Albany Seawater Desalination Plant
Marine Works Concept Study Summary

Technical Partner

This study was commissioned by Water Corporation and undertaken by Atteris Pty Ltd, an independent engineering and management consultancy.

This document is prepared by Water Corporation and is a summarised version of the assessments of the Sandpatch and Nanarup options that were included in the study. It has been prepared to support community and stakeholder engagement, providing a clear overview of the study's key findings.

Purpose of the Study

Due to climate change and population growth, there is a projected increase in demand for drinking water. Water Corporation is investigating potential areas for a future seawater desalination plant near Albany. This initiative aims to ensure a secure and sustainable water supply for the Lower Great Southern Towns Water Supply Scheme (LGSTWSS) beyond 2030.

This study focused on the marine infrastructure required to support the plant—specifically the intake and outfall pipelines that cross the shoreline and extend into the ocean. It evaluated multiple site options and construction methods to identify the most practical, cost-effective, and environmentally responsible solution.

Study Scope

In January 2025, the State Government ruled out any potential desalination infrastructure within King George Sound. This decision prompted Water Corporation to revisit all previous planning work on identified potential areas outside King George Sound.

In July 2025, Water Corporation introduced two new investigation areas to the community - **Nanarup and South Coast (Sandpatch)** - following a comprehensive assessment that identified them as the most promising locations for further detailed studies.

To assess each location, the study involved:

- Reviewing coastline at each site to find suitable locations for the intake and outfall pipelines.
- Designing concept options for how the pipelines could be built, including underwater structures.
- Looking at pipeline size, materials and the volume of water they need to convey.
- Consideration of safety, maintenance and environmental impacts of construction.
- Comparing different construction methods to find the best approach.
- Estimating costs and timelines for building marine infrastructure.
- Identifying risks and opportunities to help guide future planning.
- Recommending next steps, including further studies and data collection.

The study *did not* include the seawater desalination plant design or location, onshore pipelines, pump stations or land access requirements.

Consideration of existing data

To support the assessment of potential sites for a future seawater desalination plant near Albany, a range of publicly available and Water Corporation-supplied data were used. This has informed decisions about pipeline design, environmental impacts and construction feasibility.

Key data included:

- **Water flow requirements**: The marine works were sized based on a seawater desalination plant designed to supply 10 million litres of drinking water per day, assumed at this stage to be operating 90% of the time. This equates to the 3 GL/y plant capacity concept.
- **Marine and coastal mapping**: Publicly available bathymetry and topography data were used to understand seabed conditions and shoreline features.
- **Geological information**: Soil and rock types were reviewed to assess construction risks and suitability for drilling.
- **Environmental considerations**: Environmental data, including seagrass, benthic habitats, national parks, and heritage sites were used to identify potential environmental impacts.
- **Ocean conditions**: Wave height and sea conditions (metocean data) were analysed to inform pipeline design and evaluate safe installation.
- **Pipeline design parameters**: Material choices (e.g. High-Density Polyethylene pipe), pipeline sizing and flow rates were calculated based on technical and environmental factors.

No new field investigations were conducted; the study relied on existing and publicly available data.

Pipeline Design Options Considered

To connect the seawater desalination plant to the ocean, pipelines are needed to bring in seawater and return brine (saltwater concentrate) back to the ocean. This study explored different ways to construct these pipelines across the shoreline and into the sea.

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Three main construction methods were considered:

1. **Open Cut and Cover**

   Involves digging a trench across the shoreline, laying the pipeline and covering it back up. This technique will work with any pipeline diameter.

   - **Not suitable** for Albany due to severe metocean conditions and the large footprint required to protect the open trench. It would directly impact the shoreline, causing greater disruption to the marine environment and nearby communities during construction. As a result, it is unlikely to receive environmental or social approval.

2. **Tunnelling**

   A launch shaft is sunk, and a tunnel is then bored underground from the launch shaft out to sea. Generally, the tunnel is then used as the pipeline. This technique is only economic for pipelines larger than 2 m in diameter. It is the conventional method for constructing intakes and outfalls for large seawater desalination plants (such as those at Alkimos and Binningup).

   - **Not suitable** for this project because the required pipeline diameters are relatively small (about 750 mm) for the relatively small desalination plant required for Albany. Tunnelling would be overly complex and expensive.

3. **Horizontal Directional Drilling (HDD)**

   A curved borehole is drilled from land to sea, allowing the pipeline to be installed under the seabed without disturbing the surface. This technique only works with pipelines up to about 1 m in diameter.

   - **Preferred method** for Albany due to pipeline diameter, minimal environmental impact and proven success in similar projects.
   - HDD is sensitive to ground conditions, so further geotechnical studies will be needed.

Open Cut

Tunnelling

Horizontal Directional Drilling

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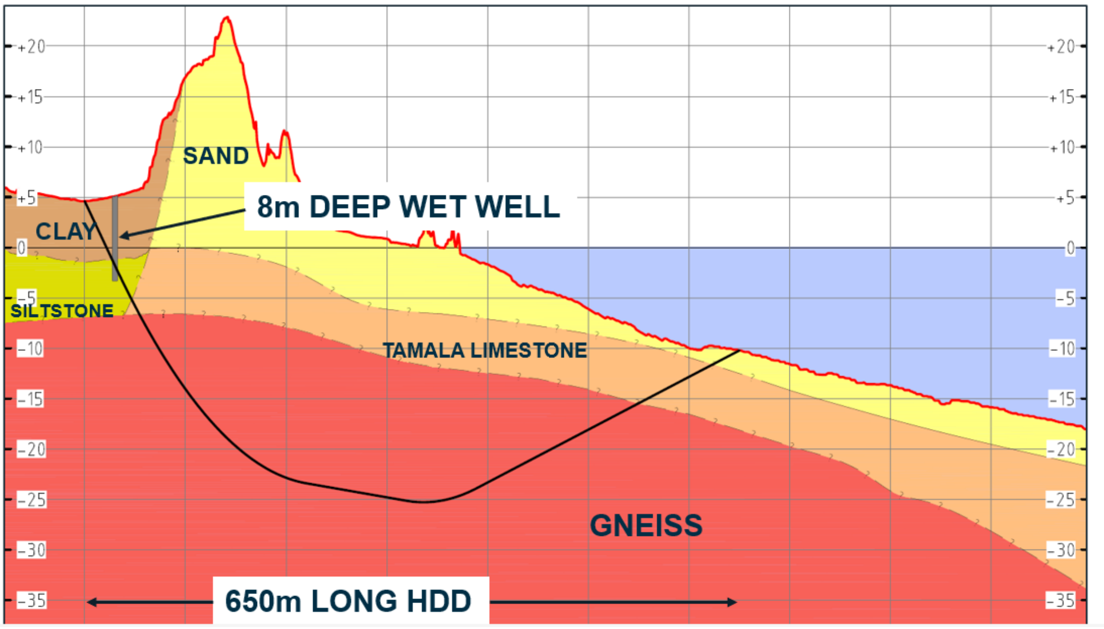
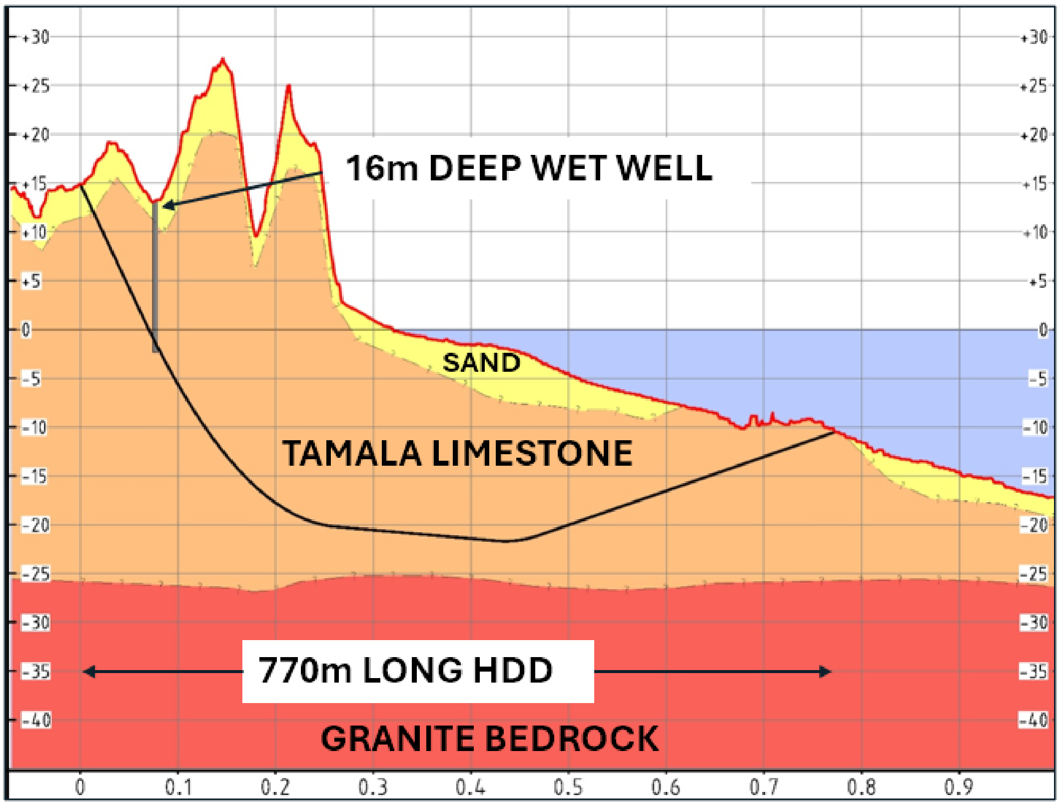
Concept Design Images

A. Nanarup(Gneiss)



B. Nanarup (Tamala)



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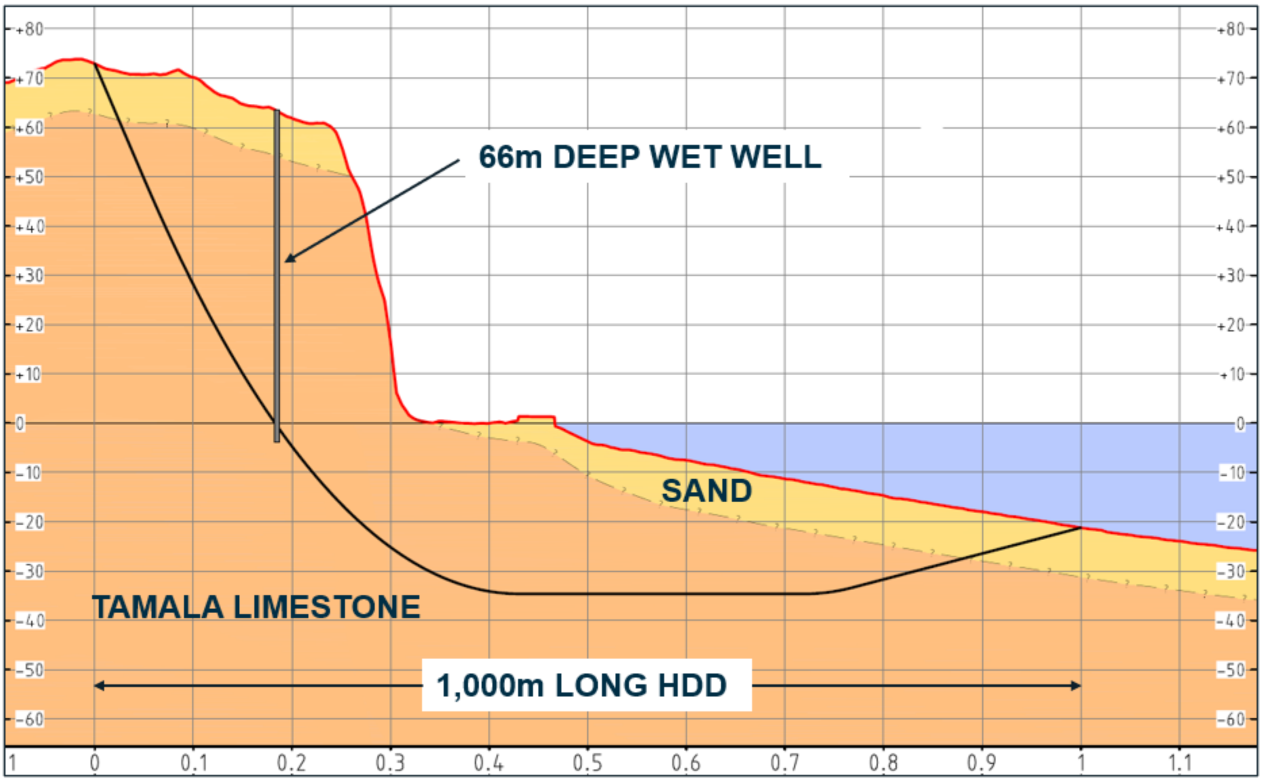
C. Sandpatch



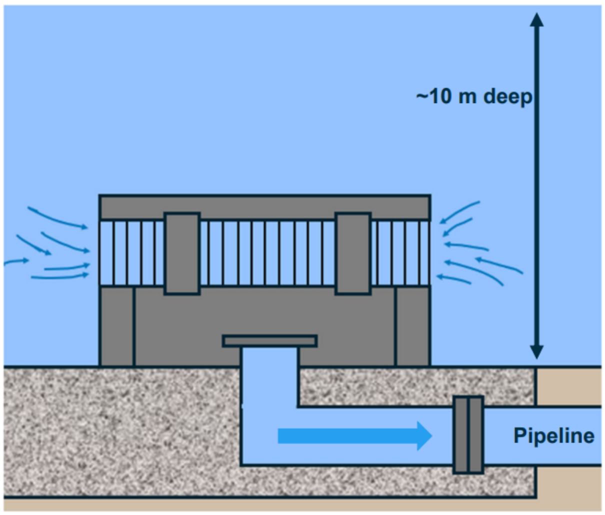
The study also considered seawater intake structures and brine outfall diffusers and suggested preferable approaches for the design stage:

- **Seawater intake structures**, which aim to avoid harming marine life and drawing in sediment.
- **Brine outfall diffusers**, which dilute and disperse the brine back into the ocean with minimal environmental impact.

Further investigation of the optimal design for the intake and outfall is required before the final design is completed.

Intake

- 4-5 m high
- ~100 tonnes
- Low flow velocity
- Must survive extreme storm loading
- Target 10 m water depth
- 500 - 1000 m offshore



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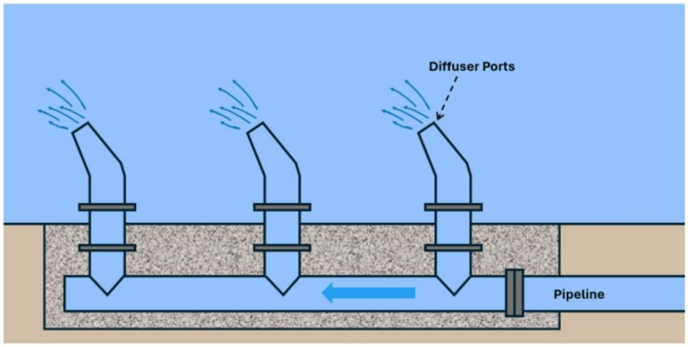
Outfall

- Multiple diffuser ports
- Must disperse brine
- Avoid the intake
- Target 15 m water depth
- 700 - 1200 m offshore



Site Comparison via Multi Criteria Assessment

To help choose the most suitable location for the seawater desalination plant's marine infrastructure, a detailed comparison was made between the shortlisted sites.

Each site was assessed using multiple criteria, including:

- Safety in design
- Environmental impact
- Community considerations
- Construction complexity
- Cost and duration
- Operability and maintenance

Criteria	Considerations
CAPEX (Capital Expenditure)	Estimated cost to construct shore crossing pipeline system in line with a Class 4 estimate as defined by the Association for the Advancement of Cost Engineering (AACE)
Execution schedule	A duration estimate for the main activities during marine construction for each shore crossing site. Day shift work only The intake and outfall pipelines are not drilled concurrently
Safety in Design	Depth of pump station wet well Diver works and marine operations Operations / maintenance phase of pump station and subsea structures

Criteria	Considerations
Heritage	Cultural heritage Historical sites & shipwrecks
Environment	**Onshore:** • Land clearing, • Landforms / transient dunes impact due to temporary construction phase & permanent operation phase • Available roads / existing infrastructure **Offshore:** • Sea grass, • Benthic habitat impact / disturbed seabed footprint. Benthic habitat refers to the ecological region at the bottom of a body of water. It includes the seafloor and everything living on or in it. • Coastal erosion / sea level rise
Third Party	Land tenure / access (qualitative only) Tourism and fishing (recreational and commercial) Services / existing utilities Distance to existing infrastructure for new utilities
Community	Aesthetics (visibility of intake structure) Community perception and social license
Shore approach & crossing complexity	Technical difficulty of design and constructability / Available skills and expertise Sea state (metocean conditions) Coastal erosion Flooding/inundation risk (e.g. near inlets & low-lying areas) Intake water quality (e.g. near inlets) Marine growth propensity
Geology	Geological complexity Ease of future geotechnical investigation, Favourability for HDD Coastal processes / geomorphology
Operability / maintainability & Operating Expenditure (OPEX)	Depth of pump station / access to pump station for maintenance Depth of pump station for OPEX (e.g. pumping costs) Access to offshore structures. Repair for accidental damage, distance to travel offshore & metocean conditions

Each factor was scored from 1 (low risk) to 3 (high risk). The scores were summed to give each site a total risk rating—the lower the score, the better the overall concept. For criteria other than cost and schedule, the risk score indicates the level of risk associated with each respective criterion that may significantly impact the design at a later stage.

Table 9.2 – Risk Level Definition

Risk Level	Description
Low (1)	No to Acceptable Risk Level. Further risk assessment is not necessary.
Medium (2)	Moderate Risk. Further risk assessment should be conducted to obtain a more accurate risk estimate and to be able to manage the risk.
High (3)	High and Unacceptable Risk. Further risk assessment should be conducted to obtain a more accurate risk estimate and measures should be implemented to lower the risk.

Note: This Multi-Criteria Assessment (MCA) focuses solely on the marine infrastructure required to support the desalination plant—specifically the intake and outfall pipelines that cross the shoreline. It differs from Water Corporation's broader MCA for the project, which will assess all land and marine components.

Multi-Criteria Assessment

Description	Nanarup (Gneiss)	Nanarup (Tamala)	Sandpatch
Cost (CAPEX)	Medium (2)	Medium (2)	High (3)
Execution Schedule	High (3)	High (3)	High (3)
Safety in Design	Low (1)	Low (1)	High (3)
Heritage	Medium (2)	Medium (2)	Medium (2)
Environment	Low (1)	High (3)	High (3)
Community	Medium (2)	Medium (2)	Low (1)
Third Party	Medium (2)	Medium (2)	Medium (2)
Shore Approach & Crossing Complexity	Medium (2)	High (3)	High (3)
Geology	Medium (2)	High (3)	High (3)
Operability / Maintainability	Low (1)	Low (1)	High (3)
Total Score	18	22	26

Nanarup (Gneiss) is the area west of Taylor Inlet and Nanarup (Tamala) is the area east of Taylor Inlet. Two areas were considered in Nanarup due to variable geological conditions.

Tamala Limestone comprises layers of low strength, porous, sedimentary rock interbedded with layers of loose sand and gravel. Cavities and voids are common in the Tamala formation. Gneiss is a high strength, homogeneous, dense rock.

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Key Findings

Nanarup (Gneiss – west of Taylor Inlet)

- Nanarup West's estimated intake and outfall Horizontal Directional Drilling (HDD) lengths are estimated at 653 m and 943 m, respectively (+/-20%). The intake shaft required is shallow at 8 m deep, due to the site's low elevation. These relatively short lengths and depths reduce technical and environmental risks, construction timeframes and cost.
- Nanarup ocean conditions: Suitable weather for offshore construction occurs 20% of the time (based on CSIRO metocean data). Location has favourable marine access conditions for construction and operational vessels.
- The Gneiss formation may be slow to drill through, but is expected to be low risk given that it is likely to be competent and stable during drilling operations, offering a lower risk of collapse.
- Potential access to previously cleared land would help reduce environmental impacts associated with vegetation clearing.

Nanarup (Tamala – east of Taylor Inlet)

- Nanarup East's estimated intake and outfall Horizontal Directional Drilling (HDD) lengths are estimated at 773 m and 953 m, respectively (+/-20%). The intake shaft is approximately 16 m deep due to higher elevation and topography.
- Nanarup ocean conditions: Suitable weather for offshore construction occurs 20% of the time (based on CSIRO metocean data). Location has favourable marine access conditions for construction and operational vessels.
- Subsurface geology includes low strength limestone and sand with potential voids and cavities, increasing the risk of borehole collapse, fluid loss and inconsistent drilling progress. These conditions require further geotechnical investigation and may complicate HDD operations, potentially contributing to higher technical and environmental risks.

South Coast Sandpatch

- While South Coast Sandpatch was initially identified as a potential site for the Albany seawater desalination plant, this study highlights significant environmental, geological, and constructability risks that affect its suitability for the shore crossing and marine infrastructure.
- Estimated intake and outfall Horizontal Directional Drilling (HDD) lengths are estimated at 998 m and 887 m, respectively (+/-20%). Geologically, the site is characterised by complex and variable formations, including sandstone with layers of loose sand and gravel, voids and cavities, which pose challenges for HDD. The high elevation of the site also necessitates a deep intake shaft (~66 m), increasing construction complexity, safety risks and operational costs.
- Sandpatch ocean conditions: Suitable weather for offshore construction occurs <1% of the time (based on CSIRO metocean data). Location has unfavourable marine access conditions for construction and for ongoing operational activities.
- These factors result in a significantly higher overall risk rating in the multi-criteria assessment, particularly in relation to the likelihood of construction challenges, safety concerns, cost escalation, schedule delays and the risk that future assessments prove the site infeasible.

Preferred Construction Methodology

Horizontal Directional Drilling is the most suitable method for all areas due to its minimal surface disturbance and proven reliability. It provides a more efficient method for installing the required pipeline size for the Albany desalination plant's expected capacity.

Conclusions

Nanarup West is the most technically and environmentally favourable location for constructing intake and outfall pipelines, achieving the lowest overall risk score in the assessment.

While Nanarup East is less favourable than the West site, it presents fewer identified risks compared to South Coast Sandpatch.

The South Coast Sandpatch site is not recommended due to geological uncertainty, complex subsurface conditions, and high operational risks—factors that together make the project highly unlikely to succeed at this site within acceptable cost, time, and safety parameters.

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Glossary of Terms

Term	Definition
Bathymetry	The study and mapping of underwater depth and seabed features. Also used interchangeably as a noun for bathymetry data.
Benthic Habitat	The ecological region at the bottom of the ocean, including seagrass, coral, and marine life.
Biofouling	The build-up of marine organisms like algae and invertebrates on underwater surfaces.
Brine	In seawater desalination plants, brine is the salty byproduct returned to the ocean. It is nearly twice as salty as seawater because about 40-45% of the freshwater is removed. Brine may contain very small amounts of food-grade chemicals like anti-scalants and cleaning agents.
CAPEX (Capital Expenditure)	The upfront cost of building infrastructure.
Diffuser	A diffuser is a device at the end of a pipeline that returns brine to the ocean. Diffusers help mix and dilute the brine with seawater.
Geotechnical Investigation	An investigation, including taking physical samples, of soil and rock to determine the conditions and to assess construction feasibility.
Gneiss	Hard, dense metamorphic rock.
HDD (Horizontal Directional Drilling)	A trenchless method of installing pipelines underground by drilling a curved path from land to sea.
Intake Pipeline	A pipe that draws seawater from the ocean into the desalination plant.
Metocean Conditions	Combined meteorological and oceanographic data, such as waves, tides, and currents.
OPEX (Operating Expenditure)	The ongoing cost of running and maintaining infrastructure.
Open Cut and Cover	A method of laying pipelines by digging a trench, placing the pipe, and covering it.
Outfall Pipeline	A pipe that returns concentrated seawater (brine) back to the ocean.
Tamala Limestone	A low strength, porous, sedimentary unit, formed from ancient sand dunes, that includes loose sand and gravel layers interbedded with sandstone.
Topography	The shape and features of the land surface, including elevation and slope.
Tunnelling	A method of installing pipelines by boring a tunnel underground.
Wet Well	A tank or chamber where seawater is collected before being pumped into the plant.