



## 10. Project Timing

### 10.1 General Discussion

There is some variation in the predicted construction times for the different locations, and the times are also dependent on the approach to contract delivery. In broad terms, and based on Australian experience, the project - at the preferred location - might be expected to have two phases.

First there would be a period of around 1½ to 2 years studying seawater quality, evaluating geology, undertaking a range of investigations and environmental assessments, community consultation, pilot testing, and developing design concepts further. This phase would also include engagement with the contracting community, developing contract documentation and tendering. Then there would typically be a further 2½ to 3-year period of detailed design, construction and commissioning before water is available. There will be some overlap between the phases.



## 10.2 Risks to Timely Delivery

The program set out above describes the range of activities which are required at any plant location. There are differences between the locations which result in various possible risks of extending the program by impacting on activities which lie on the critical path. The project risk analysis included an examination of the impact which various risks could have on the time to implement the project. Table 18 sets out a summary of the various risks that the program could be extended for the various locations, and also includes a summary assessment of the relative overall risk of delay for the different locations.

The lower risk cells for each component are highlighted in green.

**Table 18 Risks to Timely Delivery**

Component	Surf Coast	East of Port Phillip Bay	West of Western Port	Bass Coast
Time to reduce uncertainty related to various environmental and social impacts.	Victorian Safe Drinking Water Act requires assessment and management of source water quality risk. This may be time consuming if anywhere near the Black Rock outfall, due to possible need for quantitative analysis.	Until hydrodynamic modeling and ecological studies are resolved and interpreted, there is uncertainty over the concept of concentrate discharge to Port Phillip Bay. This creates a risk of time delay.	The RAMSAR listing may trigger EPBC. In any case, the need for investigations to understand and demonstrate acceptable impact creates a risk of time delay.  Some sites may be contaminated land, with consequent need for potentially time consuming investigation.	There is a need to address site acquisition and zoning.  The Wonthaggi outfall needs to be considered, but it is much smaller and also sites can be found further away than for Black Rock, so risk of delay is not regarded as significant.



Component	Surf Coast	East of Port Phillip Bay	West of Western Port	Bass Coast
Geotechnical investigation and subsequent design development.	Weather delay to marine geotech investigations is a higher risk in the open ocean locations due the need for calmer weather to drill offshore.	Lower risk than for open ocean.	Similar to Port Phillip Bay.	Similar to the Surf Coast.
Pilot Testing and water quality investigations related to design development	Apart from the issue of the Black Rock outfall (covered above), the Bass Strait location offers more consistent water quality and therefore reduced need for extended pilot testing.	Water quality variation in the Bay suggests need for pilot testing to develop and demonstrate pre-treatment concepts. The time required may be extended if a need to experience particular water quality events (eg heavy rain and river inflows) is seen to be important.	Similar to Port Phillip Bay, with additional concerns related to shipping and consequent impact on pre-treatment concepts.	Similar to Surf Coast.
Construction (Tunnelling) for the Inlet and Outlet, various complications which could increase time to complete.	Geology – Basalt ridges, energetic open ocean environment reducing time available for marine construction.	Geology – Fault and other complications. Bay provides more calm conditions for marine works.  Longest tunnels , some tunnelling under houses, roads, railway etc.	Old alluvial silt filled valleys potentially intersect tunnel route.  Bay provides more calm conditions for inlet works.	Geology – coal seams and history of mining may create complications, energetic open ocean environment reducing time available for marine construction.



Component	Surf Coast	East of Port Phillip Bay	West of Western Port	Bass Coast
Additional Complications unique to the Particular Location, which could increase time to complete.	Potential need to increase level of treatment at Black Rock to manage risk or perception of risk related to the outfall.	Need to resolve operation with the SEO as concentrate disposal option.	Contaminated land potential onsite which will need investigation and unknown quantity of rehabilitation.	Need to identify appropriate, sites, perform due diligence and investigations and acquire land.
<b>Summary of Risks that Timeline for Implementation is Increased</b>	<b>Moderate Risk</b>	<b>Moderate to High Risk</b>	<b>Moderate to High Risk</b>	<b>Least Risk</b>

The Bass Coast location is considered to pose the least risk to delivery timeframes, while the East of Port Phillip Bay and West Western Port locations pose the greatest risk. To quantify these delivery risks, further investigation into the specific locations is required. The cost estimates for each location currently include allowances to mitigate some of these risks. Investigations to quantify these risks will have the added benefit of ultimately providing greater confidence in the cost estimates.

## 11. Next Steps

This section outlines activities that typically occur when a major seawater desalination project is taken forward from feasibility study into implementation. These lists are drawn from the experience gained at other major seawater desalination projects around Australia. In general these tasks fall into five key categories:

- ▶ Technical, environmental and scientific investigations
- ▶ Planning, land use and approvals matters
- ▶ Further design and engineering
- ▶ Procurement strategy
- ▶ Community consultation and engagement

Each of these categories are explained in further detail below. Discussion of the tasks as presented here is not intended to be prescriptive, nor is the list of tasks exhaustive.

### 11.1 Technical and Scientific Investigations

Investigations are required to gather information that will assist in the development of the design and provide a greater understanding of the approvals required. Table 19 outlines some of the key investigations likely to be required.

**Table 19 Description of Likely Technical, Environmental and Scientific Investigations**

Task	Description
Geotechnical Investigations	<p>Preliminary site assessment via a desktop study to produce an outline geological model of the site, preliminary definition of geological processes, identification of geological risks and outlining the scope of additional surveys and monitoring</p> <p>Site investigation including onshore and offshore components. Onshore borehole drilling and geophysical surveys at the plant site and along the pipeline corridor. Offshore borehole drilling, CPT testing and geophysical surveys to enable projection of a 3D geophysical model along tunnel alignments.</p>
Ecological Investigations	<p>Surveys of the ecological impact of construction and operation both on land and in the marine environment. Data gathered will be required for the planning and approvals process and assist in minimising potential impacts through design improvements</p>
Hydrodynamic Modelling	<p>Computer modelling of the ocean conditions considering bathymetry, tidal and climatic data. Results are required to assist the design and location of the intake and outlet structures, consider potential water quality risks and to minimise the impact of the concentrate discharge.</p>

Task	Description
Visual Impact Assessment	Preliminary design of buildings and facilities and their placement on potential sites to determine the aesthetic impact on the landscape. Results of the assessment feed into design of the treatment plant's buildings and facilities and to assist the community consultation process.
Water Quality Risk Assessment	<p>Studies to determine risks the treated water quality posed by the feedwater quality. Typical risks include freshwater influences (rivers, drains), discharges (municipal, industrial) and other effects (shipping, algal blooms etc).</p> <p>Studies may show a quantitative risk assessment (QRA) is required to properly determine the risk to the final water quality and public health.</p>

## 11.2 Planning, Land Use and Approvals

Planning and approvals covers the legislative aspects of locating and operating the desalination plant. Work is required to ensure the relevant approvals are obtained before construction can commence. Approvals are required from a range of governmental bodies and cover a range of aspects of such a project ranging from zoning and land use issues to environmental approvals. The various approvals processes pose a potential time risk to any process, as appeals against developments can occur for a number of reasons.

A summary of the various environmental acts that could apply and approvals that may be required is discussed earlier in this report.

## 11.3 Further Design and Engineering

Various technical data is required for further design development. Table 20 outlines some of the key investigations likely to be required.

**Table 20 Description of Likely Further Design and Engineering Tasks**

Task	Description
Water Quality Sampling	Sampling of the marine environment to gain an understanding of the typical seawater composition (metals, organics, physical attributes) and their expected variation is required to develop the design of the pre-treatment and reverse osmosis processes.
Further Design Development	Progress through a functional design phase to enable a detailed design to be undertaken. How the design process is managed is largely determined by the procurement strategy.
Develop Delivery Approach	Contractual arrangements to enable engagement of contractors and equipment suppliers. The delivery approach will be determined by the procurement strategy.
Pilot Plant Testing	Running a small scale plant to determine suitable pre-treatment processes and associated required chemical dosing.



Task	Description
Power Supply Arrangements	Arrangements with relevant power companies and local authorities to enable provision of a high voltage supply to the site. Power supply may be upgraded in stages. Initial supply needed to run the construction equipment such as tunnel boring machines. Ultimate supply to power the plant and enable commissioning and on-site testing prior to operation.

## 11.4 Procurement Strategy

A number of risks have been identified in the feasibility study. Further investigation will resolve some of these risks, and reveal others. These risks may be shared in some proportion between the government and the private sector. The procurement strategy adopted will define the nature and extent of the risk shared with the private sector.

The large seawater desalination projects in Australia have adopted a variety of procurement strategies including competitive alliance in Perth, a pure alliance in Gold Coast and a possibly a Design Build and Operate in Sydney.

Selection and development of the appropriate procurement strategy is a key next step if seawater desalination is taken forward as a major augmentation.

## 11.5 Community Consultation and Engagement

A large seawater desalination project will generate considerable community interest. It is important for all such projects to develop a wide ranging community communication and consultation program. A significant effort will be required to develop and manage a communication process if a seawater desalination project proceeds as a major augmentation for Melbourne.

Broad issues raised elsewhere in community consultation which are specific to seawater desalination, rather than examining the broader question of water supply planning, might be expected to include:

- ▶ What will be the impact on home water bills? How much will industry pay?
- ▶ Concerns over a wide range of perceived environmental impacts, including water quality, marine life etc.
- ▶ How will greenhouse gas be handled?
- ▶ How will construction of the plant and pipeline affect people who live nearby?
- ▶ How will operation affect local communities?
- ▶ Why is the plant not located somewhere else?
- ▶ Why not use alternative technology?
- ▶ Who will own the plant?

Development of a comprehensive and appropriate community consultation and communication program is a key next step if seawater desalination is taken forward as a major augmentation.



## 12. Conclusions

A feasibility study was conducted into seawater desalination as one option to provide a major augmentation to Melbourne's water supply.

This study has concluded that it is feasible to desalinate seawater to produce up to 100 GL/y from four short-listed locations. The Surf Coast, East of Port Phillip Bay, West of Western Port and the Bass Coast were short listed as possible locations. Conceptual project designs have been developed for each location. The concepts include intake and outlet tunnels and marine structures, seawater screening and pumping to the plant, pre-treatment of the seawater, reverse osmosis desalination, post-treatment, pumping and transfer to suitable connection points in the existing metropolitan water supply system.

The volume of water which potential locations can supply to the system is constrained by several factors. Locations to the east of the city could connect into the Cardinia and Silvan Reservoir system, allowing more than 200 GL/y to be introduced to the existing system. Locations to the west could introduce up to 100 GL/y into the existing system via the Cowies Hill Reservoir. There are other constraints to total volume that can be produced at the desalination plant locations themselves, particularly in relation to disposal of concentrate. The conclusion of this analysis was that the Bass Coast location offer the most flexibility for expansion to 200 GL/yr.

Environmental implications and limitations of the project were considered. Preliminary assessments of the greenhouse gas contribution of the project show that the electricity consumption of the plant, whilst operating, outweighs either direct emissions from construction and operations or embedded emissions from materials and chemicals used. It appears feasible to supply an annual equivalent amount of renewable energy to supply the plant. The renewable energy generation plant(s) could be located elsewhere in Victoria. The operating cost estimates allow for a current estimate of the cost of renewable energy.

Marine considerations include feedwater quality and impact of concentrate discharge. For the locations drawing water from Port Phillip Bay and Western Port, the conceptual design allows for more variable feedwater quality, than in Bass Strait, by the inclusion of additional pre-treatment.

Marine impacts of the concentrate discharge are expected to be minimal in Bass Strait given the proposed diffuser design and the open ocean environment. Both Port Phillip Bay and Western Port have environmental and social values, which suggest that the return of the concentrated seawater to these water bodies would need careful consideration. Understanding wider area effects would also need further study.

The short listed locations have been assessed against a wide range of technical, financial, environmental and social factors. An assessment was made of the risks to timely delivery of the project for each location. The conclusion of these assessments is that the most significant difference between the locations is how they might fit into the wider strategic plans for water supply in Victoria. For example, if there is a need for future expansion to 200 GL/year supplied to the east of the city, and if there is also a need to provide the augmentation to meet particular timeframes, then the Bass Coast location is favoured.

The report includes a set of next steps that need consideration if seawater desalination is adopted as a major augmentation for Melbourne's water supply,



**GHD Pty Ltd** ABN 39 008 488 373

180 Lonsdale Street

Melbourne, Victoria 3000

T: (03) 8687 8000 F: (03) 8687 8111 E: melmail@ghd.com.au

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