Section 7 – Recommended Water Supply Plan

7.1. Recommendations and Supporting Conclusions

The recommended water supply plan includes: maximizing cost-effective fresh groundwater resources; sequential addition of slightly brackish groundwater; and additional brackish groundwater, as needed for the required capacity.

Phase I involves development of economical fresh groundwater resources. Currently the City's wholesale cost for potable water is $2.09/1,000 gallons in comparison to a Phase I freshwater well production cost of approximately $0.55/ 1,000 gallons, or approximately 1/4th the cost of currently purchased water. After start up of the Disston Avenue wells an operational period will be used to evaluate future well development.

Current City water supply demand is a peak flow of 4.5 mgd with an average annual daily demand of 3.3 mgd. Phase I, when complete, will provide 1.37 mgd of average daily capacity. Factoring in seasonal variations in fresh groundwater production, approximately 25% of the City's demand can be met with Phase I. An additional 5.0 mgd of supply would provide the additional water needed to meet the City's current and future demand and would provide an additional 1.5 mgd for possible wholesale to Tampa Bay Water

Phase II involves the development of a slightly brackish water supply with membrane treatment. A 5.0 mgd facility is recommended for consideration as a means to supply the City's current and future needs, and the ability to sell surplus water to the region. Upon successful completion of Phase II, a Phase III expansion for an additional 3.0 mgd should be considered for additional supply capacity.

The following table summarizes the recommended water supply plan for the City of Tarpon Springs.

Table 7-1 Summary of Recommended Water Supply Plan

Water Supply Source	Phase	Average Daily Capacity (mgd)	Cumulative Average Daily Capacity (mgd)	Estimated Implementation Date
Current Freshwater Wells 1 – 3	I	0.73	0.73	March 2004
Disston Avenue Freshwater Wells 5B, 5D	I	0.43	1.16	July 2004
Additional Disston Avenue Freshwater Well 5A	I	0.21	1.37	December 2004
Slightly Brackish Wells/RO Plant	II	5.00	6.37	January 2009
Additional Brackish Wells/RO Plant Expansion	III	3.00	9.37	TBD

Note: Actual sustained pumping rates of freshwater wells may be less than projected taking into account any required reduced pumping for wellfield management measures during the dry season.

The following conclusions support the recommended plan presented above:

- Groundwater is being utilized extensively in this region as a firm source of supply. Through proper wellfield design, operation, and management coupled with new treatment technologies, groundwater can be a sustainable and economical supply. The use of brackish sources to augment supply, while decentralizing pumping will further demonstrate the mission of preserving water resources in the area.
- The City of Dunedin has successfully supplied their City with water supply through the use of groundwater and advanced membrane treatment since the early 1990's. The City of Oldsmar has completed pilot testing of brackish groundwater with RO treatment systems similar to that recommended in this report. Results of testing indicate the water can be reliably treated without deterioration or "fouling" of the RO membranes. The long range planning and implementation of a stable city administration attributable in both municipalities has propelled them towards an independent water supply.
- Data reviewed from the Anclote River, the most viable fresh surface water supply indicate limited flow during the dry season (as low as 1.3 mgd total) rendering this source a seasonal supply at best. Without significant seasonal storage (over 200 million gallons from preliminary estimates) and associated capital costs, this source could not sustain the City as a firm supply. In southwest Florida, this issue is being overcome in the Peace River area through the extensive use of Aquifer Storage Recovery (ASR). This technology has not yet been successfully demonstrated in northern Pinellas County, primarily due to the lack of a suitable storage zone and overlying confinement within the aquifer system in this area.
- The discharge of advance treatment concentrate to a surface water body is an increasingly viable alternative. Recent supporting legislative activity to simplify the permitting of RO concentrate disposal may assist in this regard. Diluting the concentrate with existing cooling water would result in a discharge not significantly different than the receiving waters.
- Deep well injection, for reasons similar to lack of ASR demonstration, requires further demonstration before regulatory agencies readily permit a Class I injection well for RO brine disposal. The Tampa Bay Water (TBW) Mid-Pinellas Brackish Water Desalination Project (MPBWDP) project detailed below involves test well construction.

7.2. Siting of a Water Production Facility

A *Site Suitability Study* was conducted to identify whether there are potential sites for the construction of a water production facility. This study included a review of available data, including:

- Area hydrogeology
- Land parcel size and availability
- Existing land use
- Proximity to the City's existing water transmission system
- Proximity to concentrate disposal alternatives
- Proximity of wetlands, conservation sites, possible contaminated sites, and water use permitted wells

The findings from the study included:

- At least six (6) acres is required for the construction of a water production facility.
- Area hydrogeology indicates water quality appears most suitable for development north of the Anclote River.
- The highest degree of available land exists north of the Anclote River.
- Twelve (12) sites were compiled for consideration in the possible siting of a water production facility (see Figure E1).

Per the study, the next steps in site selection are: (1) Contact land owners to determine interest in property sale; (2) review the sites in detail to determine actual wetlands boundaries, any contamination issues, and any other constraints; and, (3) select a final site based on the results of detailed review. Land purchase will require referendum approval by Tarpon Springs' voters.

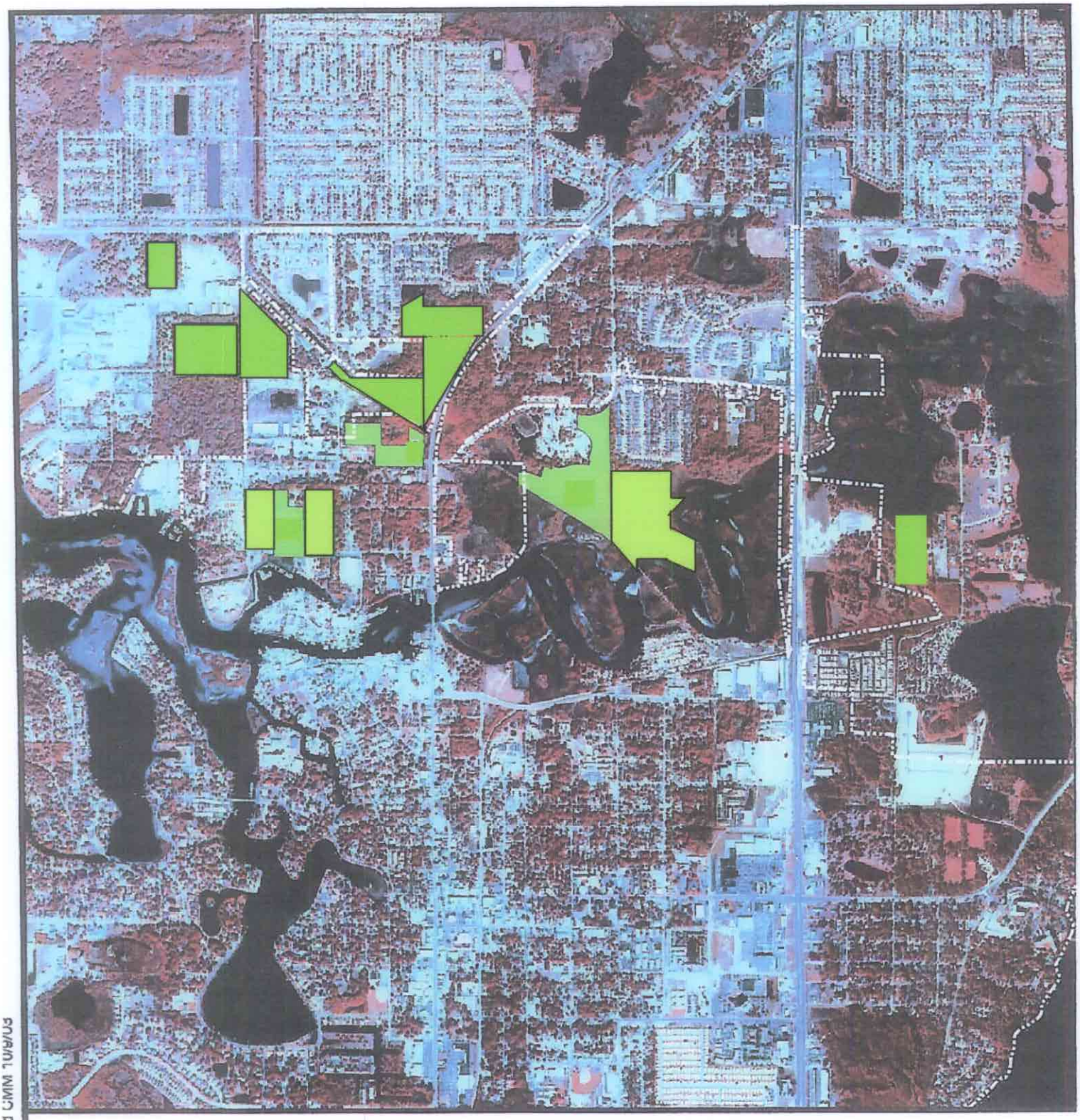

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Figure E1
Top 12 Parcels
Tarpon Springs Water Supply Facility
Site Suitability Study

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Tarpon Springs City Limits

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Feet

Jones Edmunds & Associates, Inc.
CONSULTING ENGINEERS AND SCIENTISTS
JEA
GEOGRAPHIC INFORMATION SYSTEMS

7.3. Examples of Other Similar Projects/ Facilities

This section is intended to provide information on similar successful, cost effective projects in the immediate region.

City of Dunedin, Florida

The City of Dunedin utilizes slightly brackish groundwater withdrawn from approximately 18 operational wells completed into Zone A. The typical combined raw water chlorides concentration is 180 mg/L. The City, based on verbal information provided by operations staff, has a total of approximately 30 wells, but only 18 are currently required to meet demands. Some of the 30 existing wells are either not utilized because of their poorer, more brackish water quality; or because they are new wells not yet on line; or are in the process of rehabilitation.

Approximately 5 mgd of raw water is treated through a greensand filtration/RO system to create 4 mgd of finished water. The relatively fresh concentrate is pumped to the City's WWTP for blending with the wastewater influent.

The U.S. Geological Survey (USGS) in cooperation with the City of Dunedin and the SWFWMD prepared an assessment of the fresh and brackish water resources underlying Dunedin and Northern Pinellas County (Knochenmus and Swenson, 1996). Groundwater has been utilized by the City from the current wellfields for over 20 years and some of the original wells were constructed over 50 years ago. While some wells show an increasing trend in chlorides over time, the wells remain operational. The City's controls this issue by strategic operation of the wells. Current operational practices include the reduced pumping of individual wells to minimize the potential for upconing, the primary threat of saltwater intrusion experienced in Dunedin. The City is currently investigating the rehabilitation of existing wells that are out of service and backfilling some deeper wells to improve water quality. The City is also in the process of constructing new wells as a means to increase flexibility in wellfield rotation and operation.

Staff summarized the current well construction preference is to complete wells to less than 200 feet below land surface to avoid poorer quality water. This corresponds to Upper Zone A and the very upper portion of Lower Zone A.

Dunedin's water treatment plant (WTP) has been in service since 1992. Based on information from operations staff, the primary limiting factor in utilizing poorer quality, more brackish water is the treatment of the increased hydrogen sulfide that comes with the more brackish water from their experience. However, according to City of Dunedin staff, if this option were considered with a new design today and new filtration technologies available, the use of more brackish raw water would be more feasible.

City of Oldsmar, Florida

The City of Oldsmar is in the investigative phase of potentially developing its own water supply through the use of brackish groundwater and RO treatment. The planned maximum daily capacity is 3.2 mgd, with an associated raw water supply capacity of 4.3 mgd (estimated RO concentrate disposal rate of 1.1 mgd). Total estimated capital cost is approximately $15M.

Based on the original work from Phase I of the study, two aquifers, the Tampa Limestone and the Upper Suwannee Limestone formations, in the upper part of the Floridian aquifer, were identified as viable raw water production zone sources. The advantage of incorporating two production zones is that the production wells can be nested together into one site, therefore reducing some of the capital costs associated with wellfield development and providing more operational flexibility. It is proposed that the wellfield will consist of six nested well sites with a total of twelve production wells constructed. These nested well sites will be spaced equally at 1,250 feet intervals along the Forest Lakes Blvd corridor. Operationally, five well sites (10 production wells) will be employed to meet demand with one well site (2 production wells) used as standby. Therefore the projected capacity for each production well is 300 gpm equating to a wellfield firm production capacity of 4.3 mgd.

A preliminary review of potential water quality revealed that use of membrane technology for treatment (specifically low pressure reverse osmosis) was appropriate. Discussions with regulators indicated that disposing of the resulting concentrate stream (700,000 gpd initial and 1,350,000 gpd future) using a surface water discharge to Safety Harbor appeared to be the best conceptual option to pursue.

The SWFWMD is currently providing cooperative funding for the project. The project has also been discussed with the Florida Department of Environmental Protection (FDEP) and the Pinellas Public Health Unit (PPHU) regarding future permitting regulations and requirements.

The project can be broken into four segments: (1) Wellfield and Raw Water Transmission System; (2) RO Water Treatment Plant (WTP); (3) Finished Water Transfer Pump Station/Storage Tank; and, (4) RO Concentrate Discharge System.

Wellfield and raw water transmission system includes the production wells, production well pumps, wellhead facilities, and transmission pipelines from the production wells to the WTP.
The RO Water Treatment Plant consists of coarse pre-filtration, scale and pH pre-treatment, high service pumps, RO membrane filtration, post treatment, and RO effluent treatment. After post treatment, the finished water will be pumped using low head, high volume transfer pumps to above ground water storage tanks.

The conceptual plan for the concentrate discharge is to transmit the flow through a pump station at the proposed RO WTP to a submerged outfall at Safety Harbor. Any necessary pretreatment of the concentrate such as aeration or pH adjustment will occur at the WTP prior the concentrate discharge pumps. Most likely, the submerged outfall will be fitted with multi-port diffusers or like devices that will assist in the rapid mixing of the concentrate with the receiving water of Safety Harbor.

During Phase II of the project a total of six test wells were constructed by Diversified Drilling Inc. near the intersection of Lakeview Drive and Forest Lakes Boulevard. Two test production wells were drilled into each of the target production zones. Each test production well was named corresponding to the production zone, the Tampa test production well (TTPW-1) completed to a depth of 150 feet below land surface (bls) and upper Suwannee test production well (USTPW-1) completed to a depth of 250 feet bls. In addition, four monitoring wells were constructed, three (3) into the upper Floridan aquifer and one (1) into the surficial aquifer. The monitoring wells were completed into the following zones: Tampa Limestone (TMW-1), upper Suwannee Limestone (USMW-1), lower Suwannee Limestone (LSMW-1) and the surficial aquifer (S-1).

The following is a summary of Oldsmar's water supply program:

Phase I- Feasibility Analysis, completed October 1998
Phase II- Technical Evaluation, started September 2001, complete March 2003
Phase IIIA - Preliminary Design, start May 2003
Phase IIIB - Construction Drawings & Permits, start fall 2003
Phase IV - Construction, start spring 2004, operational mid 2006

As a result of their test well program and technical evaluation, the following conclusions were developed:

- Both Tampa and Upper Suwannee groundwater zones appear suitable for municipal supply.
- Production zones appear isolated from surficial zone (good for wetlands). Some leakance between Upper and Lower Suwannee (vertical recharge).
- Nested pair of wells recommended (6 sites @ ~1,500 ft spacing).
- Water quality suitable for treatment.
- Groundwater supply more productive than previously thought on the western end of corridor.

The treatability study recently completed produced the following conclusions:

- Conventional pretreatment appears to be adequate.
- RO membrane fouling is minimal.
- RO membranes provide consistent salt rejection.
- Post-treatment will include:
    - Hydrogen sulfide removal
    - Disinfection
    - Corrosion control

The path forward for the City of Oldsmar, pending their City Council's approval, is to:

- Finalize preliminary discussions and conceptual permitting with FDEP and SWFWMD (W.U.P. and Concentrate Discharge).
- Finalize Engineering evaluation of wellfield, transmission pipelines, treatment, and concentrate disposal.
- Perform a cost analysis and economic feasibility study
- Make a recommendation to proceed to Phase III.
- Phase II - Technical Evaluation: Start September 2001, Complete March 2003

- Proceed pending Phase II results.
- Phase III - Preliminary and Final Design: Start May 2003, Complete in 12 months Bidding / Award mid 2004
- Phase IV - Construction, start July 2004 complete in 2 years
- Phase V - Start-up and testing: system operational August 2006

Tampa Bay Water's Mid County Brackish Water Desalination Project (proposed)

The following is summarized from distributed information presented by Tampa Bay Water:

Based on Pinellas County's water management activities at the Bridgeway Acres Landfill, TBW shifted the original proposed project area west. The new project area is located south of East Bay Drive, north of Park Boulevard, east of Lake Seminole and west of 66th Street North.

The project includes a reverse osmosis (RO) water treatment plant, brackish wells to supply water to the RO plant, and underground pipelines to convey water to and from the RO plant. The probable treatment plant site is in the vicinity of 66th Street North and 102nd Avenue North. About 6 million gallons of brackish groundwater would be pumped to the RO plant for desalination, making 5 mgd of drinking water with about 1 mgd of leftover saltwater. The leftover concentrate will be disposed of through deep well injection.

The desalinated drinking water will most likely be piped to the city of St. Petersburg; the saltwater that remains from the process will be injected into a saltwater portion of the aquifer nearly 1,000 feet underground.

Approximately 14 well sites within the project area are needed to supply the RO plant with a combined total of 6 million gallons per day of brackish water. Typical operation would involve 12 of the production wells operating at a time with the remaining two wells used to rotate pumping. This allows for wells to rest and facilitates maintenance.

After extensive study of more than 40 possible sites and input from the public, 17 preferred well sites, plus 11 alternative well sites, have been identified for further consideration in this project. Additional drilling and testing will be conducted during the next few months in the vicinity of the proposed production well area to provide additional information on geologic conditions, water quality and aquifer characteristics. Supply wells will be at least 1,000 feet apart. Each well would be capable of producing about 0.5 mgd (350 gallons per minute). The deep well casings and the well spacing (minimum 1000 feet) are intended to reduce the potential for impact to local irrigation wells.

Well equipment will generally be enclosed in underground vaults intended to accommodate existing land uses. Electric motors used on the pumps are quiet and the facilities will not present health or safety risks to the community or adjacent land uses.

A number of potential pipeline routes were evaluated to link the wellsites with the treatment plant and the point of finished water delivery. Public input was solicited and was factored into the evaluation. The resulting proposed routes are typically in public right-of-way and minimize effects on local residents and neighborhoods. Click to view Map of Pipeline Routes

Pipeline diameters will range from about six inches for a gathering line near the production wells to about 18 inches for the pipelines transporting drinking water from the RO plant.

Public input on previously selected well sites and pipeline routes and on RO Plant locations was taken at multiple public meetings from 1999 through 2001. The community's top well siting criteria identified during those meetings included environmental preservation, sustainability of supply, impact on current users and drawdown effects. Their top criteria for siting pipeline routes included traffic impacts during construction, project cost and effect on the cost of water, environmental/wetlands preservation and minimized property acquisition.

Additional public input was sought on June 25, 2002 and the pubic received another opportunity on August 20, 2002 to review and comment on the preferred and alternative wellsite recommendations.

Current Project Milestones and Schedule:

- Public Meeting on Alternate Well Sites June 25, 2002
- Public Meeting to Show Preferred Well Sites, Routes August 20, 2002
- Conduct Additional Testing Drilling November/December 2002
- Well Site/Pipeline Route Recommendation to Board February/March 2003
- Begin Injection Well Construction Quarter 2, 2003
- Water Use Permit Application to TBW Board Quarter 2, 2003
- Begin RO Plant Construction Quarter 3, 2005
- Begin Well and Pipeline Construction Quarter 3, 2005
- Complete Construction/Begin Startup Quarter 4, 2006

The estimated project cost is approximately $25 million, and will be funded by revenue bonds supported by the water rates paid by TBW member governments. TBW is a government agency that charges its members a uniform wholesale rate for water. TBW has no taxing authority.

7.4 Summary

Several water suppliers in the area have recognized advanced treatment of groundwater as a solution to their water supply needs. These water suppliers include local governments as well as large regional water suppliers (TBW). While TBW and the City of Oldsmar are in various phases of development, the City of Dunedin has been successfully supplying its own water using membrane treatment since 1992.