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**Criteria for Preliminary Screening of  
Areas for Potential Seawater  
Demineralization Facilities  
Task C.1.**

**for the  
Seawater Demineralization  
Feasibility Investigation**



**Criteria for Preliminary Screening of Areas for Potential Seawater Demineralization  
Facilities - Task C.1.**

**For the**

**Seawater Demineralization Feasibility Investigation  
Contract SE459AA**

**by**

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# Introduction

## Purpose and Scope

The purpose of Task C.1 is to develop criteria suitable for use as a preliminary (macro level) screening measure within the coastal areas of the SJRWMD for siting seawater demineralization facilities.

The criteria provide a rational way to perform a preliminary screening to identify up to twenty preferred sites for further consideration for a potential demineralization plant siting. The criteria provide a method to screen both collocated and non-collocated sites.

This document identifies the macro screening criteria and presents the rationale for their application to the various potential sites.

Task C.1 represents the first step in the multi-step process of site identification. This step in the screening process does not include a “ranking” of the sites but rather identifies whether a site has preferred features or not. Ranking of the preferred sites is part of Task C.2.

The next step in this process will be to rank up to twenty potentially feasible sites, under Task C.2, using more detailed and comprehensive criteria.

## **Preliminary (Macro-Level) Screening Criteria**

This section presents the preliminary (macro-level) screening criteria. Application of the criteria will be used to screen and identify up to 20 potential sites for siting a seawater demineralization facility. To identify potential sites, identification of the presence of preferred features is applied at this phase. Ranking of the preferred sites is conducted under Task C.2. A summary of the screening criteria is shown in Table 1.

The five primary preferred features are:

- Adequate access to an ample seawater source
- Access to an adequate energy source
- Proximate access to a water transmission system
- Areas of projected deficit
- Acceptable means for demineralization concentrate management

The remainder of the project feasibility criteria are those that are typical for an infrastructure project, and include site accessibility for construction, availability of off-site utilities and minimal environmental impact from on-site and off-site project improvements.

The following sections include a description of the application of each of the five primary macro-level criteria. Table 1 reflects a summary of the macro-level criteria.

### **Adequate Access to an Ample Seawater Source**

One desirable characteristic of a potential site is ready access to a sufficient supply of clean seawater. For the macro-level screening, the term “clean seawater” is defined by the characteristics associated with various FDEP water classifications as deemed acceptable for seawater demineralization.

Distinct advantages of adequate access include significant reductions in capital and operations and maintenance (O&M) costs, environmental impacts, permitting requirements and project duration.

Project impacts that may be encountered if an adequate seawater source is not in close proximity include:

- Increased capital and O&M costs due to additional pretreatment requirements, pipelines, and pump stations
- Environmental impacts resulting from the construction of pipelines and pumping facilities, including the need for additional permitting
- Public opposition to construction disturbances
- Additional project costs associated with property acquisition and possible condemnation
- Increase in project schedule duration

- Exposure of the public to navigation hazards, open excavations, traffic disruptions, etc.

Under these screening criteria, the characteristics of a preferred site include:

- Availability of a high quality seawater source. Class 1, 2 and 3 waters are preferred, with Class 1 being the most acceptable. (Water Classifications are defined in Appendix A)
- Located within five miles of an existing seawater intake of a once-through cooled power generating plant
- Located within five miles to the sea shoreline (including the intercoastal)

The five-mile criterion is based on site-specific location data for the area of study and experience with feasibility and costing analyses for demineralization plant siting studies, such as the “Gulf Coast Desalination Plant Site Selection Study”, February 2002. In that study, numerous sites were considered with intake distances from 1000 feet to 11 miles. Since the intake pipelines can be twice the size of the product water transmission pipelines, the project costs tend to be much more feasible the closer the site is to the source water. The five-mile maximum distance for intake was determined to be reasonable based on actual conditions in the study area, particularly considering the water deficit areas along the Atlantic coastline.

### **Access to an Adequate Energy Source**

Seawater demineralization technologies require approximately 10 to 17 kW-hr of electric power (dependent on salinity and temperature) per 1,000 gallon of product water. A seawater demineralization facility needs access to an adequate energy source of either steam and/or electricity. Larger seawater demineralization plants may require an electric distribution substation specifically dedicated to the facility. When an evaporative process is used, collocating the facility immediately adjacent to a steam power plant reduces energy losses associated with the transmission of steam used in the demineralization process.

The increasing trend in seawater demineralization has been the use of Reverse Osmosis (“RO”) membrane technology. This specific technology requires large amounts of electricity to produce the roughly 1,000 pounds per square inch (psi) pressure needed for the seawater RO membrane process.

If an adequate energy source is not available or in close proximity, onsite power generation facilities or a major extension of high voltage transmission lines will be needed. Other possible adverse impacts include:

- Public opposition to facility siting
- Need to acquire and/or condemn property
- Increased cost to provide power to the facility
- Increased permitting complexity and cost

- Extended project duration

Under these screening criteria, the characteristics of a preferred site include:

- Location within 2 miles of a major power generation facility
- Location within 2 miles of heavily developed urban areas (Since the scope of this project does not include the identification of specific electrical substations, another indicator of the strong likelihood of electrical substations would be proximity to urban areas.)

The two-mile distance to a power station or substation is based on experience with demineralization plant siting studies, such as the “Gulf Coast Desalination Plant Site Selection Study”, February 2002, “Desalination for Texas Water Supply”, and other demineralization feasibility cost analyses performed by PB Water. It was determined in these studies that the further the site is located from a power station or major source of power such as a substation, the more expensive it is to bring to the site the large quantity of power required for a demineralization plant.

### **Proximate Access to a Water Transmission System**

All potable water utilities have major assets generally consisting of water sources, water treatment facilities and water transmission components. A seawater demineralization facility typically only provides the source and treatment of the potable water. The water transmission components of a water utility usually account for a majority of the utility’s invested capital expense. Consequently, when new and perhaps previously unanticipated sources of water supply become available, a major economic factor in the overall project feasibility is ability of the existing utility transmission infrastructure to receive, treat, blend and retransmit the demineralized water.

For the purposes of this study, the location of water demand and transmission is defined as water treatment plant locations. Generally, product water is conveyed from one or more water treatment facilities. Specific other locations that may be acceptable for water transmission would require identification and selection by local water purveyors and may be part of local master planning efforts, which is not included in the scope of this project.

An absence of existing utility transmission infrastructure could potentially result in additional secondary project costs to upsize or parallel major backbone utility transmission infrastructure. Additional adverse impacts could include:

- Environmental impacts of construction and operation;
- Public opposition to siting; and
- Need to acquire and/or condemn property.

The characteristics of a preferred site include:

- Site location within twenty miles of the water demand

The 20-mile criterion is based upon a general review of site-specific location data for water supply demands and deficits and possible demineralization plant sites within the study area.

### **Areas of Projected Deficit**

The needs for water supply dictate that sources such as a demineralization facility be considered. This feasibility investigation study includes a review of water needs, by water system, as projected by the SJRWMD through 2020. For locating a seawater demineralization facility, the SJRWMD set a demand in the range of 2 to 20 million gallons per day (mgd) as desirable.

An inability to satisfy these criteria could potentially result in construction of a facility that has excess capacity, leading to:

- Failure to repay financing
- Use of limited environmental resources/impact areas and capital resources

The characteristics of a preferred site include water system(s) with a projected deficit between 2 and 20 mgd.

### **Acceptable Means for Demineralization Concentrate Management**

A major requirement for the development of a successful seawater demineralization project is the ability to dispose of the byproduct, demineralization concentrate, in an environmentally acceptable manner.

An inability to satisfy these criteria could potentially result in:

- Higher disposal costs for concentrate
- Difficulty in permitting of the facility
- Negative environmental impacts

For the disposal of concentrate from membrane demineralization facilities, the SJRWMD is conducting a study entitled “Demineralization Concentrate Management Project.” The draft report, Technical Memorandum C.2 – Demineralization Concentrate Management Plan, dated November 2002, defined the following as more suitable for the disposal of concentrate from a seawater demineralization facility:

- Disposal to existing suitable injection wells or areas defined as suitable for injection wells\*
- Close proximity to the coast (ocean or intercoastal) (potential for new ocean outfall). Consideration of the length of the outfall may preclude this option.

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\* Areas defined as suitable for injection wells are identified in the study report entitled “Technical Memorandum C.2 – Demineralization Concentrate Management Plan”.

The following are also characteristics of a preferred site. Note, however the use of existing facilities may require modifications to existing permits or require extensive studies for permitting and environmental impacts.

- Access to an existing permitted wastewater outfall.
- Blending with an existing high volume cooling water outfall from a power generating plant with once-through cooling.

For evaluation under this criterion, a site that is within ten miles to a potential means for concentrate disposal is considered.

The 10-mile criterion is based upon a general review of site-specific location data for water supply demands and deficits and possible demineralization plant sites within the vicinity of existing wastewater treatment plants and power stations in study area. The ten-mile criterion appears to be reasonable for this project considering the likely favorable demineralization plant sites will be in close proximity to the coastline.

**Table 1. Summary of Macro Criteria for Site Screening**

Main Criteria	Sub Criteria
<p><b>Adequate Access to an Ample Seawater Source</b></p>	<ul style="list-style-type: none"> <li>• Availability of a high quality seawater source. Class 1, 2 and 3 waters are preferred, with Class 1 being the most acceptable. (Water Classifications are defined in Appendix A)</li> <li>• Located within five miles of an existing seawater intake of a once-through cooled power generating plant</li> <li>• Located within five miles to the sea shoreline (including the intercoastal)</li> </ul>
<p><b>Access to an Adequate Energy Source</b></p>	<ul style="list-style-type: none"> <li>• Location within 2 miles of a major power generation facility</li> <li>• Location within 2 miles of urban areas</li> </ul>
<p><b>Proximate Access to a Water Transmission System</b></p>	<ul style="list-style-type: none"> <li>• Site location within twenty miles of the water demand</li> </ul>
<p><b>Areas of Projected Deficit</b></p>	<ul style="list-style-type: none"> <li>• A water system with a projected deficit between 2 and 20 mgd</li> </ul>
<p><b>Acceptable Means for Demineralization Concentrate Management</b></p>	<ul style="list-style-type: none"> <li>• Disposal to existing suitable injection wells or areas defined as suitable for injection wells (within ten miles)</li> <li>• Within ten miles of the coast (potential for new ocean outfall). Consideration of the length of the outfall may preclude this option</li> <li>• Access to an existing permitted wastewater outfall within ten miles</li> <li>• Blending with an existing high volume cooling water outfall from a power generating plant with once-through cooling within ten miles</li> </ul>

**APPENDIX A**

**WATER CLASSIFICATIONS**

## Water Classifications

The Florida Department of Environmental Protection (FDEP) has developed a classification system, which designates a water body based on one of five classes related to a particular water body's designated use (Chapter 62-302, Florida Administrative Code [F.A.C.]).

Each classification has specific water quality criteria necessary for the protection and preservation of surface waters, which are also consistent with minimum federal standards, set by the U.S. Environmental Protection Agency (USEPA).

**Table 2. Surface Water Classifications Developed Under Chapter 62-302, F.A.C.**

<b>Surface Water Classification</b>	<b>Designated use</b>	<b>Water Quality Criteria</b>
CLASS 1	Potable Water Supplies	Most stringent
CLASS 2	Shellfish Propagation or Harvesting	Stringent
CLASS 3	Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife	Moderately stringent
CLASS 4	Agricultural Water Supplies	Less stringent
CLASS 5	Navigation, Utility and Industrial Use	Less stringent

62-302.530, Criteria for Surface Water Quality Classifications further defines specific characteristics required for each of the water classifications.