

Executive Summary

The Coquina Coast Seawater Desalination Alternative Water Supply Project currently includes two Suppliers (the Cities of Palm Coast and Leesburg), and two “Ex Officio” members (the City of DeLand and St. Johns County). In an effort to meet increasing water demands and address limitations in future groundwater usage, these entities, together with the St. Johns River Water Management District (SJRWMD) known collectively as “The Partners”, are evaluating seawater desalination as a potential future source of drinking water for the region.

An important part of this task is reviewing updated water needs projections provided by the Suppliers and Ex Officio members. The most recent projections mirror current economy uncertainties, but the need for additional water in the future remains clear. Based on the projected future water needs provided by the Suppliers and Ex Officio members, the initial supply capacity of the Coquina Coast project is likely to be between 10 and 15 million gallons per day (MGD) and would need to be online by approximately 2020. These projections are subject to change as forecasts and project membership changes. It would be necessary to begin planning for expansion of the future supply capacity to achieve future additional capacity by approximately 2035. Assuming a second 20-year planning cycle, the ultimate supply capacity could be between 28 and 49 MGD to meet 2050 needs.

The Partners are committed to identifying the most cost-effective seawater desalination process that is practical for the project. To that end, the Partners are committed to evaluating emerging desalination technologies if they prove feasible for this project. However, while there are several emerging technologies, only seawater reverse osmosis (SWRO) is being considered in the current conceptual phase. Thermal processes are not considered viable for economic reasons, and most of the emerging technologies are still in development, so their applicability at this scale is likely years away.

The treatment process will be designed to meet all established National Primary and Secondary Drinking Water Standards. In addition, several other water quality objectives have been established for currently unregulated parameters or those that are more stringent than current regulatory standards. Treated water must also be stable, non-corrosive and suitable for transmission to each of the Partners with an adequate and appropriate disinfectant residual.

This report summarizes projected water supply needs for each of the Suppliers and Ex Officio members and identifies preliminary treated water quality goals and objectives from a potential future desalination facility, including required water quality adjustments at individual points of connection.

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Acronyms

AADF	annual average daily flow
BOD	biochemical oxygen demand
CCPP	calcium carbonate precipitation potential
COD	chemical oxygen demand
FDEP	Florida Department of Environmental Protection
DBP	disinfection by-product
EPA	Environmental Protection Agency
HAA5	haloacetic acids
IESWTR	Interim Enhanced Surface Water Treatment Rule
LSI	Langeleir Saturation Index
LT2ESWTR	Long-Term 2 Enhanced Water Treatment Rule
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MF	microfiltration
MGD	million gallons per day
MWCO	molecular weight cut off
NEPA	National Environmental Policy Act
O&M	operations and maintenance
SDI	silt density index
SJRWMD	St. Johns River Water Management District
SWRO	seawater reverse osmosis
SWTR	Surface Water Treatment Rule
TDS	total dissolved solids
TOC	total organic carbon
TTHM	total trihalomethanes
UF	ultrafiltration

1.0 Introduction

1.1 Background

Throughout Florida, municipalities, regulatory agencies, and various other groups concerned with the impacts of increasing water demands on our environment are seeking alternative water sources and treatment methods to meet those demands. In the Coquina Coast region of Florida, a group of municipalities in partnership with SJRWMD have been evaluating the Coquina Coast Seawater Desalination Alternative Water Supply Project as a means to accomplish the goal of meeting future water supply demands while continuing to serve as proper stewards of the environment. The Coquina Coast Suppliers presently include the cities of Palm Coast and Leesburg. In addition, there are two “Ex Officio” members, St. John’s County and the City of DeLand.

The preliminary phases for the planning for the Project will be completed in two phases. Phase 1 included establishing preliminary project requirements (size, water quality and treatment requirements, transmission system, etc.), a project feasibility determination, and a comparison of land-based and vessel-based desalination. Phase 1 concluded in January 2010 and included a recommendation to proceed with further investigation and preliminary design of a land-based desalination project. Phase 2 includes pilot-testing, National Environmental Policy Act (NEPA) activities, including required Environmental Impact Statement or Environmental Impact Document, and preliminary design of the recommended solution.

Phase 2 of the Project is divided into Phase 2A – Continued Engineering Investigations and 2B – Preliminary Engineering Report. Phase 2A, the current project phase, for the includes preliminary plant site locations, field investigations, and permitting investigations necessary to further reduce project alternatives and begin to identify the viable intake, treatment, discharge, and other technical components. Phase 2A also includes the preparation of a pilot testing plan. Phase 2B includes all of the remaining investigations necessary to site the facilities, complete a 35-percent preliminary design, pilot testing of treatment alternatives, and prepare the required National Environmental Policy Act (NEPA) documentation.

1.2 Purpose

This report provides the results of Phase 2A, Task 6.0 – Information Search and Goal Setting. It summarizes projected water supply needs for each of the Suppliers and Ex Officio members and identifies preliminary treated water quality goals and objectives from a potential future desalination facility, including required water quality adjustments at individual points of connection. A summary of each Supplier’s and Ex-Officio member’s finished water quality data, descriptions of existing treatment practices and facilities, and updated water demand projections through year 2050 was reviewed and is included in this report.

2.0 Finished Water Demands

This section provides a summary of the projected future water demands, above current permitted supply, provided by each of the Suppliers and Ex Officio members. Information was provided by individual Supplier and Ex Officio members. Also included are comparisons to Supplier and Ex Officio demands submitted in Phase 1.

Table 2-1 summarizes projected annual average day (AAD) and maximum day (max day) quantities that each Supplier and Ex Officio member will need beyond its current permitted supply. These projections are based upon expected gains from demand-side management and presuming ground water availability as currently permitted.

**Table 2-1:
Projected Water Need Summary**

Year			Estimated Water Need (MGD)								
			2010	2015	2020	2025	2030	2035	2040	2045	2050
Suppliers	Palm Coast	AAD	0.0	0.0	4.0	6.0	9.0	12.0	15.0	18.0	21.0
		Max Day	0.0	0.0	5.6	8.4	12.6	16.8	21.0	25.2	29.4
	Leesburg	AAD	0.0	0.0	0.0	5.0	5.0	5.0	5.0	5.0	5.0
		Max Day	0.0	0.0	0.0	7.5	7.5	7.5	7.5	7.5	7.5
	Subtotal	AAD	0.0	0.0	4.0	11.0	14.0	17.0	20.0	23.0	26.0
		Max Day	0.0	0.0	5.6	15.9	20.1	24.3	28.5	32.7	36.9
Ex Officio	St Johns County	AAD	0.0	0.0	0.0	0.3	2.3	4.1	5.8	8.4	10.9
		Max Day	0.0	0.0	0.0	0.4	2.9	5.1	7.3	10.4	13.6
	DeLand	AAD	0.5	4.1	6.0	7.2	7.8	8.3	8.7	9.0	9.2
		Max Day	0.8	6.6	9.6	11.5	12.5	13.3	13.9	14.4	14.8
	Subtotal	AAD	0.5	4.1	6.0	7.5	10.1	12.4	14.5	17.4	20.1
		Max Day	0.8	6.6	9.6	11.9	15.4	18.4	21.2	24.8	28.4
TOTAL	AAD	0.5	4.1	10.0	18.5	24.1	29.4	34.5	40.4	46.1	
	Max Day	0.8	6.6	15.2	27.8	35.5	42.7	49.7	57.5	65.3	

As shown in Table 2-1, the total projected water supply need from the Coquina Coast project is significantly influenced by the demands of the Ex Officio members. Ex Officio demands account for nearly 45 percent of the total projected need in 2050.

During Phase 1, members agreed that the Coquina Coast facility will provide a base level of supply based on the required AAD with an added a 5 percent safety factor. The members' existing sources of supply will be utilized to meet maximum day requirements. Table 2-2 compares the Phase 1 and 2A projected AAD needs for each of the current Suppliers and Ex Officio members.

**Table 2-2:
Phase I and Phase 2A Water Need Comparison**

Year			Estimated Water Need (MGD)								
			2010	2015	2020	2025	2030	2035	2040	2045	2050
Suppliers	Palm Coast	Phase 1	0.0	0.0	4.0	7.0	10.0	13.0	16.0	19.0	22.0
		Phase 2A	0.0	0.0	4.0	6.0	9.0	12.0	15.0	18.0	21.0
	Leesburg	Phase 1	0.0	0.0	0.0	5.0	5.0	5.0	5.0	5.0	5.0
		Phase 2A	0.0	0.0	0.0	5.0	5.0	5.0	5.0	5.0	5.0
	Total	Phase 1	0.0	0.0	4.0	12.0	15.0	18.0	21.0	24.0	27.0
		Phase 2A	0.0	0.0	4.0	11.0	14.0	17.0	20.0	23.0	26.0
Ex Officio	St Johns County	Phase 1	0.0	0.0	0.0	0.0	4.0	5.2	7.4	9.6	11.7
		Phase 2A	0.0	0.0	0.0	0.3	2.3	4.1	5.8	8.4	10.9
	DeLand	Phase 1	0.5	4.1	6.0	7.2	7.8	8.3	8.7	9.0	9.2
		Phase 2A	0.5	4.1	6.0	7.2	7.8	8.3	8.7	9.0	9.2
	Total	Phase 1	0.5	4.1	6.0	7.2	11.8	13.5	16.1	18.6	20.9
		Phase 2A	0.5	4.1	6.0	7.5	10.1	12.4	14.5	17.4	20.1
TOTAL	Phase 1	0.5	4.1	10.0	19.2	26.8	31.5	37.1	42.6	47.9	
	Phase 2A	0.5	4.1	10.0	18.5	24.1	29.4	34.5	40.4	46.1	
Reduction	Value	0.0	0.0	0.0	0.7	3.7	2.1	2.6	2.2	1.8	
	%	0.0%	0.0%	0.0%	3.6%	13.3%	6.7%	7.0%	5.2%	3.8%	

The most recent demand projections for Phase 2A mirror current economic uncertainties, but the need for additional water in the future remains clear. Over the entire planning period (2010 to 2050), projected needs for the current group of Suppliers and Ex Officio members declined less than 4 percent. The reduction in the average estimated water need for each of the 5-year increments between 2010 and 2050 varies from no change to 13 percent; the biggest change occurs in 2030. SJRWMD has projected a reduction in overall water demand in the region of 10 to 15 percent in 2030. The water demands for the Coquina Coast project are in line with the recent projections conducted by SJRWMD.

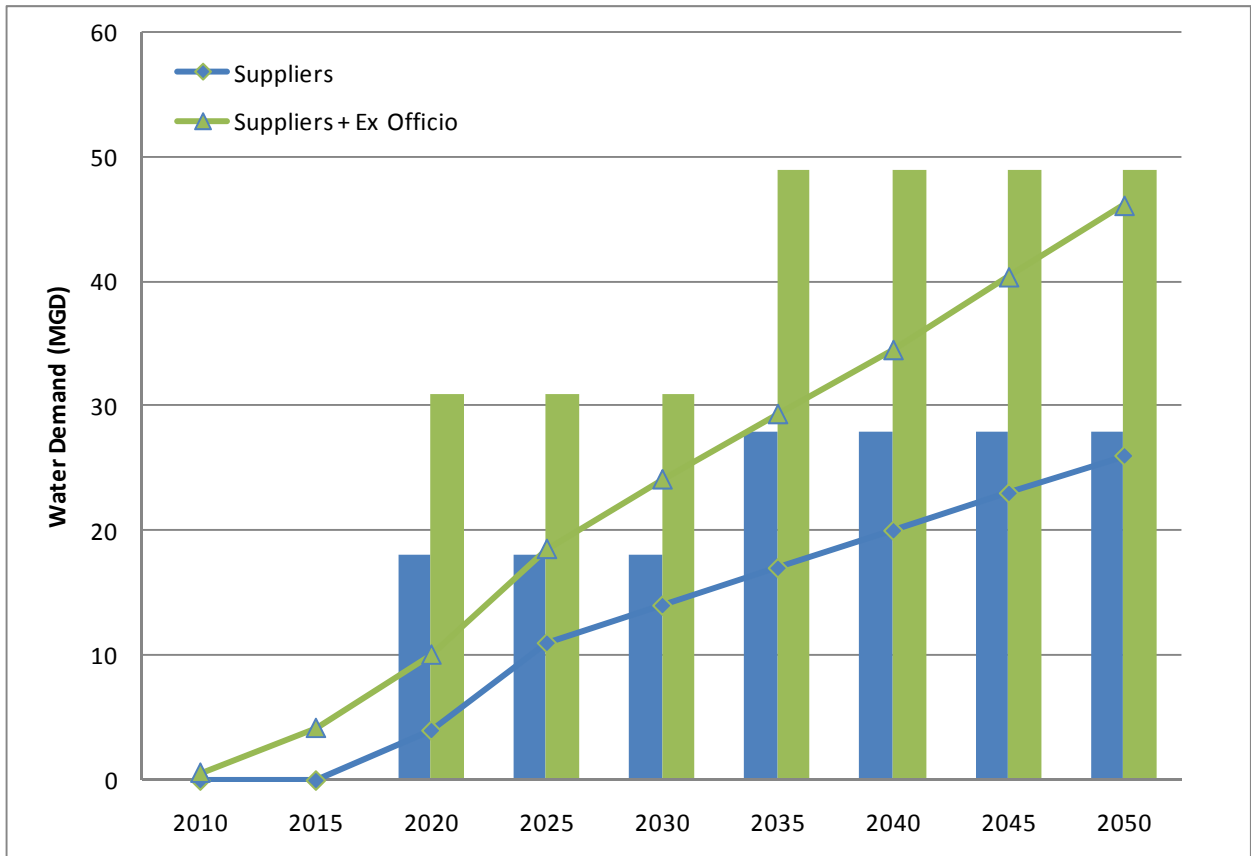
Table 2-3 compares projected water needs and presents a summary of the reduction in need observed between Phases 1 and 2A of the project. The overall average reduction between Phase 1 and 2A is 35%. As previously discussed, the needs for the current group of Suppliers decreased on average by only about 4 percent between 2010 and 2050. Therefore, the majority of the reduction in the projected water needs and size of a possible desalination facility are primarily the result of the departure of several Phase 1 Suppliers and Ex Officio members with sizable projected needs.

**Table 2-3:
Phase 1 and Phase 2A Projected Needs Reduction Summary**

Year	Phase 2A Need (MGD)		Phase 1 Need (MGD)		Reduction	
	Suppliers	Suppliers + Ex Officio	Suppliers	Suppliers + Ex Officio	Suppliers	Suppliers + Ex Officio
2015	0.0	4.1	<0.1	6.3	0%	35%
2020	4.0	10.0	4.1	20.3	2%	51%
2030	14.0	24.1	20.4	44.2	31%	45%
2050	26.0	46.1	43.0	75.5	40%	39%

Figure 2-1 shows projected water needs from the Coquina Coast project for the years 2010 through 2050. Note that when the Ex Officio member needs are considered, there is an immediate projected need for additional water supply.

**Figure 2-1:
Projected Water Needs from the Coquina Coast Facility**



First, note that when Ex Officio needs are considered, there may be a need for additional water supply as early as 2015. Based on the projected water need summarized in Figure 2-1, the initial phase of the Coquina Coast project should be sized for between 18 and 31 MGD. This includes a 5 percent safety factor and rounding up to the nearest 1 MGD increment. These capacities are based on an approximate 15 to 20-year planning cycle to 2035 and provide sufficient capacity until the expansion is online (2035). Some infrastructure, e.g., the concentrate discharge pipeline, may be sized to meet buildout (2050) conditions. The initial treatment capacity is likely to be between 10 and 15 MGD and would need to be online by 2020 at the latest and possibly earlier given some of the Ex Officio member needs. The treatment capacity would be installed in multiple phases to take advantage of the modular nature of the SWRO process and reduce the cost to the Suppliers' customers. For example, the facility may be sized for 30 MGD with an initial 15 MGD increment on-line in 2020 and additional 5 MGD increments added as needed to meet customer demands. It would be necessary to begin planning for expansion of the future supply capacity and have that additional capacity online around 2035. Assuming a second 20-year planning cycle, the ultimate supply capacity of the Project could be between 28 and 49 MGD to meet 2050 Supplier and Supplier + Ex Officio needs, respectively.

3.0 Finished Water Quality Goals

The finished water quality goals for the Coquina Coast desalination plant remain unchanged from Phase 1, and are summarized in Table 3-1. A discussion of these goals, along with applicable background information is provided in the subsections that follow.

**Table 3-1:
Finished Water Quality Goals**

Water Quality Parameter or Category	Desalination Plant Finished Water Goal	Notes
<u>Pathogens</u>		
<i>Cryptosporidium</i>	3-log (99.9%) reduction	LT2ESWTR requirements ¹
<i>Giardia</i>	3-log (99.9%) reduction	SWTR requirements
Viruses	4-log (99.99%) reduction	SWTR requirements
<u>Turbidity</u>		
Filtration process – if media filtration is used	≤ 0.3 NTU in 95 percent of all measurements each month ≤ 1 NTU for all measurements	IESWTR requirements
Filtration process – if membrane filtration is used	Cannot exceed 0.15 NTU for a period of more than 15 minutes	LT2ESWTR requirements for membrane processes
<u>Disinfectants</u>		
Free chlorine	< 4.0 mg/L	Target value for secondary disinfection at the plant effluent
<u>Disinfection Byproducts</u>		
Total trihalomethanes (TTHMs)	< 0.040 mg/L	50% of the MCL ²
Haloacetic acids (HAA5)	< 0.030 mg/L	50% of the MCL ²
Chlorite	< 0.8 mg/L	80% of the MCL
Bromate	< 0.008 mg/L	80% of the MCL
<u>Other Regulated Water Quality Categories</u>		
Inorganic contaminants	FDEP MCLs	
Organic contaminants	FDEP MCLs	
Radionuclides	FDEP MCLs	
<u>Secondary Standards</u>		
pH	7.5	
Chloride	< 80 mg/L	Equiv. sodium limit ± 50 mg/L
Total dissolve solids	< 250 mg/L	
Other Secondary Parameters	FDEP MCLs	
<u>Unregulated Parameters</u>		
Calcium carbonate precipitation potential (CCPP)	> 0 mg/L (minimum) 4 – 10 mg/L (target)	

Water Quality Parameter or Category	Desalination Plant Finished Water Goal	Notes
Langelier saturation index (LSI)	> 0 (minimum) > 0.2 (target)	
Boron	< 1.0 mg/L	See discussion – Section 4.4.2
Bromide	<0.3 mg/L	See discussion – Section 4.4.1

- 1 Level of *Cryptosporidium* award to a conventional treatment plant in compliance with the turbidity requirements of the IESWTR.
- 2 See Section 4.4 for discussion of these specific goals.

4.0 Treatment Process Requirements

4.1 Pretreatment Process Requirements

Pretreatment processes need to be established to produce a water quality suitable for optimum SWRO treatment and to comply with warranty conditions. In terms of water quality, the following factors should be considered in pretreatment process selection to reduce membrane fouling, minimize cleaning frequency, reduce damage risk, maintain low energy costs, protect membrane life expectancy and ensure efficient operations:

- Particle and colloidal fouling of membranes can be minimized if turbidity of less than 0.5 NTU and silt density index (SDI) below 3 is maintained to comply with most standard membrane warranties. Suspended solids may be either inorganic or organic.
- Biological fouling, or bio-fouling, is a widespread problem with RO membranes. Therefore, minimization of organic content and algae, such as that experienced in “red tides” along Florida’s coastline, should be given high priority. Oxidant dosing should be avoided on a continuous basis due to increased bio-fouling potential resulting from the formation of assimilable organic carbon and membrane tolerance issues.
- Organic fouling occurs from natural organic matter such as organic carbon and biopolymers. Entrained hydrocarbons, such as tars and oils, must be removed if present. Membrane recommendations are for oils to be maintained at less than 0.1 mg/L, so plant shutdown would be necessary above this value.
- Mineral scaling occurs when salts of certain minerals such as calcium, magnesium, barium and strontium precipitate and collect on the surface of the membrane and resist the flushing action of the concentrate flow.

Pretreatment requirements will be significantly impacted by the seawater intake type and raw water quality. The following pretreatment processes will be considered to reduce SWRO fouling potential.

- Screening will be required to remove larger particles down to 1,500 micron for conventional filtration, or 80 micron for MF or UF pretreatment options.

- Chemical coagulation and flocculation may be necessary to agglomerate smaller and lighter particulates together for downstream clarification or filtration. This process may not be necessary for some UF pretreatment options.
- Clarification by either conventional sedimentation, high-rate settlers or dissolved air flotation is generally required for high turbidity waters, but may not be necessary for raw water supplied through a subsurface or deep water intake, subject to confirmation by EPA.
- Filtration is normally required to remove finer particles between 50 and 5 micron which are not removed by screening or clarification in order to achieve acceptable SDI levels for desalination. This may be accomplished with conventional media filtration, cartridge filtration, MF, UF or a combination of these. Conventional media filtration does not typically remove algae and protozoa as effectively as membrane filtration (microfiltration or ultrafiltration), which may provide additional protection of SWRO membranes against bio-fouling. Membrane filtration will also likely produce filtrate (i.e., SWRO membrane feed) with an SDI below 3 at all times, which can, but will not necessarily, extend SWRO membrane life due to reduced cleaning, when used as an alternate to media filtration.
- Acid pH adjustment and possible anti-scalant chemical injection may be necessary to further protect the membranes against mineral fouling by precipitation of salts from the concentrated feed water.
- Cartridge filters ahead of the membranes provide a final safety barrier against potential breaches in upstream processes. A 5 micron pore size is generally considered suitable for membrane pretreatment filters. Cartridge filtration may not be required if membrane filtration is utilized.

For the purposes of Phase 2A the pretreatment objectives listed in Table 4-1 are adopted related to SWRO membrane protection:

**Table 4-1:
Phase 2A Pretreatment Objectives**

Parameter	Objective (mg/L)	Remark
SDI	<3	95% of time (Warranty)
Total Organic Carbon (TOC) (mg/L)	<3	Bio-fouling and DBP potential
Oil and grease (mg/L)	0	Membrane Warranty condition
Chlorine (mg/L)	0	Membrane Warranty condition
Biological Oxidation Demand (BOD) (mg/L)	<5	Bio-fouling potential
Chemical Oxidation Demand (COD) (mg/L)	<8	Bio-fouling potential
Iron (mg/L)	<0.05	Scaling and bio-fouling potential
Aluminum (mg/L)	<0.05	Colloidal fouling potential
Manganese	<0.05	Scaling potential
Turbidity (NTU)	<1	Membrane Warranty condition

4.2 SWRO Process Requirements

The Suppliers are committed to identifying the most appropriate desalination technology. However, at this time, it is assumed a SWRO process will be utilized due to its long history and reliability in treating seawater. Thermal processes tend to be more expensive and require more energy than membrane-based SWRO designs. While emerging technologies, such as forward osmosis, are still in their infancy and show promise, they are not considered commercially viable for the Project at this time. The Suppliers do intend to optimize SWRO performance to minimize energy consumption and develop the most environmentally friendly process possible. Therefore, they will continue to view emerging technologies as alternative throughout this process.

The ultimate objective of the SWRO process is to produce desalinated water that will meet (with necessary stabilization and disinfection) the finished water quality goals discussed earlier. Pilot testing will be conducted in Phase 2B to better determine SWRO process requirements, for example, whether a partial second-pass or two-pass system needed to improve salt, bromide, or boron rejection.

Inclusion of efficient energy recovery devices is essential to improve the financial viability and reduce the carbon footprint of seawater reverse osmosis as a means of potable water supply. Power costs in a seawater reverse osmosis plant represent the majority of total operation and maintenance (O&M) budget. Energy recovery devices can lower energy costs up to 40 percent. Options include Pelton Wheels, energy recovery turbines and isobaric pressure exchange devices, which will be evaluated further during preliminary design in Phase 2B.

4.3 Permeate Stabilization

The SWRO process reduces TDS by about 99.3 percent (perhaps slightly greater depending on configuration and water quality goals), producing permeate water that is very low in mineral content. (Permeate is the water that has been purified by the reverse osmosis process.) Although the low levels of constituents such as sodium and chloride may be beneficial for health reasons, the water is deficient in important minerals such as calcium, magnesium, and sulfate, as well as alkalinity. As such, it is necessary to re-mineralize and stabilize the water to reduce corrosion potential prior to distribution.

The most common chemicals used for re-mineralization and stabilization of the water are lime (various forms) and carbon dioxide while sulfuric acid, sodium hydroxide and soda ash (sodium carbonate) can also be used, mostly for fine pH adjustment. Mineral deficiencies and low alkalinity are adjusted to maintain a positive LSI and CCPP. Lime saturators, or limestone (calcite) filters can be selected to avoid the very significant post treatment turbidity impacts associated with direct feeding of slurries.

Carbon dioxide is before lime treatment added to increase the acidity and carbonate of the permeate to aid the saturation of calcium and/or lime. In some plants sulfuric acid dosing is used in lieu of carbon dioxide, though this is dependent on the finished water stabilization targets adopted. The combination of lime and carbon dioxide directly produce the calcium hardness as well as alkalinity (bicarbonate) needed, and it is not always necessary to use supplementary chemicals for pH correction.

4.4 Additional Water Quality Considerations

4.4.1 Brominated DBPs

The potential for DBP formation, and specifically TTHM and HAA5 formation, is relatively uncertain at this time. Work by Loveland et al. (2010) indicates that the potential for significant TTHM or HAA5 formation in chlorinated RO permeate is minimal. Other studies (Blute et al., 2008) and anecdotal evidence from Tampa Bay Water indicate that there may be potential for significant DBP formation, particularly brominated trihalomethane species. These issues will need to be fully investigated during Phase 2B pilot testing.

Chloramination practices may also be affected by desalinated seawater as a result of bromide. Bromide can facilitate the formation of bromamines in the presence of ammonia, thus reducing the amount of free ammonia available for the generation of chloramines and necessitating increased doses of chlorine and/or ammonia. In addition, because bromamines have greater oxidation strength than chloramines, the formation of these compounds may lead to increased brominated DBP formation. Thus, it is recommended that bench- or pilot-scale tests be conducted in Phase 2B of the project to determine the potential for bromamine formation (for those Suppliers that practice chloramination), DBP formation, and residual decay for the blend of each Supplier's

receiving water with desalinated seawater. Note that bromamine levels will be diluted in proportion to the percent of desalinated water comprising the blend in each Supplier's system.

4.4.2 Boron

Boron is present in seawater at concentrations averaging 4.5 mg/L. The Coquina Coast facility will have a finished water quality parameter of 1.0 mg/L for boron, below the USEPA's established health reference of 1.4 mg/L of boron in drinking water systems. Although some studies have shown that boron in high concentrations may have human health effects, the USEPA has determined that there is inadequate data to accurately assess human carcinogenicity (USEPA, 2006.) However, the USEPA encourages systems with concentrations exceeding the 1.0 mg/L benchmark to consider site-specific reduction as a component of the treatment process. The California Department of Public Health has established a 1.0 mg/L notification level for boron regulation in the state. Depending upon the levels of boron in each Supplier's blended water supply, it may be advisable for each Supplier to include language in its Consumer Confidence Report to indicate boron concentrations in the blended water supply and suggest some common irrigated plant species that may be sensitive to boron at those levels.

4.4.3 Algal Toxins

Limited numbers of marine algae, including some species of dinoflagellates, diatoms, and blue-green algae, can metabolically produce a variety of highly toxic compounds collectively called biotoxins. Occasionally, water quality conditions will promote a high growth rate in phytoplankton, which may cause the formation of dense algal blooms, sometimes producing vivid colors ("red tides"). Limited research conducted to date suggests that the RO process effectively removes most algal toxins. However, the rejection of algal toxins may be further studied in Phase 2B of this project, particularly if an algal bloom occurs during pilot testing.

5.0 Supplier Adjustment Requirements

Seawater desalination produces a high-quality drinking water that will be blended with other sources in the distribution systems of the Suppliers and Ex Officio members. One of the goals of this project is to conceptualize a treatment process that meets the water quality needs of the majority of Suppliers and Ex Officio members, thereby minimizing the need for water quality adjustments at each of the Supplier's points of connection. However, there will still be a need for each Supplier and Ex Officio member to provide some minimal adjustment to the water provided from the Coquina Coast facility. These adjustments are necessary for several reasons, including disinfectant residual compatibility, corrosion control, pH adjustment, or other chemical adjustments (e.g., fluoride). These adjustments remained unchanged from Phase 1 and are summarized in Table 5-1. At this time it is assumed that water produced by the Coquina Coast facility will contain free chlorine (rather than chloramines) and have a pH of approximately 7.6-

7.8. This accommodates the majority of Partners and requires the least complicated water quality adjustments (i.e., based on current technology, it is easier to form chloramines in a chlorinated water, than breakpoint and rechlorinate a chloraminated supply to achieve a free chlorine residual). No fluoride or corrosion inhibitor are currently planned. Pilot-testing will confirm these assumptions and the need for modifications (e.g., DBP formation is too high with free chlorine and chloramination is necessary.)

**Table 5-1:
Connection Point Chemical System Requirements**

Utility	Sodium Hypochlorite	Sodium Hydroxide	Corrosion Inhibitor	Aqua Ammonia	Fluoride
Leesburg	X	X			
Palm Coast	X	X	X	X	
St. Johns County	X	X		X	
DeLand	X	X	X		X

Each Supplier should consider system-specific blending facilities for both water storage and chemical trimming to minimize potential fluctuations in water quality characteristics. Blending in storage tanks will generally balance out inconsistencies in water quality parameters, which may otherwise create consumer concerns due to variations in characteristics such as taste. Any specific mineralogical inconsistencies between the respective waters before blending may require further consideration during the design phase.

6.0 References

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