in addition to digital alarms and SMS alerts. The audible alarms can be muted (Aquatec, no date (a)).

Vibration

Operation of the Proposal would not generate vibration.

7.5.5 Safeguards and management measures

Safeguards and management measures would be implemented to avoid, minimise or manage identified noise and vibration impacts. The measures nominated are considered suitable due to the small scale and short duration of the proposed works and are in addition to development and implementation of the Community Consultation Plan and the Complaints Management Process discussed in **Section 6** and **Section 7.11.3**.

7.5.5.1 Construction

Noise

- Train workers and contractors on the best practice use of equipment and work methods in order to minimise noise.
- Ensure workers and contractors are aware of the noise management requirements in the development approval for the Proposal, for example through site inductions and 'toolbox talks' and by providing a summary of relevant project requirements for quick reference.
- Avoid shouting, talking loudly, slamming vehicle doors or making any other unnecessary noise.
- Regularly inspect equipment to ensure it is in good working order.
- Operate equipment in accordance with the manufacturer's instructions.
- Reduce throttle settings and turn off equipment when it is not being used.
- Minimise or avoid the need for reversing or movement alarms.
- Halt construction for the duration of funeral services and weddings at All Saints Church.
- Consult with noise sensitive receivers identified in **Figure 7.5-2** prior to the commencement of construction including but not limited to:
 - Letterbox drop to sensitive receivers providing contact details for the lodgment of complaints.
 - Ongoing consultation with sensitive receivers about expected timeframes for noise impact and possible scheduling of activities to avoid periods when impacts would be most intrusive.

Vibration

- Prior to the commencement of construction, conduct a pre-dilapidation survey of the condition of relevant structures. Relevant structures include the section(s) of privately owned built surfaces (such as driveways) and structures (such as fences) that encroach into road reserves along the construction footprint.
- The pre-dilapidation survey would include the documentation of the pre-construction condition of relevant structures, including collection of dated photographic records.
- Throughout construction, monitor relevant structures for impact from vibration using the following methods:
 - Comparison with the condition of relevant structures as documented during the pre-dilapidation survey, and
 - Other methods such as crack monitoring and feel tests (place a hand on the structure or building and feel for vibration).
- If damage to a relevant structure(s) is identified during construction, cease work, notify the relevant landowner, and use non-vibratory compaction equipment to complete localised works.
- Following the completion of construction, conduct a post-construction dilapidation survey of the condition of relevant structures, including collection of dated photographic records.

- If damage to a relevant structure(s) for which pre-and post-construction dilapidation surveys were undertaken is identified as a result of the Proposal (identified either during construction or as a result of the post-construction dilapidation survey), undertake an assessment of damage to the relevant structure(s) and, in consultation with the landowner, agree rectification action with the intention to restore the property to the condition it was in prior to the commencement of construction.
- If damage to property for which pre- and post-construction dilapidation surveys have not been conducted is reported, arrange for an independent assessment to be undertaken to determine whether the damage was caused by the Proposal.
- Should the independent assessment determine the reported damage was caused by the Proposal, consult with the owner as soon as practicable to determine appropriate rectification action with the intention to restore the property to the condition it was in prior to the commencement of construction.

7.5.5.2 Operation

- Mute audible alarms if required.

7.6 Traffic and access

7.6.1 Existing environment

7.6.1.1 Traffic

Taylor's Road / Country Road runs between the Burnt Pine town centre and Kingston. It is subject to the highest volumes of traffic in KAVHA.

Middlegate Road runs between the Norfolk Island Central School which is located at the intersection of Queen Elizabeth Avenue and Middlegate Road and Kingston.

Both these routes terminate at the intersection of Country Road, Quality Row, Middlegate Road and Pier Street in Kingston.

The local road network is shown in **Figure 7.6-1**.

Average daily vehicle movements¹ on local roads that would be impacted during construction of the Proposal are:

- Country Road / Taylor's Road: 1087.
- Middlegate Road: 387.
- Pier Street: 1208.
- Quality Row: 453.

The intersection of Country Road, Quality Row, Middlegate Road and Pier Street is the busiest intersection in Kingston with an average of over 1,208¹ vehicle movements per day.

All these roads are two way, sealed roads with a speed limit of 50 kilometers per hour.

Regular sources of traffic in the Proposal area and surrounds include traffic movements to and from:

- The New Military Barracks (NIRC Registry Office and Office of the Administrator of Norfolk Island).
- The Kingston Pier (fishing, boating and the cargo ship).
- Emily Bay and Slaughter Bay (beach / water recreation and picnics).
- The football field / Kingston Oval (sporting matches).
- The Norfolk Island Golf Club (golf and events).
- Various organised tourist activities (tour buses).

Less regular sources of significant traffic volumes include:

- Funerals (All Saints Church and the Cemetery).
- Community events (the Prisoner's Compound on Bay Street).
- Cargo transport during unloading of the ship at the Kingston Pier.

7.6.1.2 Parking

There is no formal roadside parking in the Proposal area.

Grassy road verges throughout the Proposal area are sometimes used for informal parking.

¹ Measured between 26 February 2021 and 26 February 2022 (Source: DITRDC, 2022).

KAVHA SEWERAGE SCHEME - STAGE 2: LOCAL ROAD NETWORK

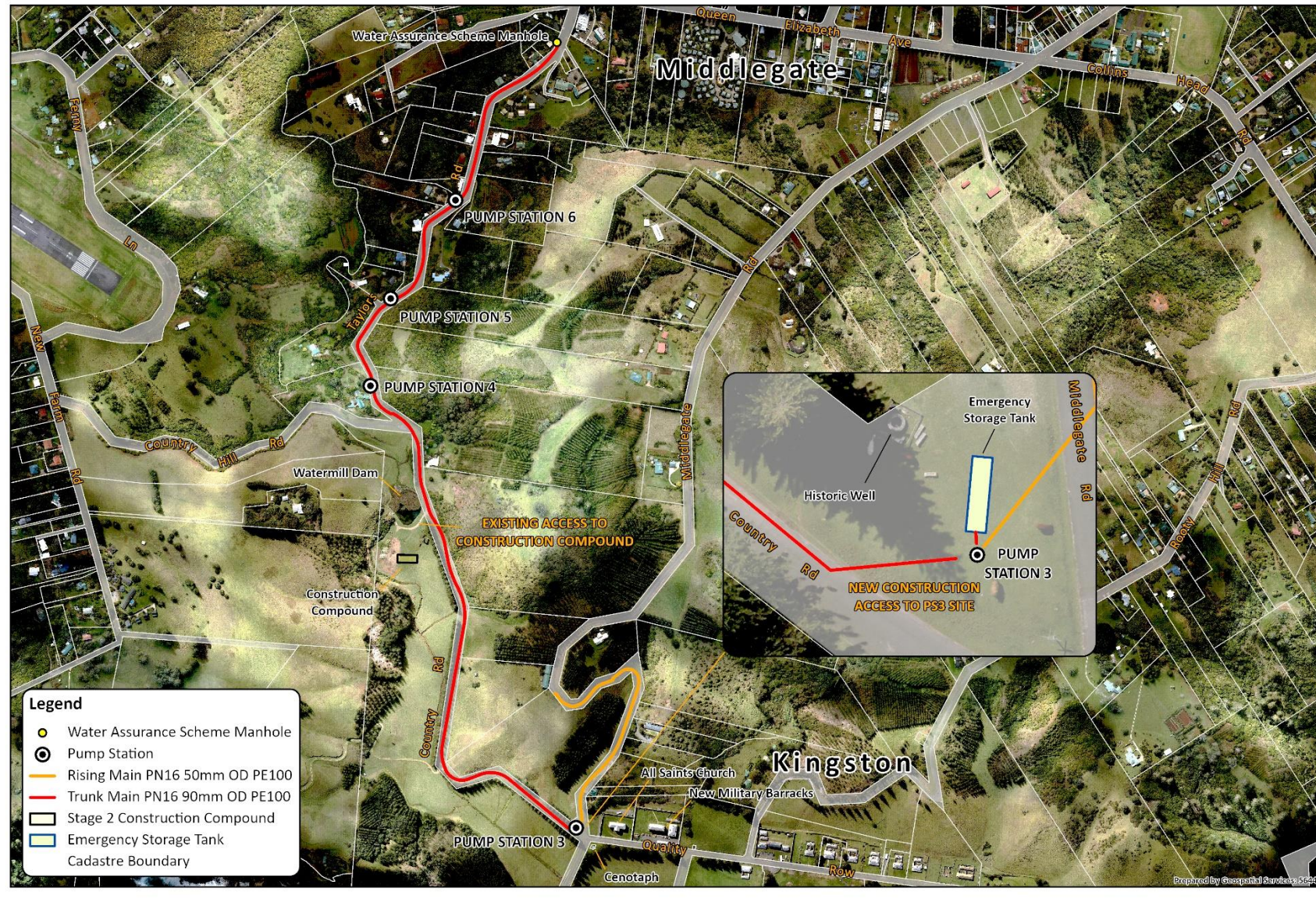


Figure 7.6-1: Local road network in the vicinity of the Proposal area

7.6.1.3 Access

Access to the construction footprint would be via the existing local road network.

Access to the proposed construction compound in the Kingston Common Reserve would be via an existing unsealed access road which is also utilised by:

- The public visiting Watermill Dam and / or the nearby heritage ruins.
- KAVHA maintenance staff who need to access the KAVHA materials stockpile.

Access to the proposed PS3 site in the Kingston Common Reserve would be:

- During construction, access to the Kingston Common Reserve would be via a temporary access track from Country Road near the intersection of Country Road, Quality Row, Middlegate Road and Pier Street (refer **Section 4.6.5**).
- During operation, maintenance of PS3 and associated infrastructure, including emergency pump out, would be undertaken from the Middlegate Road Reserve.

There are numerous driveways along both the Country Road / Taylors Road and Middlegate Road routes which provide access to private properties.

7.6.2 Potential impacts

7.6.2.1 Construction

Traffic

The majority of construction would be undertaken within the Country Road / Taylors Road reserve and the Middlegate Road reserve. This would require temporary changes to existing traffic conditions throughout the construction period.

Works that would be undertaken within public road reserves include:

- Country Road / Taylors Road:
 - Trunk main installation along the northern / eastern side of the Country Road / Taylors Road pavement between the intersection of Country Road, Quality Row, Middlegate Road and Pier Street and the connection to the NIRC Water Assurance Scheme near the intersection of Taylors Road and Queen Elizabeth Avenue.
 - Installation of three sewage pumping stations (PS4 – PS6).
 - Upgrade of the Water Assurance Scheme manhole where the Proposal would connect to the Water Assurance Scheme.
- Middlegate Road:
 - Rising main installation along the northern / eastern side of the Middlegate Road pavement between the intersection of Country Road, Quality Row, Middlegate Road and Pier Street and about the Panorama Seaside Apartments.
- Intersection of Country Road, Quality Row, Middlegate Road and Pier Street
 - Nil. Crossing of this intersection will be completed during construction of Stage 1 of the Project.

Due to the small scale of the Proposal, works along the length of the road pavement would generally only require half of the road to be closed at any one time. Traffic would continue to utilise the remaining half of the road.

Construction works undertaken in the Kingston Common Reserve would be off-road in the Reserve and would not impact traffic or access.

Parking

Most construction would be undertaken within the existing road pavement and it is not expected that informal parking on grassed road verges would be significantly impacted.

Access

Most construction would be undertaken within the existing road pavement. Consequently, no existing access infrastructure (driveways) would need to be altered as a result of the Proposal.

Access to private driveways on the northern / eastern side of Country Road / Taylors Road and the northern / eastern side of Middlegate Road would be temporarily unavailable when a trench is open in the adjoining roadway. Given the restriction on the cumulative length of open trench to 30 linear metres and the requirement to close trenches at the end of every day, impact to each driveway access would be limited to one day only.

7.6.2.2 Operation

It is not anticipated that operation of the Proposal would have any impact on traffic or access.

7.6.3 Safeguards and management measures

Safeguards and management measures would be implemented to avoid, minimise or mitigate the identified construction traffic impacts.

7.6.3.1 Construction

- Lodge an application with NIRC (Public Works) to install pipeline or conduit crossings in a public roadway for all works required in road reserves.
- Lodge an application with NIRC (Public Works) to construct a driveway / access / entrance from a public roadway for the temporary construction access track from Country Road to the PS3 site in Kingston Common Reserve.
- Prepare and implement of a Traffic Management Plan to:
 - Identify construction methods and staging to minimise road closures and disruptions to existing traffic.
 - Maintain continuous access to private properties where possible.
 - Where maintenance of continuous access to private properties cannot be achieved, manage driveway closure in consultation with the affected resident to minimise impact to the resident, including limiting private driveway access to a maximum period of one day.
 - Avoid work during community events that generate significant traffic, including all funerals.
 - Avoid conflict with traffic associated with the unloading of the ship.
 - Avoid conflict with construction traffic associated with other development projects in the vicinity (refer **Section 7.12**).
 - Implement additional speed limits as required.
 - Manage traffic movements and maintain vehicle and pedestrian safety.
 - Identify methods for the communication of changes to traffic conditions to the community.
- Erect temporary safety fencing around any excavated area in the public roadway that would be required to remain open after hours.
- Complete reinstatement of the road pavement as quickly as possible.
- Communicate changes to traffic conditions to the community prior to the change.

7.6.3.2 Operation

- Nil.

7.7 Visual amenity

7.7.1 Existing environment

KAVHA has significant natural and historic landscape value, and the visual amenity of the area is high.

The historically developed area of KAVHA known as Kingston consists of historic Georgian buildings and ruins set in manicured and well maintained grounds surrounded by the broader picturesque landscape of ocean, cliffs and hills.

Taylor's Road is the main road through the Burnt Pine township. At the southern end of Burnt Pine, Taylor's Road descends toward Kingston and terminates at the intersection with Country Road. It is a steep winding road lined by low density residential development. The residential character of the road decreases on approach to the Country Road intersection.

Following the transition of Taylor's Road into Country Road the character of the surrounds changes and the residential character is replaced with the flat open spaces of the Kingston Common Reserve and roads lined with commemorative plantings of Norfolk Island Pine trees. Country Road terminates at the intersection of Country Road, Quality Row, Middlegate Road and Pier Street, which is where the historic development of Kingston starts.

Middlegate Road is also a steep winding road. The section of Middlegate Road that is located in the Proposal area is rural in character. There is little visible residential development, and the road reserves comprise rocky cuttings on one side and grassy verges on the other. Valleys planted with Norfolk Island Pine trees lie adjacent to the road reserve. As Middlegate Road descends into Kingston, it overlooks the proposed PS3 site in the Kingston Common Reserve and more distantly, the ocean.

The intersection of Country Road, Quality Row, Middlegate Road and Pier Street serves as the major access point to and from Kingston. It is also immediately adjacent to the Norfolk Island Cenotaph War Memorial. Due to the location and the higher volume of traffic movements at this intersection comparative to the remainder of the local road network in Kingston, this intersection is considered to be visually sensitive.

7.7.2 Potential impacts

An assessment undertaken of the visual and landscape values associated with heritage significance is presented in **Section 7.4** and **Appendix G**. This assessment concluded that the Proposal would not adversely impact visual and landscape values with heritage significance. Therefore, heritage values have not been considered further in this section.

7.7.2.1 Construction

Potential impacts of construction on the visual amenity of KAVHA, including Kingston, would be temporary and short term, limited to the construction phase of the Proposal. Impacts would be generated within the construction footprint (Taylor's Road, Country Road and Middlegate Road reserves; and the PS3 and construction compound sites in the Kingston Common Reserve). Visual impacts would result from:

- Excavation.
- Soil stockpiles.
- Temporary fencing around any excavation that would need to remain open.
- Plant and equipment.
- Construction compound.
- Traffic control measures.

It is expected that post-resealing of the in-road excavation, the new sections of pavement would vary visually from the existing. However, this would not be dissimilar to other sections of the roads that have been repaired and may be a temporary impact subject to the KAVHA Roads Reconstruction Project (refer **Section 7.12.2**) which is in the planning phases. If the KAVHA Roads Reconstruction Project proceeds, all roads impacted by the Proposal would be upgraded and resurfaced.

Once reinstated, the excavated areas outside the road pavement would remain visible until the grass regrows. Consideration was given to turfing disturbed areas, although this option was discarded based on advice that turfing would make it more difficult to achieve a final ground level matching the surrounds (A. Barnett pers. Comm; 31 January 2022).

At the completion of construction, the construction compound and all materials, fencing, plant and equipment would be removed from the site.

7.7.2.2 Operation

Most of the proposed sewerage infrastructure would be installed underground and would not be visible.

Components of the proposed sewerage infrastructure that would be above ground and visible in the long-term include sewage pumping station lids and control cabinets.

Sewage pumping station lids

The sewage pumping stations would have low profile lids (diameter of less than one meter) located at ground level (refer **Figure 7.7-1**). The lids would be unobtrusive.



Figure 7.7-1: Sewage pumping station lids
(Source: Aquatec, no date: Appendix 3 of **Appendix C**)

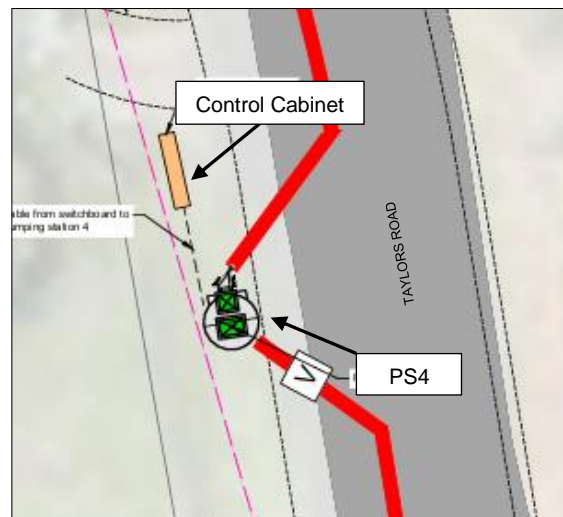
Control cabinets

The control cabinets would be made from powder coated marine grade aluminium and would be about 1.8 metres high, 0.8 metres wide and 0.45 metres deep (refer **Figure 7.7-2**). The control cabinets would be the component of the Proposal with the greatest visual impact.

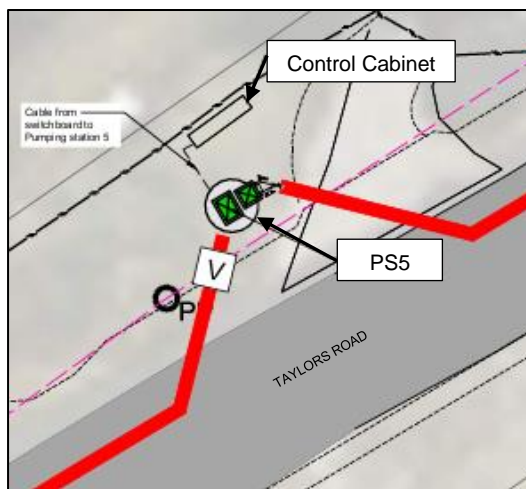
The control cabinets would be co-located with the associated sewage pumping station. The proposed locations of the control cabinets for PS4, PS5 and PS6 are shown in **Figure 7.7-3**. The control cabinets would be located toward the outer edge of the respective road reserve and are expected to be unobtrusive.



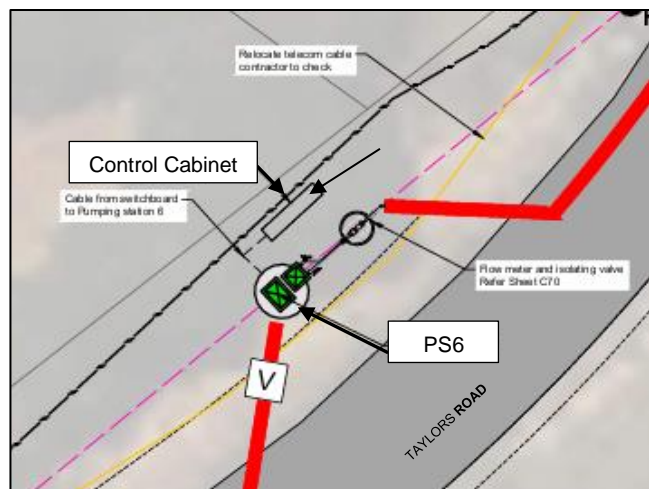
Figure 7.7-2: Typical sewage pumping station control cabinet
(Source: Fluent Solutions, 2023 (**Appendix C**))



PS4



PS5



PS6

Figure 7.7-3: Proposed locations for PS4 to PS6 control cabinets
(Source: Appendix 1: C40, C50 and C60 of **Appendix C**)

In the drawings presented in Appendix 1: Sheet C30 of **Appendix C**, the control cabinet for PS3 is located immediately adjacent to - and behind (when looking from Middlegate Road) - the heritage well on the site (refer **Figure 7.7-4**). Following consultation with the KAVHA Archaeologist, it was agreed that this location is inappropriate for a number of reasons including long-term visual impact and potential impact to the historic well.

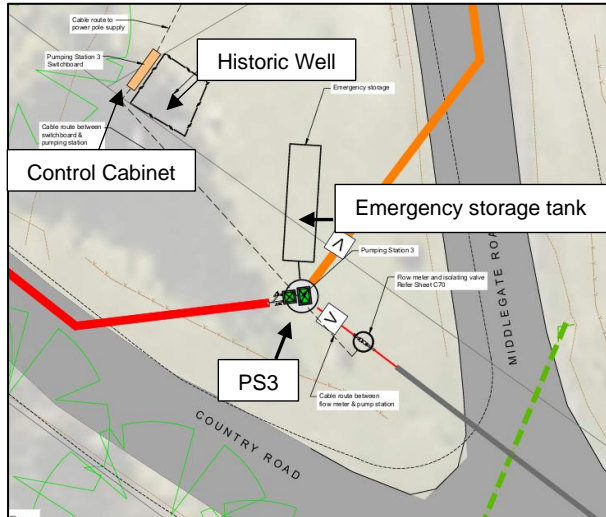


Figure 7.7-4: Proposed location for PS3 control cabinet – location to be revised
(Source: Appendix 1: Sheet C30 of **Appendix C**)

Consequently, the control cabinet for PS3 would be relocated away from the historic well to minimise the visual impact and potential heritage impact that would occur if located as shown in Sheet C30. An appropriate alternate site would be determined in consultation with the KAVHA Archaeologist, NIRC and Fluent Solutions prior to the commencement of construction of PS3.

7.7.3 Safeguards and management measures

Safeguards and management measures would be implemented to avoid, minimise or mitigate the identified visual impacts.

7.7.3.1 Construction

- Maintain the construction site, including the construction compound, in an orderly manner.
- Minimise the area to be excavated to a cumulative maximum of 30 linear metres.
- Progressively backfill excavated areas, remove soil stockpiles and clean up the immediate area prior to commencement of excavation in a new area. Any open excavation would be backfilled within the same working day, with the exception of:
 - An area of about 2.5 square metres at the end of the trench which would be left open to enable work to continue the next day.
 - Any area that is required to be left open for purposes such as managing an unexpected archaeological find (refer **Section 7.4**).
- Prior to the commencement of construction of PS3, consult with the KAVHA Archaeologist, NIRC and Fluent Solutions to determine an appropriate alternate site for the PS3 control cabinet that would minimise the visual impact of the control cabinet.
- Consider vegetation screening or other minor works to screen / minimise the long term visual impact of above ground infrastructure components at the PS3 site (sewage pumping station lid, vents and control cabinet) if required / appropriate.

- Create the construction access track to the PS3 site in the Kingston Common Reserve using methods that enable the track to be grassed.
- Reseal excavated areas within the road pavement as soon as practicable.
- Remove all materials, plant and equipment from the site, including the construction compound, as soon as practicable following the completion of construction.
- Reinstates the site to pre-construction condition as far as practicable.

7.7.3.2 Operation

- Nil.

7.8 Air Quality

7.8.1 Existing environment

Air quality impacts on Norfolk Island are generally intermittent and associated with emissions from backyard burning, small industrial operations including port operations, local road traffic and dust from unsealed roads. These impacts are considered to be low and localised, and air quality on the island is generally considered to be good.

Existing air quality impacts in the Proposal area are generally limited to emissions from local road traffic and port operations.

Local road traffic sources and volumes are detailed in **Section 7.6**.

The Proposal area is located, at the closest point, about 380 metres from the Kingston Pier which is the closest port operation and one of the two locations on the island where the cargo supply ship unloads. The shipping operation is infrequent (currently every few months) and small scale. It takes about three days to unload the ship, subject to weather and sea conditions. Cargo is progressively transported out of KAVHA by truck along both the Country Road / Taylors Road and Middlegate Road sewerage routes.

7.8.2 Potential impacts

7.8.2.1 Construction

Potential air quality impacts that may be generated during construction of the Proposal include: dust; vehicle emissions; and odour.

Given the small scale of the Proposal, the short-term construction phase, and the construction methodology which has been designed to minimise potential wind erosion and odour impacts, significant impacts to air quality during construction are not anticipated.

Dust

Dust would be generated as a result of soil disturbance during the excavation process. Soil would be excavated and stockpiled on site during installation of the sewerage infrastructure, until such time that it is used to backfill the excavations and reinstate disturbed areas. This would generally be within the same working day.

The construction methodology (refer to **Section 4.6**) has been designed to limit the length of open excavations to about 30 cumulative linear metres and to close them at the end of every working day (excluding areas that need to remain open for reasons such as:

- To enable work to continue the next day.
- To enable management of an unexpected archaeological find).

Any excavated area that would need to remain open overnight, and any stockpiled soil remaining at the end of the day, would be covered until recommencement of construction to minimise the risk of windblown dust.

Vehicle emissions

The vehicles, plant and equipment to be used during construction are detailed in **Section 4.6.6**. These vehicles, plant and equipment would introduce an additional source of vehicle emissions to the area.

Odour

Odour emissions during testing and commissioning of the new infrastructure are not anticipated. All testing would be undertaken using clean water in an enclosed system.

During connection of the Proposal to operational sewage infrastructure, the relevant section of operational sewer would be isolated and emptied prior to the connection being made to minimise the risk of localised odour emissions.

7.8.2.2 Operation

The proposed pressure sewerage system is a sealed system with the exception of the following vents.

- Four sewage pumping vents.
- Two combination air and vacuum relief valve vents.
- One Water Assurance Scheme manhole vent.

Each of these vents would be fitted with a McBerns activated carbon odour filter designed to prevent release of malodours. Subject to proper maintenance of the odour filters, no odour impacts are expected during operation of the Proposal.

7.8.3 Safeguards and management measures

Safeguards and management measures would be implemented to avoid, minimise or mitigate the identified impacts on air quality.

7.8.3.1 Construction

- Restrict areas of open excavation to about 30 cumulative linear metres.
- Backfill excavated areas at the end of each working day (excluding areas that need to remain open for reasons such as: to enable work to continue the next day; or to enable management of an unexpected archaeological find).
- Cover excavations that must remain open overnight.
- Cover or water soil stockpiles to minimise wind-blown dust.
- Rehabilitate disturbed areas as soon as practicable.
- Cover vehicle loads that would generate dust.
- Maintain vehicles, plant and equipment in good working order.
- Turn off vehicles, plant and equipment when not in use.

7.8.3.2 Operation

- Maintain odour control filters at sewage pumping station vents, the combination air relief valve vents and the Water Assurance Scheme manhole vent in accordance with manufacturer's specifications.

7.9 Waste

7.9.1 Existing environment

Waste on Norfolk Island is managed by NIRC at the NIRC Waste Management Centre which is the only licenced waste disposal facility on Norfolk Island. The management of waste is a significant problem on the island. There is no landfill on the island, and funds available to transport waste streams offshore for disposal are limited.

7.9.2 Potential impacts

7.9.2.1 Construction

Waste that is expected to be developed as a result of construction of the Proposal includes:

- Unsuitable or excess spoil. Excavated soil would be used to backfill excavations. Some spoil may not be suitable for use (too rocky) or may be excess to requirements. Unsuitable and excess spoil volumes, including excavated road pavement, are expected to be small.
- Packaging from new materials and infrastructure components.
- General waste from workers: This would likely be limited to small amounts of personal waste such as food packaging.

7.9.2.2 Operation

Waste that is expected to be developed as a result of operation of the Proposal includes:

- Sewage.
- Any system components that need replacement.

7.9.3 Safeguards and management measures

Safeguards and management measures would be implemented to avoid, minimise or mitigate the identified impacts of waste including:

- Manage all waste generated during construction and operation of the Proposal in accordance with the following waste management hierarchy:
 - Waste generation would be avoided and where avoidance is not feasible or reasonable, reduced.
 - Where avoiding or reducing waste is not possible, waste would be re-used, recycled, or recovered.
 - Where re-using, recycling or recovering waste is not possible, waste would be delivered by truck to the NIRC Waste Management Centre for disposal.
- Additional measures would be applied to manage specific impacts of waste during construction and operation (refer **Section 7.9.3.1** and **Section 7.9.3.2**).

7.9.3.1 Construction

- Remove unsuitable or excess spoil from the site and relocate it to the KAVHA materials stockpile (currently located adjacent to the Watermill Dam) for reuse in other projects.
- Collect all general waste from workers and packaging from materials and infrastructure components in bins located at the construction compound. Bins would provide for separate storage of different waste streams (food and organics, glass, recyclapod (e.g. cardboard, paper, plastic, aluminium, steel, packaging, takeaway coffee cups), hazardous, and sanitary (refer **Appendix I** for further information of waste separation).
- Remove bins from the site as required and dispose of waste at the NIRC Waste Management Centre.
- Do not burn or stockpile waste on site.

7.9.3.2 Operation

- If required during system maintenance or failure, pump sewage into effluent tankers and transport it to the sewage treatment plant for treatment and disposal.
- Repair any system component requiring maintenance. If repair is not possible, store the component for spare parts. If components are unable to be repaired and are not useful for spare parts, take them to the NIRC Waste Management Centre for disposal.

7.10 Hazard and risk

Environmental hazards resulting from the construction and operation of the Proposal, and the identification of measures to avoid, mitigate or manage these risks, are addressed throughout **Section 7** of this EIS.

Hazards arising from incidents during project construction and operation could also pose a risk to human health, as well as that of the environment. Potential risks and appropriate safeguards and management measures are discussed in **Section 7.10.1** and **Section 7.10.2**

7.10.1 Potential impacts

7.10.1.1 Construction

The following hazards and risks would be associated with construction of the Proposal:

- Potential impacts on the environment and human health resulting from accidental releases or improper transport, handling and storage of hazardous substances related to the Proposal.
- Occupational health and safety hazards, such as dangers to the construction workforce, road users and the general public.
- Potential rupture or interference with existing underground services.

Hazardous substances

Small volumes of hazardous substances that may be transported and used on site during construction of the Proposal include fuels and oils required to run plant and machinery.

Fuels and oils would generally be stored off-site at the contractor's facilities and the contractor would transport fuels and oils to the construction site daily in jerry cans with a maximum capacity of 20 litres. Should hazardous materials need to be stored on-site for any reason, they would be stored at the construction compound in accordance with *Australian Standard AS 1940 The storage and handling of flammable and combustible liquids*.

Potential inadvertent spills, fire and / or explosions resulting from the handling, storage and transportation of hazardous substances may adversely affect the quality of the local environment and impact human safety. However, the potential for such incidents to occur is considered to be low in view of the following factors:

- The quantities of hazardous substances required would be small.
- Hazardous substances would be stored off-site or, if required, on-site at the construction compound in accordance with *Australian Standard AS 1940 The storage and handling of flammable and combustible liquids*.

Occupational health and safety hazards

Potential occupational health and safety hazards include:

- Changed traffic conditions.
- Changed pedestrian access conditions.
- Open excavations.
- Exposure to pathogens during:
 - Emptying, cleaning and decommissioning of the existing Stage 1 'end of line' sewage holding tanks (if constructed).
 - Connection of the Proposal to Stage 1 infrastructure and the Water Assurance Scheme.

Potential traffic or pedestrian accidents or exposure to pathogens during construction of the Proposal may impact human safety. However, the potential for occupational health and safety hazards to occur is considered to be low in view of the following factors:

- Safeguards and management measures would be implemented to mitigate traffic and access impacts (refer to **Section 7.6.3**).
- Excavations would be managed during construction to maximise public safety including:
 - Backfilling of excavations at the end of each working day.
 - Exclusion fencing of any excavation that would need to remain open overnight (refer to **Section 4.6.2**).
- Connection of the Proposal to operational sewage infrastructure would be undertaken by experienced plumbing and septic service contractors.

Underground services

During excavation, there is the potential for works to rupture underground services including electricity and telecommunications. This could give rise to additional hazards such as electrocution.

Overall, the hazards and risks to the environment, construction personnel and the public during construction are considered low and would be managed by the implementation of standard safeguards and management measures including those identified in **Section 7.10.2**.

7.10.1.2 Operation

Hazard and risk associated with the operation of the Proposal would be limited to potential leakage of raw sewage into the environment as a result of infrastructure failure.

Hazard and risk associated with sewage overflow is considered to be low in view of the following factors:

- The successful operation and maintenance contractor would be required to keep spare parts and components for the entire sewerage scheme in stock to enable timely repairs in the event of maintenance problems or infrastructure failure. This is essential due to the remote location and infrequent freight deliveries to Norfolk Island.
- Isolation valves enable sections of the sewerage scheme to be isolated so a section can be shut down for maintenance whilst other sections still function. The Proposal includes five isolation valves located just before the entrance to each sewage pumping station¹.
- All sewage pumping stations would be alarmed and would send out an automated alert to the scheme operator in the event of a problem.
- Each sewage pumping station would have about 24 hours storage capacity in the event of equipment or power failure which would allow time for the problem to be rectified. If more than 24 hours was required for a repair, each sewage pumping station and the emergency storage tank associated with PS3 could be manually pumped out into an effluent tanker for disposal at the sewage treatment plant.
- The pressure sewage system is fully sealed (with the exception of vents which would be installed above potential flood levels) and is not subject to inundation or overflow during heavy rainfall or flood events.

Refer to **Section 4.4**, **Section 4.5**, **Section 4.6** and **Appendix C** for more information about the sewerage scheme infrastructure.

As a result of the Project, seepage from existing sewage holding tanks on Crown land in KAVHA would be eliminated. This would result in an improvement in the quality of currently affected waterbodies and decreased risk to public health.

¹ Note there are two isolation valves before sewage pumping station PS3, one in the Middlegate Road rising main and one in the Country Road trunk main.

The Proposal would connect Stage 1 infrastructure to the Water Assurance Scheme, removing the need for the approved Stage 1 'end of line' sewage holding tanks and the associated risk of tank failure and sewage spills.

7.10.2 Safeguards and management measures

Safeguards and management measures would be implemented to avoid, minimise or manage identified hazard and risk impacts during construction.

7.10.2.1 Construction

Fuels and oils

- Fuels or oils would not be stored on site unless at the construction compound and in accordance with *Australian Standard AS 1940:2017 The storage and handling of flammable and combustible liquids* provisions for minor storage quantities (Office of Industrial Relations, 2018) including:
 - Keep fuels and oils separated from potential ignition sources and combustible materials and in a well-ventilated place.
 - Secure storage areas against access by unauthorised persons at all times.
 - Store fuels and oils in bunded areas with a capacity of at least 25 percent of the combined fuel / oil stored.
 - Take care when decanting or transferring fuels and oils to reduce the hazards of splash filling, spillage and vapour escape.
 - Fill storage containers to no greater than 95 percent.
 - Keep fuel / oil containers closed when not in use.
 - Transfer and move liquid substances, fuels and oils in a way that reduces the likelihood of spillage, vapour escape or fire.
 - Ensure that spill-response kits suitable for use with the hazardous substances on site are available at all times and are replaced or restocked after use. A simple spill-response kit may consist of:
 - A readily identifiable, suitable container with a lid or cover containing absorbent materials.
 - Suitable personal protective equipment.
 - Suitable equipment required for spill clean-up.
 - Clean up all spills and leaks immediately.
- Maintain plant and machinery well and check daily for fuel and oil leaks. Contain any identified fuel or oil leak and repair as soon as practicable.

Accidents

- Implement safeguards and management measures to address traffic and access impacts during construction as described in **Section 7.6.3**.
- Manage open excavations in accordance with the construction methodology described in **Section 4.6.2**.
- Utilise experienced plumbing and septic service contractors to connect the Proposal to operational sewage infrastructure.

Underground services

- Consult DITRDCA and NIRC prior to the commencement of excavation to identify any existing underground services in the Proposal area, including, but not limited to electricity and telecommunications services.

7.10.2.2 Operation

System maintenance

- Implement safeguards and management measures to address sewage overflow impacts during operation as described in **Section 7.2.3.2**.

7.11 Socio-economic

7.11.1 Existing environment

Both Kingston, and the broader KAVHA area have great value to the Norfolk Island community in terms of both cultural heritage and current lifestyle. The built heritage and natural landscape values of the area also provide an attraction and valuable visitor experience for tourists.

The existing social and economic environment of Kingston / KAVHA area includes the consideration of:

- The social environment including community values such as lifestyle and cultural heritage.
- The economic environment including tourism and tourist related businesses.

The key objectives of the Project relate to reduction of human waste contamination with aim to improving water quality in the creeks and wetlands and ultimately Emily Bay and Slaughter Bay in the Norfolk Marine Park.

In addition to Kingston / KAVHA, the Proposal area includes the Taylors Road, Country Road and Middlegate Road reserves which adjoin land that has been largely developed for residential purposes.

7.11.1.1 Social environment

The Norfolk Island community values and utilises Kingston / KAVHA for many purposes including:

- Setting for cultural events such as historic celebration days, including but not limited to; (Bounty Day; Foundation Day; Thanksgiving Day; and Anzac Day).
- Funerals.
- Sport and recreation including, but not limited to: golf; football; water sports (such as beaching, swimming, snorkeling; outriggering; paddle boarding; wind surfing; diving, school sports carnivals); walking; and picnicking.
- Boating and shipping.

Within the Proposal area, social values would primarily relate to residential amenity.

7.11.1.2 Economic environment

According to a 2017 economic study undertaken by the Centre for International Economics, tourism represents about 58 percent of economic activity on Norfolk Island. 78 percent of tourists visit KAVHA, and 38 percent of tourists visit the island specifically to visit KAVHA (CIE, 2017).

Along with the World Heritage values of KAVHA - one of eleven historic sites that together form the Australian Convict Sites World Heritage Property – the beaches and coral reefs in KAVHA are a significant tourist attraction with Emily Bay included in top 10 beach listings in:

- The South Pacific in 2022 (Kachor, 2022).
- Australia in 2017 (Escape, 2017).

Existing pollution of Emily Bay and Slaughter Bay is threatening the health of the coral reefs and other marine species (refer **Section 3**) and limiting safe use of the bays for recreational purposes. Pollution adversely impacts use of the area by both the resident Norfolk Island community and the tourist population.

7.11.2 Potential impacts

7.11.2.1 Construction

The following socio-economic impacts would potentially occur during the construction phase of the proposal:

- Amenity impacts.
- Impacts on traffic conditions and access arrangements.
- Economic impacts.

Amenity impacts

Amenity impacts include any factors that affect the ability of a resident, visitor or business owner to enjoy their home and daily activities, for example, noise, changes to views, changes to air quality and changes to water quality. Amenity impacts during construction of the Proposal are discussed in detail in **Section 7.2**, **Section 7.5**, **Section 7.7**, and **Section 7.8**.

Construction activities would take place between 7am and 5pm, Monday to Friday and between 8am and 1pm Saturday, with no work on Sunday or public holidays.

During construction, a number of sensitive receivers, primarily residential receivers, would be affected by noise. Whilst the construction period is expected to be about 4 – 6 months, construction would generally progress along the linear construction route and noise impacts would be greatest at any sensitive receiver for days rather than weeks or months as it progresses past the subject property. Refer to **Section 7.5** for further details about noise impacts and proposed mitigation.

Construction of the Proposal would generate visual impacts to road users, occupiers / users of properties in the vicinity of the construction site, and visitors to KAVHA. As construction progresses, each section of construction would be completed, and the site reinstated as far as practicable prior to progression to the next section. Refer to **Section 7.7** for further details about visual impacts and proposed impact mitigation.

Dust would be generated during the construction of the Proposal from excavation and stockpiles within the Proposal area. Dust would be managed using water suppression, covering of stockpiles and progressive reinstatement of trenches as construction moves from west to east. Refer to **Section 7.8** for further details about dust impacts and proposed impact mitigation.

Sedimentation is a possible impact resulting from excavation and the erosion and mobilisation of soil by surface water during rainfall events. Unchecked, this could result in sedimentation of Watermill Dam, Watermill Creek and associated swampland, and ultimately downstream wetlands and Emily Bay. Erosion and sediment controls are effective in preventing impacts of erosion and sedimentation and would be implemented as an intrinsic part of the construction methods. Refer to **Section 7.2** for further details about erosion and sedimentation impacts and proposed impact mitigation.

Traffic and access impacts

During construction, temporary changes to traffic conditions and access arrangements in the Proposal area would be required. Traffic and access would be managed to minimise disruption to traffic, and to maintain ongoing access to properties where possible. In instances where ongoing access to properties cannot be maintained (for example when trenching in the adjoining roadway) impacts would be limited to one day only, and would be undertaken in consultation with the occupier of the respective property. Construction traffic impacts would be managed through the implementation of a Traffic Management Plan. Refer to **Section 7.6** for further details about traffic and access impacts and proposed impact mitigation.

Economic impacts

The Proposal

Potential negative impacts to business include construction noise and change in access arrangements to four tourist accommodation businesses. Refer to **Section 7.5** and **Section 7.6** for further details about potential noise and access impacts and proposed mitigation.

Construction of the Proposal would be funded by DITRDCA. The construction contractor would be sourced locally, and the Proposal would generate local employment for the period of construction.

Possible future private connections

Possible future private connections to the sewerage scheme are outside the scope of the Project, and would be managed by NIRC should they proceed.

However, as part of the Proposal, provision would be made within the road reserves for the possible future connection of private properties along Country Road / Taylors Road and Middlegate Road in the form of capped off T-junctions (or similar). These boundary connections would prevent the need for re-disturbance of the operational sewerage infrastructure should NIRC decide to proceed with future private connections.

The locations of the boundary connections identified in the design provided at **Appendix C** have been selected to keep connection points close to sewage pumping stations for ease of maintenance.

During consultation undertaken during the environmental assessment for the Proposal, concern was raised regarding the location of a boundary connection in relation to the associated property. In response to this concern, affected landowners would be consulted during the construction phase of the Proposal with aim to determining a boundary kit location that better suits the landowner, subject to still meeting technical requirements of the sewerage scheme.

7.11.2.2 Operation

The operational socio-economic impacts of the Proposal would be positive.

Containment of the human waste generated in the Proposal area and the consequent reduction in pathogen and nutrient pollution of the downstream freshwater and marine environments would reduce existing impacts on freshwater and marine biodiversity including coral reefs, fish assemblages and migratory sea birds.

This in turn would increase the attractiveness and safe use of the area by both the Norfolk Island community and visitors to the island and help protect the social and economic values of KAVHA and the Norfolk Marine Park.

Operation of the Proposal would be funded by DITRDCA. The contracted operational personnel would be sourced locally, and the Proposal would generate ongoing local employment.

It is acknowledged that the possible future connection of properties to the sewerage scheme proceed (refer **Section 4.7**), it is likely to result in an annual cost to the respective landowner. Sewerage connection fees and charges would be levied by NIRC. The possible future connections and associated NIRC fees and charges are outside the scope of the Proposal.

7.11.3 Safeguards and management measures

Safeguards and management measures would be implemented to avoid, minimise or mitigate identified socio-economic impacts during construction including:

- Develop and implement a Community Consultation Plan to provide timely, regular and transparent information about the Proposal, details of future work programs, changes to access and traffic conditions, and general construction progress throughout the construction phase of the Proposal.
- Provide information to the community in a variety of ways such as letter box drops, articles in the Norfolk Islander weekly newspaper, radio announcements and signage.
- Develop and implement an enquiries and complaints management process for the duration of construction. Provide the community with information about how to make an enquiry or a complaint including: Telephone Number; Email Address; Postal Address; Physical Address and hours within which enquiries or complaints can be made.
- Provide landowners that may be required by NIRC to connect to the Proposal in the future with the opportunity to liaise with DITRDCA and / or its Contractor to determine a boundary kit location that better suits the landowner, subject to still meeting technical requirements of the sewerage scheme.
- Implement safeguards and management measures to address noise impacts as described in **Section 7.5.5**.
- Implement safeguards and management measures to address air quality impacts during construction as described in **Section 7.8.3**.
- Implement safeguards and management measures to address visual impacts during construction as described in **Section 7.7.3**.
- Implement safeguards and management measures to address erosion and sedimentation impacts during construction as described in **Section 7.2.3**.
- Implement safeguards and management measures to address traffic and access impacts during construction as described in **Section 7.6.3**.

7.12 Cumulative impacts

The cumulative environmental effect of the Proposal with other existing or likely future activities must be taken into account when consideration is being given to the potential impact of the Proposal on the environment.

The assessment of cumulative impacts associated with the Proposal was separated into:

- Cumulative impacts within the Project (Stages 1-3).
- Cumulative impacts with other projects in the vicinity of the Proposal.

Smaller scale developments such as minor building and residential construction projects were excluded from the assessment of cumulative impacts.

7.12.1 KAVHA sewerage scheme project

Stage 1 of the Project was approved in 2022 and is under construction. Stage 3 of the Project is in the design phase.

It is intended that Stage 1, Stage 2 and Stage 3 of the Project would be constructed consecutively. Consecutive construction enables more realistic use of available human resources, which are limited on the island.

Should the Proposal proceed, it is intended that it be constructed consecutive to Stage 1, but that Stage 1 and Stage 2 be commissioned at the same time. This would remove the need for the large temporary above ground 'end of line' sewage holding tanks and associated costs and impacts.

Consecutive construction of Stage 1, Stage 2 (the Proposal) and Stage 3 of the Project would have the following temporary impacts in KAVHA:

- Prolonged changes to traffic conditions.
- Prolonged construction noise impacts.
- Prolonged visual impacts.

Given the small scale and linear nature of the Project, the safeguards and management measures that are being implemented for Stage 1 and would be implemented for Stage 2 and Stage 3 to minimise potential impacts of each stage of the Project, and the possible time delay between the construction of each stage, cumulative impacts of the three stages of the Project are not expected to be significant and have not been considered further.

7.12.2 Other development activities

Consultation with DITRDCA and with NIRC identified five projects that, if carried out concurrently with the Proposal, could result in the generation of cumulative impacts. The projects are detailed in **Table 7.12-1**.

Table 7.12-1: Projects that may operate concurrently with the Proposal

Project	Proponent	Location	Approved	Estimated timing of construction
Refurbishment of Sea Wall	DITRDCA	Point Hunter Reserve	2 June 2020	Underway. Estimated completion by 15 March 2024.
Refurbishment of Public Building – Civil Hospital stabilisation works	DITRDCA	Pier Street	22 April 2021	Timing currently unknown.
Augmentation of Kingston Pier Channel and repair work to Kingston Pier	DITRDCA	Kingston Pier	1 July 2022	Timing currently unknown.
KAVHA Roads Reconstruction Project	DITRDCA	All roads in KAVHA	Pre-DA	Estimated start in 2025
Bounty Street Bridge Maintenance	DITRDCA	Bounty Street		Estimated start in January 2025

The proposed KAVHA Roads Reconstruction Project is currently in the early planning phase. Should it proceed, it would be undertaken in three stages:

- Stage 1: Taylors Road, Country Road (between the intersection of Country Road, Middlegate Road, Pier Street and Quality Row and the transition to Taylors Road) and Quality Row.
- Stage 2: Middlegate Road, Pier Street, Bounty Street, Bay Street, Emily Bay Road.
- Stage 3: Rooty Hill Road, Driver Christian Road, Country Road (between the transition to Taylors Road) and the intersection with New Farm Road.

The design of the Proposal has taken the proposed KAVHA Roads Reconstruction Project into consideration.

7.12.3 Potential cumulative impacts

7.12.3.1 Cumulative construction impacts

It is expected that cumulative construction impacts would generally be limited to potential traffic impacts of the Proposal and other development activities in the area occurring concurrently. The greatest cumulative traffic impact would be experienced at the intersection of Country Road, Middlegate Road, Pier Street and Quality Row, and along Country Road, Taylors Road and Middlegate Road.

The KAVHA Roads Reconstruction Project is the only project that would be undertaken within the Proposal area. Should this project proceed, the upgrade of Taylors Road and Country Road would occur following completion of the Proposal. This would expose sensitive receivers along these roads to a second period of construction and associated traffic, access, noise and visual amenity impacts. The upgrade of Middlegate Road would be undertaken during Stage 2 of the KAVHA Roads Reconstruction Project and there would be a longer time period between construction events, reducing the potential for cumulative impact on Middlegate Road.

7.12.3.2 Cumulative operational impacts

There would be no cumulative operational impacts.

7.12.4 Safeguards and management measures

Cumulative construction traffic impacts (including access) would be mitigated and managed by the safeguards and management measures outlined in **Section 7.6.3**, particularly the development and implementation of a Traffic Management Plan.

The preparation and implementation of a Traffic Management Plan is required, amongst other things, to avoid conflict with construction traffic associated with other development projects in the vicinity.

Traffic, access, noise and visual amenity impacts of the Proposal would be minimised, mitigated and managed by the safeguards and management measures outlined in **Section 7.5.5**, **Section 7.6.3** and **Section 7.7.3**. DITRDCA would be responsible for mitigation and management of potential impacts of other DITRDCA projects.

7.13 Implications for long term sustainability

The Project (including the Proposal) would contribute to the long term sustainability of the Norfolk Marine Park by minimising human waste contamination of Emily Bay and Slaughter Bay and consequent degradation of the coral reefs, other marine species and the marine environment.

8 Environmental management

8.1 Compilation of safeguards and management measures

Environmental safeguards outlined in this document would be incorporated into the detailed design phase of the Proposal and implemented during construction and operation of the Proposal, should it proceed. These safeguards would minimise potential adverse impacts arising from the proposed works on the surrounding environment. The safeguards and management measures are summarised in **Table 8-1** and **Table 8-2**.

Many of the safeguards and management measures nominated for the management of impacts of the Proposal are: current practice on Norfolk Island; standard and / or statutory measures; and / or measures adopted from relevant government guidelines that have been tried and tested over time and across multiple projects. Where tailored mitigation is required, project specific measures have been developed.

The use of standard measures that are demonstrated to be effective, in conjunction with project specific measures where required and the selection of infrastructure suitable to the Norfolk Island environment (simple components and easy to operate and maintain), provides confidence that adverse impact on the environment would be avoided or mitigated and that any residual impacts would be effectively managed.

Table 8-1: Site-specific environmental safeguards and management measures for construction

Ref #	Environmental safeguards and management measures	Comments
CONSTRUCTION		
Design		
1	Determine the final treatment for each culvert crossing on a case by case basis in consultation with the DITRDCA Norfolk Island Contracts and Building Supervisor, the KAVHA Archaeologist and the NIRC Team Leader for Public Works.	Prior to treatment of the respective culvert.
Methodology		
2	Open excavations would be small scale (no longer than 30 cumulative linear metres) to minimise the time in which soils are exposed to oxygen.	
3	Trenches would be shallow (less than one metre deep) to avoid any need for draining or dewatering thereby avoiding groundwater fluctuations which could expose Potential ASS to oxygen.	
4	Only clean fill would be used, sourced from the site and supplemented (if required) with soil from the KAVHA materials stockpile (currently located adjacent to Watermill Dam).	
Water quality / Geology and soils		
Erosion and sedimentation		
5	Keep roads and access tracks clear of soil or sediment.	
6	Limit vehicle and machinery movements to existing roads and access tracks where possible.	
7	Monitor weather forecasts regularly.	
8	Do not undertake construction activities if rainfall is forecast for that day.	
9	Do not undertake construction activities during or immediately following wet weather.	
10	<p>Install erosion and sediment control measures progressively along the construction route in areas where there is potential for sediment movement or surface water runoff. Erosion and sediment control measures include, but are not limited to:</p> <ul style="list-style-type: none"> - Measures included in the Erosion and Sediment Control Plan. - Sandbag walls about 0.5 – 1 metre high. - Wind erosion protection fencing in less protected areas of the construction site (if required). - In addition to the controls included in the Erosion and Sediment Control Plan (Figure 7.2-6), sandbags would be used as needed to prevent stormwater from uphill areas eroding soil from the construction site and causing sedimentation into downstream environments. 	Refer to Figure 7.2-6 – 7.2-9 of the EIS for the Erosion and Sediment Control Plan.

Ref #	Environmental safeguards and management measures	Comments
11	Install erosion and sediment control measures prior to the commencement of each area of excavation.	Refer to Figure 7.2-6 – 7.2-9 of the EIS.
12	Supplement erosion and sediment control measures as required to prevent sediment leaving the construction site.	
13	Maintain erosion and sediment control measures in good working order until excavations are backfilled, all stockpiles are removed from the impacted area and the site is cleaned up.	
14	Limit excavations to a linear length of about 30 cumulative linear metres at any one time.	
15	Locate excavated soil away from drains and creeks.	
16	Store excavated soil uphill of excavations and downhill of sandbag walls.	Refer to Figure 7.2-10 of the EIS.
17	Backfill open excavations at the end of every working day with the exception of small areas that must be left open to enable work to continue the next day (maximum 2.5 square metres) or to enable proper management of an unexpected archaeological find.	Refer to Section 4.6.2 of the EIS.
18	Sandbag, cover and fence any excavated area left open at the end of the for erosion protection, and safety.	
19	Cover any piles of soil that have not been depleted at the end of each day to prevent erosion or movement of sediment (wind and water protection).	
Acid sulfate soils (ASS)		
20	Undertake an assessment of construction depth core samples for presence of ASS in the section of the Country Road construction footprint that is adjacent to areas of known ASS.	To be completed prior to the commencement of construction. Refer to Section 7.2.2.1 of the EIS.
21	Should pre-construction core samples in the Country Road construction footprint identify the presence of Potential ASS or Actual ASS, develop an ASS Management Plan prior to the commencement of construction in the affected area.	If required the ASS Management Plan would be developed by suitably qualified personnel with ASS expertise, such as a Registered Soil Practitioner – ASS by accreditation through Soil Science Australia (https://www.soilscienceaustralia.org.au/rsp/acid-sulfate-soil-accreditation).

Ref #	Environmental safeguards and management measures	Comments
22	<p>If Potential ASS or Actual ASS is encountered during construction:</p> <ul style="list-style-type: none"> - Stop work in the affected area. - Apply lime, or another appropriate alkaline product, to the site to lower the pH of the soil. - Backfill the affected area to minimise further exposure to oxygen. - Contact a qualified soil scientist to seek guidance on required soil management actions. 	<p>ASS is identifiable by look and smell. It is black and peaty and smells like hydrogen sulfide (rotten egg gas).</p> <p>A suitably qualified soil scientist is a qualified soil scientist with ASS experience (such as a Registered Soil Practitioner – ASS by accreditation through Soil Science Australia (https://www.soilscienceaustralia.org.au/rsp/acid-sulfate-soil-accreditation))</p>
Biodiversity		
23	Modify the design during the detailed design and construction phases of the Proposal to avoid damage to protected or significant trees if required.	
24	Erect tree protection barriers to prevent unnecessary damage to the Norfolk Island Pine tree located next to the temporary construction access track to the PS3 site if required by NIRC.	
25	Obtain a permit to 'take' a protected tree in accordance with the <i>Trees Act 1997(NI)</i> prior to any unavoidable damage (felling, ring barking, removing, injuring or destroying) to a tree protected under the <i>Trees Act 1997 (NI)</i> , including the trimming of the branches of the Norfolk Island Pine tree located next to the temporary construction access track to the PS3 site.	Refer to Section 8.2 of the EIS. Obtain prior to felling, ring barking, removing, injuring or destroying a tree protected under the <i>Trees Act 1997 (NI)</i> - Norfolk Island Pine tree greater than 4.5 metres high and White Oak tree greater than four metres high.
Heritage		
Built heritage		
26	Consult with the KAVHA Archaeologist, NIRC and Fluent Solutions to determine an appropriate alternate site for the PS3 control cabinet that would minimise the visual impact of the control cabinet.	Prior to the commencement of construction at the PS3 site.
27	Dig any excavation that would be in close proximity to the heritage well at the PS3 site by hand or using non-vibratory equipment, as advised by the KAVHA Archaeologist.	
28	Erect a barrier around the heritage well at the PS3 site to prevent accidental damage during construction.	Prior to the commencement of construction at the PS3 site.
Significant plantings		
29	Prevent, or if prevention is not possible, minimise damage to significant plantings.	Refer to Figure 7.4-5 of the EIS

Ref #	Environmental safeguards and management measures	Comments
Archaeology		
30	Provide the KAVHA archaeologist with a minimum of two weeks notice of the commencement of construction.	
31	Dig all excavations close to foundations or remains of heritage structures by hand under supervision of the KAVHA archaeologist.	
32	Cease mechanical excavation and commence manual excavation as instructed by the KAVHA archaeologist.	
33	Stop work immediately if accidental damage occurs to any heritage item, and immediately notify the Commonwealth Heritage Manager or the KAVHA archaeologist. Work would not recommence until the Commonwealth Heritage Manager or the KAVHA archaeologist has provided approval to do so.	
34	Stop work immediately if any unexpected heritage item is found and immediately notify the Commonwealth Heritage Manager and / or the KAVHA archaeologist. Work would not recommence until the Commonwealth Heritage Manager or the KAVHA Archaeologist has provided approval to do so.	
35	<p>The Commonwealth Heritage Manager and / or KAVHA archaeologist would, in accordance with the requirements of the HMP and the AZMP, implement the following safeguards and management measures for all land in KAVHA. They would also be applied to land in the Proposal area that is outside KAVHA, as required:</p> <ul style="list-style-type: none"> - Prepare an archaeological research design and methodology for the Proposal prior to the commencement of construction. - Complete test excavations where ground disturbance is proposed in areas of high archaeological potential prior to the commencement of, and during construction as required. - Adjust the construction footprint as required if test excavations identify potential archaeological impact that should be avoided prior to the commencement of construction. - Consult data collected from non-invasive investigations (LiDAR and geophysical surveys) to refine/adjust the construction footprint in areas of high archaeological potential prior to the commencement of construction. - Designate areas of known heritage values as no-go zones on site maps prior to the commencement of construction and during construction as required. - Undertake induction training to inform workers and contractors of the importance of safeguarding heritage values including, laydown restrictions (construction compound only), unexpected finds procedure and other moveable cultural heritage requirements prior to the commencement of, and during construction as required. 	To be implemented by the Commonwealth Heritage Manager and / or the KAVHA archaeologist

Ref #	Environmental safeguards and management measures	Comments
	<ul style="list-style-type: none"> - Supervise all excavation works in areas zoned as high and moderate archaeological potential in order to be able to guarantee appropriate management and mitigation measures are implemented as works progress. - Where possible, supervise all excavation works in areas zoned as low archaeological potential in order to be able to guarantee appropriate management and mitigation measures are implemented as works progress. - Undertake archaeological sieving if required during construction. - Maintain photographic records of the works for the duration of construction. - Accurately map the location of works undertaken. - Record and conserve to archival standard all archaeological features encountered. - In the event that potential archaeological material is encountered during construction, implement the Unexpected Finds Procedure documented at Section 6.3.8 of the AZMP. - Should significant fabric and/or findings be uncovered during the course of investigations, undertake additional recording to capture high-quality photogrammetric data regarding the fabric or findings. Capture the data to a degree that will allow it to be used for the generation of high-resolution 3D models. - Invite staff from the Norfolk Island Museum to attend excavations and assist with the recording of any materials encountered. - Prepare a post-construction report including comprehensive research archives of all relevant records, responses to research design and recommendations for future archaeological heritage management. 	
Noise		
36	Train workers and contractors on the best practice use of equipment and work methods in order to minimise noise.	
37	Ensure workers and contractors are aware of the noise management requirements in the development approval for the Proposal, for example through site inductions and 'toolbox talks' and by providing a summary of relevant project requirements for quick reference.	
38	Avoid shouting, talking loudly, slamming vehicle doors or making any other unnecessary noise.	
39	Regularly inspect equipment to ensure it is in good working order.	
40	Operate equipment in accordance with the manufacturer's instructions.	
41	Reduce throttle settings and turn off equipment when it is not being used.	
42	Minimise or avoid the need for reversing or movement alarms.	

Ref #	Environmental safeguards and management measures	Comments
43	Halt construction for the duration of funeral services and weddings at All Saints Church.	
44	Consult with noise sensitive receivers prior to the commencement of construction including but not limited to: <ul style="list-style-type: none"> - Letterbox drop to sensitive receivers providing contact details for the lodgment of complaints. - Ongoing consultation with sensitive receivers about expected timeframes for noise impact and possible scheduling of activities to avoid periods when impacts would be most intrusive. 	Refer to Figure 7.5-2 of the EIS for noise sensitive receivers.
Vibration		
45	Conduct a pre-dilapidation survey of the condition of relevant structures. Relevant structures include the section(s) of privately owned built surfaces (such as driveways) and structures (such as fences) that encroach into road reserves along the construction footprint.	Complete prior to commencement of construction.
46	The pre-dilapidation survey would include the documentation of the pre-construction condition of relevant structures, including collection of dated photographic records.	
47	Monitor relevant structures for impact from vibration using the following methods: <ul style="list-style-type: none"> - Comparison with the condition of relevant structures as documented during the pre-dilapidation survey, and - Other methods such as crack monitoring and feel tests (place a hand on the structure or building and feel for vibration). 	Action throughout the construction phase.
48	If damage to a relevant structure(s) is identified during construction, cease work, notify the relevant landowner, and use non-vibratory compaction equipment to complete localised works.	Action throughout the construction phase.
49	Following the completion of construction, conduct a post-construction dilapidation survey of the condition of relevant structures, including collection of dated photographic records.	Complete post completion of construction.
50	If damage to a relevant structure(s) for which pre-and post-construction dilapidation surveys were undertaken is identified as a result of the Proposal (identified either during construction or as a result of the post-construction dilapidation survey), undertake an assessment of damage to the relevant structure(s) and, in consultation with the landowner, agree rectification action with the intention to restore the property to the condition it was in prior to the commencement of construction.	
51	If damage to property for which pre- and post-construction dilapidation surveys have not been conducted is reported, arrange for an independent assessment to be undertaken to determine whether the damage was caused by the Proposal.	
52	Should the independent assessment determine the reported damage was caused by the Proposal, consult with the owner as soon as practicable to determine appropriate rectification action with the intention to restore the property to the condition it was in prior to the commencement of construction.	

Ref #	Environmental safeguards and management measures	Comments
Traffic and access		
53	Lodge an application with NIRC (Public Works) to install pipeline or conduit crossings in a public roadway for all work required in road reserves.	Refer to Section 8.2 of the EIS. Obtain prior to installing pipeline or conduit in a public roadway.
54	Lodge an application with NIRC (Public Works) to construct a driveway / access / entrance from a public roadway for the temporary construction access track from Country Road to the PS3 site in Kingston Common Reserve.	Refer to Section 8.2 of the EIS. Obtain prior to constructing a driveway/access/entrance from a public roadway.
55	Prepare and implement of a Traffic Management Plan to: <ul style="list-style-type: none"> - Identify construction methods and staging to minimise road closures and disruptions to existing traffic. - Maintain continuous access to private properties where possible. - Where maintenance of continuous access to private properties cannot be achieved, manage driveway closure in consultation with the affected resident to minimise impact to the resident, including limiting private driveway access to a maximum period of one day. - Avoid work during community events that generate significant traffic, including all funerals. - Avoid conflict with traffic associated with the unloading of the ship. - Avoid conflict with construction traffic associated with other development projects in the vicinity. - Implement additional speed limits as required. - Manage traffic movements and maintain vehicle and pedestrian safety. - Identify methods for the communication of changes to traffic conditions to the community. 	Prepare in consultation with relevant parties including but not limited to: <ul style="list-style-type: none"> - Proponent / project manager(s) of other development projects in the vicinity (refer to Section 6.12.2 of the EIS). - Norfolk Island Police. - NIRC (Public works).
56	Erect temporary safety fencing around any excavated area in the public roadway that would be required to remain open after hours.	
57	Complete reinstatement of the road pavement as quickly as possible.	
58	Communicate changes to traffic conditions to the community prior to the change.	Action throughout the construction phase.
Visual amenity		
59	Maintain the construction site, including the construction compound, in an orderly manner.	
60	Minimise the area to be excavated to a cumulative maximum of 30 linear metres.	

Ref #	Environmental safeguards and management measures	Comments
61	<p>Progressively backfill excavated areas, remove soil stockpiles and clean up the immediate area prior to commencement of excavation in a new area. Any open excavation would be backfilled within the same working day, with the exception of:</p> <ul style="list-style-type: none"> - An area of about 2.5 square metres at the end of the trench which would be left open to enable work to continue the next day. - Any area that is required to be left open for purposes such as managing an unexpected archaeological find (refer Section 7.4). 	
62	Prior to the commencement of construction of PS3, consult with the KAVHA Archaeologist, NIRC and Fluent Solutions to determine an appropriate alternate site for the PS3 control cabinet that would minimise the visual impact of the control cabinet.	
63	Consider vegetation screening or other minor works to screen / minimise the long term visual impact of above ground infrastructure components at the PS3 site (sewage pumping station lid, vents and control cabinet) if required / appropriate.	
64	Create the construction access track to the PS3 site in the Kingston Common Reserve using methods that enable the track to be grassed.	
65	Reseal excavated areas within the road pavement as soon as practicable.	
66	Remove all materials, plant and equipment from the site, including the construction compound, as soon as practicable following the completion of construction.	
67	Reinstate the site to pre-construction condition as far as practicable.	
Air quality		
68	Restrict areas of open excavation to about 30 cumulative linear metres.	
69	Backfill excavated areas at the end of each working day (excluding areas that need to remain open for reasons such as: to enable work to continue the next day; or to enable management of an unexpected archaeological find).	
70	Cover excavations that must remain open overnight.	
71	Cover or water soil stockpiles to minimise wind-blown dust.	
72	Rehabilitate disturbed areas as soon as practicable.	
73	Cover vehicle loads that would generate dust.	
74	Maintain vehicles, plant and equipment in good working order.	
75	Turn off vehicles, plant and equipment when not in use.	

Ref #	Environmental safeguards and management measures	Comments
Waste		
76	<p>Manage all waste generated during construction and operation of the Proposal in accordance with the following waste management hierarchy:</p> <ul style="list-style-type: none"> - Waste generation would be avoided and where avoidance is not feasible or reasonable, reduced. - Where avoiding or reducing waste is not possible, waste would be re-used, recycled, or recovered. - Where re-using, recycling or recovering waste is not possible, waste would be delivered by truck to the NIRC Waste Management Centre for disposal. 	
77	Remove unsuitable or excess spoil from the site and relocate it to the KAVHA materials stockpile (currently located adjacent to the Watermill Dam) for reuse in other projects.	
78	Collect all general waste from workers and packaging from materials and infrastructure components in bins located at the construction compound. Bins would provide for separate storage of different waste streams (food and organics, glass, recyclapod (e.g. cardboard, paper, plastic, aluminium, steel, packaging, takeaway coffee cups), hazardous, and sanitary (refer Appendix I for further information of waste separation).	
79	Do not burn or stockpile waste on site.	
Hazard and risk		
Fuels and oils		
80	Keep fuels and oils separated from potential ignition sources and combustible materials and in a well-ventilated place.	Fuels or oils would not be stored on site unless at the construction compound and in accordance with Australian <i>Standard AS 1940:2017 The storage and handling of flammable and combustible liquids</i> provisions for minor storage quantities (Office of Industrial Relations, 2018).
81	Secure storage areas against access by unauthorised persons at all times.	
82	Store fuels and oils in bunded areas with a capacity of at least 25 percent of the combined fuel / oil stored.	
83	Take care when decanting or transferring fuels and oils to reduce the hazards of splash filling, spillage and vapour escape.	
84	Fill storage containers to no greater than 95 percent.	
85	Keep fuel / oil containers closed when not in use.	
86	Transfer and move liquid substances, fuels and oils in a way that reduces the likelihood of spillage, vapour escape or fire.	

Ref #	Environmental safeguards and management measures	Comments
87	Ensure that spill-response kits suitable for use with the hazardous substances on site are available at all times and are replaced or restocked after use. A simple spill-response kit may consist of: <ul style="list-style-type: none">- A readily identifiable, suitable container with a lid or cover containing absorbent materials.- Suitable personal protective equipment.- Suitable equipment required for spill clean-up.	
88	Clean up all spills and leaks immediately.	
89	Maintain plant and machinery well and check daily for fuel and oil leaks. Contain any identified fuel or oil leak and repair as soon as practicable.	
Accidents		
90	Manage open excavations in accordance with the construction methodology described in Section 4.6.2 of the EIS.	
91	Utilise experienced plumbing and septic service contractors to connect the Proposal to operational sewage infrastructure.	
Underground services		
92	Consult DITRDCA and NIRC prior to the commencement of excavation to identify any existing underground services in the Proposal area, including, but not limited to electricity and telecommunications services.	Complete prior to construction.
Socio-economic		
93	Develop and implement a Community Consultation Plan to provide timely, regular and transparent information about the Proposal, details of future work programs, changes to access and traffic conditions, and general construction progress throughout the construction phase of the Proposal.	Complete prior to construction.
94	Provide information to the community in a variety of ways such as letter box drops, articles in the Norfolk Islander weekly newspaper, radio announcements and signage.	Action throughout the pre-construction phase and the construction phase.
95	Develop and implement an enquiries and complaints management process for the duration of construction. Provide the community with information about how to make an enquiry or a complaint including: Telephone Number; Email Address; Postal Address; Physical Address and hours within which enquiries or complaints can be made.	Complete prior to construction.
96	Provide landowners that may be required by NIRC to connect to the Proposal in the future with the opportunity to liaise with DITRDCA and / or it's Contractor to determine a boundary kit location that better suits the landowner, subject to still meeting technical requirements of the sewerage scheme.	Complete prior to boundary kit installation at each affected property.

Ref #	Environmental safeguards and management measures	Comments
OPERATION		
Design		
97	If NIRC monitoring of operational flows determines that the Water Assurance Scheme gravity main between manholes BA42 and BA37 has capacity limitations due to the flows from the Project, Option 2 would be implemented [Option 2: Installation of a level transducer at the Water Assurance Scheme manhole (BA42) located at the start of the 150 diameter pipeline, along with an autodialler to send an SMS message to PS6 to stop pumping when wastewater flows start backing up in the manhole.].	Refer to Section 4.4.2.4 of the EIS. Further consideration would be given to this approach (Option 2) should it be deemed appropriate following post-commissioning monitoring.
Water quality / Geology and soils		
98	Keep adequate levels of spare parts and spare components for the entire sewerage scheme in stock on island at all times.	
99	Ensure the sewerage scheme infrastructure, including alarm systems, is properly maintained at all times.	
100	Ensure timely responses to warning alarms from sewage pumping stations.	
101	Investigate the source of any potential operational failure identified by the NIRC water quality monitoring program and undertake any repair(s) required as soon as practicable.	
102	Develop an overflow procedure for both public health and reef health purposes. These procedures would be prepared in consultation with NIRC (Public Health and Environment) and Marine Parks personnel respectively.	Prior to the commencement of operation.
103	Implement overflow procedures in the event of an overflow / sewage leak as required.	
Noise		
104	Mute audible alarms if required.	
Air quality		
105	Maintain odour control filters at sewage pumping station vents, the combination air relief valve vents and the Water Assurance Scheme manhole vent in accordance with manufacturer's specifications.	

Ref #	Environmental safeguards and management measures	Comments
Waste		
106	<p>Manage all waste generated during construction and operation of the Proposal in accordance with the following waste management hierarchy:</p> <ul style="list-style-type: none"> - Waste generation would be avoided and where avoidance is not feasible or reasonable, reduced. - Where avoiding or reducing waste is not possible, waste would be re-used, recycled, or recovered. - Where re-using, recycling or recovering waste is not possible, waste would be delivered by truck to the NIRC Waste Management Centre for disposal. 	
107	If required during system maintenance or failure, pump sewage into effluent tankers and transport it to the sewage treatment plant for treatment and disposal.	
108	Repair any system component requiring maintenance. If repair is not possible, store the component for spare parts. If components are unable to be repaired and are not useful for spare parts, take them to the NIRC Waste Management Centre for disposal.	

8.2 Permits and approvals

The Proposal would require certain approvals and permits for its construction. A summary of the approvals and permits required for the proposal is provided in **Table 8-2**.

Table 8-2: Summary of permits and approvals required

Approval / permit requirement	Timing	Approval Authority
Development Approval (Significant Development) under the <i>Planning Act 2002 (NI)</i>	Prior to commencement of construction.	Administrator of Norfolk Island under delegation to the Australian Government Minister administering the <i>Planning Act 2022 (NI)</i> .
Approval to install pipeline or conduit in a public roadway	Prior to installing pipeline or conduit in a public roadway.	NIRC (Public Works)
Approval to construct a driveway/access/entrance from a public roadway.	Prior to constructing the driveway/access/entrance from Country Road at the PS3 site for the construction access track.	NIRC (Public Works)
Approval to take a protected tree under the <i>Trees Act 1997 (NI)</i> .	Prior to felling, ring barking, removing, injuring or destroying a tree protected under the <i>Trees Act 1997 (NI)</i> . Required prior to trimming the Norfolk Island Pine branches at the entrance to the PS3 construction site in the Kingston Common Reserve.	NIRC (Chief Executive Officer / General Manager or delegate)
Approval to undertake a Controlled Action under the EPBC Act 1999 (Commonwealth) (If required subject to the EPBC Self Assessment for the Proposal and any potential EPBC Referral).	<p>Prior to commencement of construction if required.</p> <p>It is not expected that any approval under the EPBC Act would be required for the Proposal.</p>	Australian Government Minister administering the <i>Environment Protection and Biodiversity Conservation Act 1999</i> , or delegate.

9 Conclusion

The Proposal is subject to assessment under Part 3A of the *Planning Act 2002 (NI)* as Declared Significant Development. The environmental impact assessment documented in this EIS has examined and taken into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the proposed activity.

Consideration has been given in this EIS to the likely impact of the Proposal on the natural and built environment in accordance with the factors outlined in Schedule 2 of the *Planning Regulations 2004 (NI)* and the CEO Directions for the EIS issued under Section 45(6) of the *Planning Act 2002 (NI)*.

A number of potential adverse environmental impacts from the Proposal have been avoided or reduced during the assessment of options and alternatives and the development of the concept design. Notwithstanding, some temporary, short-term construction impacts such as traffic, noise and visual amenity are unavoidable and would be mitigated and managed using the safeguards and management measures identified in this EIS. Many of these measures are standard practice in the construction industry.

There is potential for discovery of unknown archaeological artefacts during excavation. Impact to archaeological artefacts would be avoided where possible and otherwise managed in accordance with the archaeological policies included in the KAVHA Archaeological Zoning and Management Plan (Extent, 2020).

The Proposal would contribute to the Project objectives of reducing impacts of human waste on marine water quality, and would satisfy key government strategies and plans, including the *Australian Marine Parks, Temperate East Marine Parks Network Management Plan 2018*, *KAVHA Heritage Management Plan April 2016*, *Norfolk Island Community Strategic Plan 2016-2026: Our Plan for the Future*; *Norfolk Island Regional Council Delivery Program 2022 – 2026*; *Norfolk Island Environment Strategy 2018-2023*; *Norfolk Island Plan 2002: Housekeeping Amendment 2022*; and *Kingston and Arthur's Vale Historic Area Development Control Plan 2020*. These plans identify the protection and enhancement of water quality as a priority.

It would also achieve the Proposal objectives of providing sewerage infrastructure that would convey all sewage collected by the scheme directly to the Water Assurance Scheme, removing the need for the approved Stage 1 'end of line' holding tanks and consequently reducing the impacts associated with these tanks including: risk of sewage spills; and visual impact.

By reducing human waste emissions into the local KAVHA environment, the Proposal, as part of the Project, would achieve positive environmental outcomes for water quality, for marine ecosystem health including coral reefs, and for public safety. Unavoidable adverse impacts of the Proposal would be short-term and temporary with the exception of potential impact to archaeological artefacts which would be carefully managed.

On balance, the Proposal is considered justified.

10 References

Administration of Norfolk Island, 2002, *Norfolk Island Plan 2002, Housekeeping Amendment 2022 (effective 6 March 2023)*, Administration of Norfolk Island.

Administration of Norfolk Island, 2003, *Norfolk Island Heritage Register*, Administration of Norfolk Island.

Administration of Norfolk Island, 2021, *Development Control Plan No. 2: Water Resources*, Administration of Norfolk Island.

AECOM, 2017 *Emily Bay and Upper Cascade Creek Catchments: Norfolk Island Water Quality Study*, Queensland.

AECOM, 2020, *Kingston and Arthur's Vale Historic Area Development Control Plan 2020*, Sydney NSW.

Aquatec, no date, *Aquatec Pressure Sewer Systems*.
<https://www.aquatecenviro.com/product/pressure-sewer>, accessed 20 May 2022

Aquatec, no date (a), *Omnismart Controller Brochure*, <https://www.aquatecenviro.com/wp-content/uploads/2020/02/AQT-OmniSmart-Brochure.pdf>, accessed 20 May 2022

Australian Standard AS 1940 *The storage and handling of flammable and combustible liquids*.

Australian / New Zealand Standard AS / NZS 1547:2012 *On-site Domestic Wastewater Management*, Standards Australia International Ltd, Strathfield, NSW and Standards New Zealand, Wellington.

Australian / New Zealand Standard AS/NZS 2566.2:2002 *Buried Flexible Pipelines – Part 2: Installation*, Standards Australia International Ltd, Strathfield, NSW and Standards New Zealand, Wellington.

Bligh Tanner, 2020, *Improving the Water Quality of Emily Bay, Norfolk Island*, Queensland.

Centre for International Economics (CIE) 2017; KAVHA Economic Feasibility Study; New Farm, Qld.

Commonwealth of Australia, 2013, *Significant Impact Guidelines 1.1: Matters of National Environmental Significance*, Commonwealth of Australia.

Commonwealth of Australia, 2013, *Significant Impact Guidelines 1.2: Actions on, or impacting upon, Commonwealth Land and Actions by Commonwealth Agencies*, Commonwealth of Australia.

CSIRO, 2020, *Norfolk Island Water Resource Assessment: Options for Improving the Resilience of Norfolk Island to Extended Dry Spells*, CSIRO Land and Water.

CSIRO, 2023, *Acid Sulfate Soil Management in the Kingston and Arthur's Vale Historic Area (KAVHA) on Norfolk Island*, CSIRO Australia.

DAWE; 10 Oct 2021; *National Heritage Places – Kingston and Arthurs Vale Historic Area (KAVHA)*, <https://www.awe.gov.au/parks-heritage/heritage/places/national/kavha> Accessed 2 May 2022.

DECC, 2009, *Interim Construction Noise Guideline*, State of NSW and Department of Environment and Climate Change NSW.

Department of Water and Environmental Regulation; Government of WA; (no date); <https://www.der.wa.gov.au/your-environment/acid-sulfate-soils> Accessed 13 July 2022.

Director of National Parks, 2010, *Norfolk Island Region Threatened Species Recovery Plan*, Commonwealth of Australia.

Director of National Parks, 2023, *Draft Norfolk Island Region Threatened Species Recovery Plan*, Commonwealth of Australia.

Director of National Parks, 2018, *Australian Marine Parks, Temperate East Marine Parks Network Management Plan 2018*, DoNP Canberra.

DITRDC, 2020; *Norfolk Island Community Engagement Framework: A Guide for the Department Working in Partnership with the Community*, Canberra.

DITRDC, 2022; *Kingston Traffic Statistics*; DITRDC, Canberra

DITRDCA, 2024; *Kingston and Arthur's Vale Historic Area (KAVHA) Sewerage Scheme: Stage 2 Heritage Impact Statement*, Canberra.

DITRDCA, 2022; *Kingston and Arthur's Vale Historic Area (KAVHA) Sewerage Scheme: Stage 1 Environmental Impact Statement*, Planning Assist, Norfolk Island.

DITRDCA, 2022a; *Kingston and Arthur's Vale Historic Area (KAVHA) Sewerage Scheme: Stage 1- Referral under the Environment Protection and Biodiversity Conservation Act (EPBC Act)*; <https://epbcpublicportal.awe.gov.au/entity/sharepointdocumentlocation/36c868a5-bc6a-ed11-81ac-00224818a1ee/2ab10dab-d681-4911-b881-cc99413f07b6?file=00-2022-09393%20Referral.pdf>; Accessed 15 January 2024.

EDO; 17 March 2022; *What is Ecologically Sustainable Development?* <https://www.edo.org.au/publication/what-is-ecologically-sustainable-development/> Accessed 29 April 2022.

EPA, 2021, *Draft Construction Noise Guideline* State of NSW and NSW EPA.

Escape; 24 Feb 2017; Nationwide News Pty Ltd; <https://www.escape.com.au/experiences/beach/tripadvisor-reveals-australias-best-beaches/news-story/880731464cc400fa9bcd5c30ec609f02> Accessed 30 May 2022.

Extent Heritage Advisors, 2020, *KAVHA Archaeological Zoning and Management Plan*, Sydney.

Fluent Solutions Pty. Ltd., 2023, *Kingston and Arthur's Vale Historic Area Sewerage Scheme Stages 2 & 3 – Concept Design and Construction Plan*, Dunedin, New Zealand.

Fluent Solutions Pty. Ltd.; 2023a; *KAVHA Valley to Queen Elizabeth Avenue – Norfolk Island: Wastewater Scheme – Stage 2 Detailed Design Report*, Dunedin, New Zealand.

Fluent Solutions Pty. Ltd., 2024, *Impact of KAVHA Wastewater Scheme on Existing Wastewater Infrastructure*, Dunedin, New Zealand.

GML Heritage + Context, 2019, *Kingston and Arthur's Vale Historic Area Cultural Landscape Management Plan*, GML Heritage Pty. Ltd.

ICOMOS (Australia), 2013, *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance*, Australia.

Invasive Species Council and TierraMar, 2021, *The Native Plant Communities of Norfolk Island*, Invasive Species Council, Katoomba, NSW, Australia.

Jean Rice Architects, et. al., 2016, *KAVHA Heritage Management Plan*.

Kachor, Kate; 24 Feb 2022; Nine News; <https://travel.nine.com.au/latest/top-10-beaches-in-the-south-pacific-for-2022-revealed-by-tripadvisor> Feb /be32ba7b-3faa-4bbd-955b-3b9d5fc792e5_Accessed 30 May 2022.

Landcom, 2008, *Managing Urban Stormwater: Soils and Construction - Volume 2A Installation of Services*, NSW Department of Environment and Climate Change

Norfolk Island Church of England, no date, <https://norfolkislandchurchofengland.com/what-time-are-your-sunday-services/> Accessed 26 May 2022).

Norfolk Island Parks and Forestry Service, 2003, *Plans of Management for Norfolk Island Public Reserves*, Norfolk Island.

Norfolk Island Regional Council 2016 *Norfolk Island Community Strategic Plan 2016-2026: Our Plan for the Future*, Norfolk Island

Norfolk Island Regional Council, 2016, *Norfolk Island Regional Council Delivery Program 2022-2026* Norfolk Island.

Norfolk Island Regional Council, 2018, *Norfolk Island Environment Strategy 2018-2023*, Norfolk Island.

Norfolk Island Regional Council, 2023, *Norfolk Island Regional Council Operational Plan 2023- 2024*, Norfolk Island.

Norfolk Island Regional Council, 2021, *Sewage Containment within the KAVHA Catchment: Options Paper*, Norfolk Island.

Norfolk Island Regional Council, 2022; <http://www.norfolkisland.gov.nf/services/waste-and-environment/beach-water-quality-monitoring> Accessed 28 June 2022.

Office of Industrial Relations, Workplace Health and Safety Queensland; 2018; *A Guide for Flammable and Combustible Liquids under the Work Health and Safety Act 2011*; Queensland Government.

Parsons Brinkerhoff, 2005, *Norfolk Island Report on Geotechnical Soils Investigation*, Parsons Brinkerhoff ("PB").

Protection of the Environment Operations Act 1997 No. 156 (NSW).

Queensland Government, *Acid Sulfate Soil Technical Manual, Soil Management Guidelines v4.0.*, Science Division.

Senversa, 2021, *Detailed Site Investigation into Per- and Polyfluoroalkyl Substances (PFAS)*, Melbourne.

SIMS et. al., 2021, *Norfolk Island Lagoonal Reef Ecosystem Health Assessment 2020–2021*. Prepared by the Sydney Institute of Marine Science, for Parks Australia.

Stephens and Hutton, 1954, *A soils and land use study of the Australian Territory of Norfolk Island, South Pacific Ocean*, CSIRO Divisions of Soils.

Sydney Tools, 2022, <https://sydneytools.com.au/product/wacker-neuson-bs654as-27kw-4stroke-vibrator-rammer>, Accessed 6 June 2022.

Wikipedia; 2022; <https://en.wikipedia.org/wiki/Colluvium> Accessed 9 May 2022.

Wilson P; NIRC, 14 April 2022; *Media Release: Are you Planning an Upgrade to your Septic Tank?* <http://www.norfolkisland.gov.nf/sites/default/files/docs/NIRC/MediaReleases/2022.04.14%20MR%20-%20Upgrading%20Septic%20Tanks.pdf> Accessed 30 April 2022.

11 Glossary of terms and abbreviations

Term	Meaning
Symbols	
>	Greater than
<	Less than
A	
Aerobic	Requires the presence of oxygen.
Acid sulfate soils	Naturally occurring soils and sediments that contain iron sulphides. Exposure to air causes a chemical reaction between the iron sulphides and producing sulphuric acid. There are two types of acid sulfate soils (ASS) – Potential ASS and Actual ASS.
Actual ASS	Actual ASS is formed when Potential ASS is exposed to air causing a chemical reaction between the iron sulphides and oxygen. The reaction of the exposed Potential ASS with oxygen produces sulphuric acid, which can lead to a range of environmental issues and degradation of infrastructure (corrosion).
ADWF	Average Dry Weather Flow
Anaerobic	Does not require the presence of oxygen.
Aquatic ecology	Flora and fauna that live in or on water for all or a substantial part of the life span (generally restricted to fresh/inland waters).
Aquifer	Geologic formation, group of formations, or part of a formation capable of transmitting and yielding quantities of water.
Archaeological artefact	An artefact is an ornament, tool, or other object that is made by a human being, especially one that is historically or culturally interesting.
Archaeological potential	The likelihood of survival of potential archaeological fabric.
Archaeology	The scientific study of human history, particularly the relics /artefacts and cultural remains of the distant past.
ANZECC	Australia and New Zealand Environment and Conservation Council
AS	Australian Standard
ASS	Acid sulfate soils
AZMP	Archaeological Zoning and Management Plan - <i>Kingston and Arthur's Vale Historic Area (KAVHA) Archaeological Zoning and Management Plan</i>
B	
Bioremediation	Bioremediation is natural biological process by which microorganisms and / or plants destroy contaminants in the soil (or other substances) or transform them into less harmful forms.
Bund	A small embankment designed to contain water or other liquid.
Burnt Pine	Commercial centre of Norfolk Island
C	
Calcarenite	A marine rock made up of sand, coral and shell fragments cemented with lime.
CEMP	Construction Environmental Management Plan
CEO	Chief Executive Officer of the Norfolk Island Regional Council
Colluvium	A general name for loose, unconsolidated sediments that have been deposited at the base of hillslopes by either rainwash, sheetwash, slow continuous downslope creep, or a variable combination of these processes
Commonwealth Heritage Manager	The Commonwealth employee responsible for overall heritage management at KAVHA. Note: The CHM position no longer exists. CHM responsibilities would be fulfilled by the person(s) responsible for the management of Commonwealth Heritage at Kingston at that time.

Term	Meaning
Conservative	An estimate that tends to err on the side of caution or gives a 'worst case scenario'. Often used in risk assessment to ensure that as much risk as possible is taken into account.
Construction footprint	The area to be disturbed during construction.
Controlled Action	An action that required approval under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth)
Coral bleaching	The breakdown of the association between corals and algae living within their tissue. Coral bleaching is a stress response and results in coral looking white and at increased risk of mortality.
CLMP	Cultural Landscape Management Plan - <i>Kingston and Arthurs Vale Historic Area Cultural Landscape Management Plan</i>
CSIRO	Commonwealth Scientific and Industrial Research Organisation
Cumulative	Increasing by successive additions or made up of accumulated parts.
D	
DA	Development Application
dB	Decibel
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Commonwealth). Previously Department of Agriculture, Water and the Environment (Commonwealth).
DCP	Development Control Plan
Declared Significant Development	A significant development in relation to which a declaration under paragraph 28C(5)(a) of the <i>Planning Act 2002 (NI)</i> is in effect.
Diatom	Any member of a large group comprising several genera of algae, specifically microalgae, found in the oceans, waterways and soils of the world
DITRDC	Department of Transport, Infrastructure, Regional Development and Communications (Commonwealth). Now Department of Transport, Infrastructure, Regional Development, Communications and the Arts (Commonwealth).
DITRDCA	Department of Transport, Infrastructure, Regional Development, Communications and the Arts (Commonwealth).
E	
<i>E. coli</i>	<i>Escherichia coli</i> - A type of faecal coliform that is a naturally occurring gut bacteria that can cause stomach cramps, bloody diarrhoea and vomiting if introduced elsewhere in the body.
Earthworks	All operations involved in loosening, excavating, placing, shaping and compacting soil or rock.
Effluent tanker	Vacuum tanker used to transport sewage.
EIS	Environmental Impact Statement
<i>Enterococci</i>	A naturally occurring gut bacteria that can cause inflammation and blood infection if introduced elsewhere in the body.
EPA	Environment Protection Authority
EPBC	Environment Protection and Biodiversity Conservation
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth)
Extant	Still in existence; surviving.
F	
Faecal Coliform	Faecal coliform bacteria are a collection of microorganisms that live in large numbers in the intestines of humans and warm and cold blooded animals. The presence of faecal coliform bacteria in aquatic environments indicates that the water has been contaminated with the faecal material of humans or other animals.

Term	Meaning
Fleshy Algae	These are overgrown patches of algae (including long, black cyanobacterial tufts) that smother corals and other algae (especially when growing on them for structural support). This algae does not contribute to reef complexity.
G	
GHD	Multinational company offering engineering and architectural services.
Groundwater	Water that is held in the rocks and soil beneath the earth's surface.
H	
Habitat	The place where a species, population or ecological community lives (whether permanently, periodically or occasionally).
Hazard	A source or a situation with the potential for harm in terms of human injury or ill-health, damage to property, damage to the environment, or a combination of these.
Heritage Act	Norfolk Island Heritage Act 2002 (NI)
HIS	Heritage Impact Statement
HMP	Heritage Management Plan - <i>The Kingston and Arthurs Vale Historic Area (KAVHA) Heritage Management Plan</i>
Human waste	Human waste (also see Sewage and Wastewater) includes <ul style="list-style-type: none"> - Excrement (faeces and urine) – Pathogens (Faecal Coliforms, <i>E.coli</i> and <i>Enterococci</i>). - Detergents (bathroom, laundry and kitchen detergents) – Nutrients (Nitrogen and Phosphorus).
Hypersulfidic material	Acid sulfate soil material that will form sulfuric material and become severely acidic (pH \geq 4) is exposed to oxygen allowed to oxidise completely. This material a latent risk of impact from acidity, metal mobilization and deoxygenation This material has a latent risk of impact to the environment as a result of acidity, metal mobilisation and deoxygenation.
I	
ICOMOS	International Council on Monuments and Sites - An international non-government organisation primarily concerned with the philosophy, terminology, methodology and techniques of cultural heritage conservation.
Interim remediation works	Repair of sewage holding tanks and installation of leaky weirs in KAVHA to prevent ongoing human waste pollution form the Proposal area and to slow surface water runoff into Emily Bay prior to implementation of the Proposal.
K	
KAVHA	Kingston and Arthurs Vale Historic Area
Kingston	The lowland / coastal plain area of KAVHA area which was developed in the nineteenth century and contains a number of Georgian buildings as well as extensive ruins and standing structures, archaeological features and landform and landscape elements (Jean Rice Architects, et. al., 2016).
kWh	Kilowatt-hour. Kilowatt-hours are a common billing unit for electrical energy supplied by electric utilities.
L	
L	Litre
L/sec	Litres per second
Latent risk	Existing risk but not yet developed; hidden or concealed.
Leaky weir	An in-stream structure to slow surface water runoff, promote infiltration and minimise waterway erosion.
Lot	A parcel of land defined by measurement as a lot in a deposited plan (DP) or as a Crown portion or allotment.

Term	Meaning
M	
Mains (rising, pressure, gravity)	Underground pipes used to transport sewage.
Malodour	A very unpleasant smell.
mm	Millimetres
MNES	Matters of National Environmental Significance
N	
NIRC	Norfolk Island Regional Council
Norfolk Marine Park	One of eight marine parks that make up the Temperate East Marine Parks Network
Nutrients	A substance used by an organism to survive, grow, and reproduce.
NZ	New Zealand
P	
Pathogens	An organism that causes disease in its host (bacteria or viruses). Includes: Faecal Coliforms; <i>E.coli</i> ; and <i>Enterococci</i> .
PDWF	Peak Dry Weather Flow
PFAS	Per- and Polyfluoroalkyl substances originating from fire-fighting foams.
Plan	<i>Norfolk Island Plan 2002, Housekeeping Amendment 2002</i>
Planning Act	<i>Norfolk Island Planning Act 2002 (NI)</i>
Planning Regulations	<i>Norfolk Island Planning Regulations 2004 (NI)</i>
Potential ASS	Potential acid sulfate soils. Waterlogged soils rich in iron sulphides that have not been oxidised. Potential ASS are harmless to the environment if they are kept in this state or under water. Any exposure of Potential ASS to air or the lowering of the water table would lead to the development of Actual ASS.
Post-dilapidation survey	An assessment and recording of the post-construction condition of the road reserve in the Proposal area including, but not limited to, built surfaces (such as driveways) and structures (such as fences).
Pre-dilapidation survey	An assessment and recording of the pre-construction condition of the road reserve in the Proposal area including, but not limited to, built surfaces (such as driveways) and structures (such as fences).
Project	The overall KAVHA Sewerage Scheme Project – Stages 1-3.
Proponent	The person or organisation that proposes carrying out the project or activity.
Prescribed Development	Development listed in Schedule 1 of the <i>Planning Regulation 2004 (NI)</i> . An application for Prescribed Development must be accompanied by an Environmental Impact Statement. 'Public Works – Major' is a Prescribed Development.
Proposal	Stage 2 of the overall KAVHA Sewerage Scheme Project (Stages 1-3).
Proposal area	The construction footprint plus a buffer area of 25 metres.
PS3	Sewage pumping station 3
PS4	Sewage pumping station 4
PS4	Sewage pumping station 5
PS6	Sewage pumping station 6
Public Reserves Act	Norfolk Island Public Reserves Act 1997 (NI)
PWWF	Peak Wet Weather Flow

Term	Meaning
Q	
Qualitative	Information that is descriptive in nature, expressed in terms of language rather than numerical values.
Quantitative	Information that can be quantified, counted or measured, and given a numerical value.
R	
RD	Road
Receiver	An environmental modelling term used to describe a map reference point where the impact is predicted. A sensitive receiver is a home, workplace, school or other place where people spend some time.
RES	Reserve
Risk	A risk is the chance of something happening that will have a negative effect.
Runoff	That part of the rainfall on a catchment which flows as surface discharge past a specified point.
S	
Sediment	Material, both mineral and organic, that is being or has been moved from its site of origin by the action of wind, water or gravity and comes to rest either above or below water level.
Septic treatment system	Onsite sewage treatment system that provides primary treatment through settling of solids and flotation of fats and grease. Clarified liquid is released to the ground via soakage or absorption trenches.
Sewage	Wastewater and excrement conveyed in sewers. Also see Human waste and Wastewater.
Sewage holding tank	Tank used to hold sewage and store it for pump out by an effluent tanker and safe disposal at the sewage treatment plant.
Significant Development	Development to establish or upgrade infrastructure, including sewerage schemes, to support economic growth or community welfare, or both, in Norfolk Island.
Surface water	Freshwater above ground in rivers, creeks, dams, lakes, wetlands, floodplains and reservoirs.
Swampland	An area of low-lying, uncultivated ground where water collects; a bog. The swampland adjoins Country Road at the southern end of the Proposal area.
T	
Take	To 'take' a protected tree is to fell, ring bark, remove, injure or destroy a tree protected under the <i>Trees Act 1997 (NI)</i> .
Taxa	A taxon is a group of one or more populations of an organism or organisms seen by taxonomists to form a unit. Taxa is plural of taxon.
Terrestrial	Living or growing on land (i.e. a terrestrial plant or animal).
Trunk main	A trunk main transports large quantities of sewage from a collection network to a sewage treatment plant.
Turfing Algae	These are short algae (less than 10mm). Turfing algae does not contribute to reef complexity.
U	
Unexpected finds procedure	Unexpected Finds Procedure documented at Section 6.3.8 of the AZMP. Procedure to be implemented in the event a previously unknown artefact is found during construction.
Unsuitable material	Material that contains too many rocks that could potentially damage the pipelines, or soil containing too many organics that would decompose and result in excessive trench settlement.

Term	Meaning
V	
Vehicle movement	One way vehicle trip.
W	
Wastewater	Water that goes down drains from sinks, baths, showers, laundries and toilets and other drains inside buildings. It is about 99 percent water. The remaining 1 percent is made up of things added to water as it has been used it. Also see Human waste and Sewage.
Water Assurance Scheme	NIRC's existing sewerage scheme –reticulated mains network and sewage treatment plant - that services the Burnt Pine township.
Waterway	Any flowing stream of water, whether natural or artificially regulated (not necessarily permanent).
Wetland	A swamp or marsh in which the soil is frequently or permanently saturated with water, or under water.