Revision History

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Document Acceptance

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1 Need for Project

Gold Coast Water (GCW) is currently undertaking an options analysis to determine an offshore release location for excess recycled water from the city’s four (possibly five in the future) sewage treatment plants (STPs). This infrastructure is required to meet the needs of the growing population and associated forecast sewage treatment and water release projections for the next fifty years (until 2061).

Under average dry weather conditions, approximately 105ML/day of excess recycled water is currently released at two locations - the northern Seaway release and the southern Seaway release. This dry weather flow is expected to increase to 317ML/day by 2061. Flows during peak wet weather events for the current system are approximately 3 to 4.5 times higher.

Infrastructure capacity assessments therefore indicate the northern Seaway release system is expected to exceed capacity between 2015 and 2020 and the southern Seaway release system around 2024.

The decision to evaluate potential ocean release systems was based on a review undertaken by Allconnex (including Gold Coast Water) in 2012. This review recommended that a long term release strategy be developed that considers deep ocean release as a potential long term solution in combination with water reduction, recycling and reuse initiatives. This includes ensuring short-term objectives are considered as part of, or in combination with, the long term options assessment to provided potential stage infrastructure solutions.

In summary, concept engineering and multi-criteria analysis has been completed and recommendations made on a preferred option (Gold Seaway Southern Offshore Option) and an alternative option (Gold Coast Seaway Northern Offshore Option) for long term release of excess recycled water.
2 The Options Analysis Process and Current Status

Feasibility assessment, multi-criteria analysis (MCA) and concept engineering, planning and consideration of potential environmental investigations were undertaken to evaluate the offshore release options. An overview of this process is provided in Figure 1 and its position in the Long Term Release Plan is shown in Figure 2.

![Figure 1: Current Status of Options Analysis](image-url)
Figure 2: Long Term Plan – Recycled Water Release
3 Conceptual Overview of Ocean Release System

3.1 Offshore Release System

The objective of the Gold Coast ocean release system is to provide a safe, reliable and economic method of disposal of excess recycled water, with minimal impact on the receiving environment. A typical ocean release system comprises an incoming pipeline to a surge chamber, release pipeline extending beyond the surf zone and a diffuser section. A typical ocean release schematic is shown in Figure 3.

![Figure 3: Offshore Release Pipeline](image)

The release pipeline is proposed to be approximately 2400mm (2.4m) diameter, and to extend approximately 2km out to sea.

Given its size, the release pipeline would need to be constructed using a Tunnel Boring Machine (TBM). A major component of the TBM operations is the launch shaft that would have to be excavated prior to commencing the tunnelling works. The surge chamber for the release pipeline will be located at the site of this launch shaft.

3.2 Surge Chamber/Standpipe

A surge chamber will be located at the shoreline interface between the landside pipelines and the offshore release pipeline. The purpose of the surge chamber is to attenuate surges in the pipeline in the event of a sudden pump shutdown at the treatment plants, and to prevent air being drawn into the system.

The surge chamber would be similar in scale as the existing standpipe located at The Spit serving the existing southern Seaway release structure. A structure approximately 2-5m square by up to 5m above ground level has been assumed.

3.3 Diffuser

A concept diffuser configuration has been developed that should provide in the order of 50:1 dilution at average flows, which is the generally accepted target level of dilution for an ocean release. Important factors in the design of the diffuser are the flow rate, water depth and diffuser length. The level of dilution will decrease for peak flows, but the typical conditions (average flows) will be of most interest.

Locating the far end of the diffuser at approximately 2km from the shoreline is a suitable starting point for consideration. This will provide around 20-22m of water depth, which is important for good near field mixing.

A nominal diffuser length of 150-200m has been assumed, with the following features:
Assume 32 ports in total (e.g. 8 no. ports in a rosette pattern on each of 4 risers)
Port exit velocity of 3m/s
Ports oriented horizontally
Ports located 1m above the seabed
A firm foundation is essential for the diffuser with the release ports raised clear of any sand movements and sand waves. Some form of protection, such as a heavy concrete cap would be required against damage from nets or anchors. The diffuser riser structures would be installed from some form of marine platform, likely to be a jack-up barge.

Refer to Figure 4 for a schematic of the diffuser concept. The diffuser configuration will need to be confirmed by detailed modelling and design in subsequent stages of the project.
4 Preferred Option – Gold Coast Seaway Southern Offshore Option

4.1 Description

The preferred option as determined by the multi-criteria analysis (MCA) is Option 4 – The Gold Coast Seaway Southern Offshore Option. The capital cost estimate of this option is ~$322M.

The design features of this option are:

- DN2400 release pipeline beginning from The Spit and extending slightly south of east to the release point 2km offshore
- Locate the Tunnel Boring Machine (TBM) launch site in a cleared area below the southern edge of The Spit car park where there appears to have been construction works undertaken previously (possibly as part of sand bypassing works). This results in the offshore release pipeline being approximately 2.3km long
- The surge chamber to be built atop the TBM launch shaft near the southern edge of The Spit car park
- An approximately 1800m long section of DN1600 pipeline augmenting the existing northern release pipeline between Lands End and the existing northern release point on South Stradbroke Island. This section would be pipe jacked, requiring shafts at Lands End and on South Stradbroke Island. This section would need to be designed to a depth sufficient to allow deepening of the Seaway as required for maintenance purposes and/or as part of the proposed Broadwater Marine Project. Approximate depths of 20-25m have been suggested however this will be confirmed once the geological conditions are known.
- An approximately 1100m long section of DN1800 pipeline connecting between South Stradbroke Island and The Spit. This section would be pipe jacked in one section, requiring shafts on South Stradbroke Island and at The Spit. This section would need to be designed to a depth sufficient to allow deepening of the Seaway as part of maintenance operations and/or the proposed Broadwater Marine Project. Approximate depths of 25m have been suggested however this will be confirmed once the specific details of the other activities are known.

This option provides good utilisation of the existing infrastructure and the future upgrades can be stages, which minimises community disturbance. It most resembles the current configuration with a single release point near the Gold Coast Seaway (and connection of northern and southern pipelines in the area).

This option has been designed to avoid the Broadwater Marine Project Development Zones, based on currently available information.

This option does not discharge into the Moreton Bay Marine Park and therefore the approvals process will not need to consider works areas within conservation zones.

4.2 Plan and Schematics

The proposed route (in the form of a map) and schematic of this option are presented in Figures 5 and 6.
Recycled Water Release System

Shortlisted Route Option The Spit (4)
Proposed Staging - Option 4 The Spit

Merrimac WWTP
(2052) 33ML of additional Storage to be added at Merrimac WWTP (total storage 100 ML)

Elanora
(2022) Upgrade pump station to 60ML/d

Benowa pump station
(2032) Upgrade pump station to 210ML/d

Lands End
(2027) Pipeline augmentation - addition of DN 1500 MSCL pipeline

South Stradbroke Island
(2016) New pipeline added DN1800

Surge chamber at The Spit
(2016) (DN 2400 MSCL) new offshore release pipeline

Coombabah WWTP
(2022) Increase pumps to achieve 210 ML/d
(2022) 56ML of additional Storage to be added at Coombabah WWTP (total storage 200 ML)
(2027) Upgrade pump station to 550ML/d

Pimpama WWTP
No upgrades required
5 Alternative Option – Gold Coast Seaway Northern Offshore Option

It was also recommended that the second ranked option – Option 2 – The Gold Coast Seaway Northern Offshore Option - remains in consideration. The capital cost estimate for this option is ~$365M.

This option presents an alternative if the southern option is constrained by the Broadwater Marine Project. In addition, marine modelling is underway to evaluate the dispersion of the plume along the coastline and potential for re-entrainment to the Broadwater. Option 2, presents an alternative release point on the northern side of the Seaway for evaluation by hydrodynamic and plume dispersion modelling.

5.1 Description

The design features of this option are:

- TBM launch site at Lands End
- Offshore release pipeline passes under a GCW owned parcel of land on South Stradbroke Island
- Offshore release pipeline continues linearly to a release point 2km offshore
- The total length of the DN2400 release pipeline is approximately 4.2km long
- An approximately 2000m long section of new DN1000 pipeline connecting the southern release system with the new offshore release pipeline. This new pipeline would begin at The Spit, traverse under the Seaway and South Stradbroke Island, before connecting into the new release pipeline at the GCW owned parcel of land on South Stradbroke Island. This section would be pipe jacked in at least two sections, requiring shafts at The Spit, and two on South Stradbroke Island. This section would need to be designed to a depth sufficient to allow deepening of the Seaway as required for maintenance purposes and/or as part of the proposed Broadwater Marine Project. Approximate depths of 20-25m have been suggested however this will be confirmed once the geological conditions are known.
- Northern surge chamber to be built atop the TBM launch shaft at Lands End.
- Southern surge chamber to be built below the southern edge of The Spit car park.

This option avoids the Broadwater Marine Project Development Zones, based on currently available information.

The pipeline route and construction areas largely avoids residents and other stakeholders (e.g. recreational beach users) and therefore minimises negative community perception.

5.2 Plan and Schematics

The proposed route (in the form of a map) and schematic of this option are presented in Figures 6 and 7.
Proposed Staging - Option 2 South Stradbroke Island

Coombabah WWTP
(2022) Increase pumps to achieve 210 MLD
(2022) 56ML of additional Storage to be added at Coombabah WWTP (total storage 200 ML)
(2027) Upgrade pump station to 550MLd
Pimpama WWTP
No upgrades required

Merrimac WWTP
(2052) 33ML of additional Storage to be added at Merrimac WWTP (total storage 100 ML)

Elanora
(2022) Upgrade pump station to 60ML/d

Benowa pump station
(2032) Upgrade pump station to 210ML/d

Surge Chamber at Landsend

South Stradbroke Island

Surge Chamber at The Spit

Existing pipeline DN 1125 MSCL

(2027) Pipeline augmentation - addition of DN 1500 MSCL pipeline

Existing pipeline between Landsend and South Stradbroke Island (across the Broadwater) DN 1000 HDPE to be decommissioned

(2016) New pipeline DN 1125 mm (between the Spit and South Stradbroke Island)

(2016) (DN2400 MSCL) New offshore release pipeline

Existing DN 600 Pipeline
Existing DN 750 Pipeline
Existing DN 1128 Pipeline
Existing Pipeline DN1000 HDPE
Existing DN125
Existing DN125

(2042) Nerang river crossing augmentation addition of pipeline DN1000 HDPE

Existing pipes
Upgraded pipes