SAN JACINTO RIVER AUTHORITY

GRP Division Rate Study and Financial Planning/Rate Design Model Development Report

Final Report / July 16, 2019

RAFTELIS

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July 16, 2019

Mr. Matt Corley
Compliance & Administrative Manager
P.O. Box 329
Conroe, TX 77305

Subject: San Jacinto River Authority – GRP Division Rate Study and Financial Planning/Rate Design Model Development Report

Dear Mr. Corley,

Raftelis Financial Consultants, Inc. (Raftelis) is pleased to provide this GRP Division Rate Study and Financial Planning/Rate Design Model Development Report for the San Jacinto River Authority (Authority). The Ground Water Reduction Plan (GRP) Division has undergone significant changes since the last rate study. The current Study provides changes that address current financial challenges the GRP is facing.

The following Report summarizes the key findings and recommendations related to the development of the financial plan and update of rates.

It has been a pleasure working with you, and we thank you and the GRP staff for the support provided during the course of this Study.

Sincerely,

Angie Flores

Angie Flores
Manager

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1. Introduction of Study and Objectives

1.1. Introduction

The San Jacinto River Authority ("SJRA") is a public entity whose mission is to develop, conserve, and protect the water resources of the San Jacinto River Basin.

The Groundwater Reduction Plan ("GRP") Division is one of five divisions within SJRA. The GRP has contracted with certain groundwater users in Montgomery County to plan, permit, design, acquire property, finance, construct, operate and maintain the surface water treatment plant ("SWTP"), transmission lines and ancillary facilities, and promote and implement additional strategies for complying with Lone Star Groundwater Conservation District's rules for reducing groundwater pumpage from the Gulf Coast aquifers. SJRA's SWTP was commissioned in September of 2015.

All of the GRP's Participants equitably share in the GRP's annual costs by paying a user fee for their water usage. A Groundwater Pumpage Fee is assessed to each Participant based on groundwater removed from that Participant's well. A Surface Water Fee is assessed based on the quantity of surface water delivered to that Participant. Rates are developed to generate revenue to pay for the GRP Division's operations and maintenance expenses, debt service, and necessary reserves.

The GRP Division completed an initial rate study in calendar year 2014 (2014 Rate Study) to develop rates for the Participants. The original study was completed using a set of assumptions for the 5-year period from Fiscal Year 2015 to Fiscal Year 2019. The GRP Contracts require that the Authority engage an independent rate analyst to review the fees charged every five years. This most recent study considers the fiscal years 2020 through 2024.

1.2. Rate Study Objectives

In August 2018, SJRA contracted with Raftelis Financial Consultants, Inc., to provide services related to the development of a Rate Study and Financial Planning/Rate Design Model Development for the GRP Division for a ten-year period beginning FY 2020 through FY 2029, known as the GRP Rate Study (Study). The Study's objective was to identify sustainable rates, sufficient reserves, and a solvent financial plan for the GRP Division. To achieve a financially sound and sustainable business model, Raftelis was tasked with ensuring the GRP Division can meet its operations, maintenance, repair & rehabilitation, and capital improvement requirements.

Raftelis used these objectives to calculate rates and recommend various reserve policies and financial goals. The goals work together with the financial model to guide the GRP Division to a sustainable financial future.

The major tasks as described in Work Order No. 1, August 23, 2018 include the following:

- Task 1101 – Project Management
- Task 1102 – Data Collection and Review
- Task 1103 – Financial Risk Assessment and Financial Reserve Policies Review
- Task 1104 – Revenue Requirement Development
- Task 1105 – Financial Planning/Rate Design Model Development
- Task 1106 – Reports and Presentations
- Task 1107 – Additional Services as Directed by SJRA

2. Project Management

2.1. Task 1101 – Project Management

Raftelis was tasked to manage the Study and adhere to timelines and budgets in the process. The Study involved multiple interrelated work efforts that required effective coordination between Raftelis Financial Consultants, Inc., SJRA staff, GRP Review Committee, SJRA Board of Directors, and other stakeholders. Raftelis communicated with SJRA's Project Manager regarding data requests, data validation, data decisions, and review of preliminary results.

3. Data Collection and Review

3.1. Task 1102 – Data Collection and Review

Raftelis provided a data list at the beginning of the Study that was used to develop the revenue requirement and consumption forecast used in the model. The data was analyzed and used to begin creating the financial planning model. Raftelis worked closely with GRP staff to ensure that the data used in the model was valid.

4. Financial Risk Assessment and Financial Reserve Policies Review

4.1. Task 1103 – Financial Risk Assessment and Financial Reserve Policies Review

Since the completion of the 2014 Rate Study, the GRP Division has experienced lower water demands than previously projected, which can be attributed to a change in customer behavior. For this study, Raftelis completed a risk assessment of the GRP revenues to determine how water demand and weather has impacted its revenues. Also, as part of the study, Raftelis reviewed SJRA's existing reserve policies and benchmarked the GRP against similar agencies and considered financial policy recommendations of agencies, such as the Government Finance Officers Association (GFOA) and the American Water Works Association (AWWA).

4.2. Risk Assessment

During the risk assessment, Raftelis analyzed GRP Participant historical consumption and considered weather-related impacts. The consumption analysis exhibited that in the first couple years of operation, GRP Participant consumption had fallen short of modeled forecast. The rainfall analysis demonstrated a general trend of increased rainfall leading to a decrease in consumption, especially acute during summer months. These findings were critical in developing the model's consumption forecast found in **Section 5.3**. Raftelis has provided the technical memo summarizing the Risk Assessment Analysis in **Appendix A**.

4.3. Benchmarking Memo

The Benchmarking Analysis assisted Raftelis and staff in developing new reserve policies for the GRP Division. By using the rating agency's recommended best practices and other utility's guidelines, Raftelis and staff were able to develop reserve policies that will assist the GRP in meeting its future financial needs. The recommended reserve policies have been included in the model. The model allows the user to consider various funding levels and sequence

of funding for the recommended reserves. Raftelis has provided the technical memo summarizing the Benchmarking Analysis in **Appendix B**.

4.4. Weather Derivatives Memo

Raftelis also investigated a product that has yet to be used in the water and wastewater utility sector, known as Weather Derivatives. Weather Derivatives are products that various industries have utilized as a risk management tool to hedge against weather-related revenue instability. The primary industries that have used weather derivatives as a risk management strategy include energy and power utilities, agriculture and shipping companies. Attached in **Appendix C**, Raftelis has provided a memo that summarizes the review of the Weather Derivatives product. The memo researches various weather derivatives in use around the world. The memo finds that there are certain utilities that utilize derivatives, but in the United States adoption is very low. The memo also finds that the prospective contract price is very high. Raftelis does not recommend the GRP Division utilize Weather Derivatives as a risk management tool.

5. Revenue Requirement Development

5.1. Task 1104 – Revenue Requirement Development

Raftelis used data received in Task 1102 and the outcome of the analysis in Task 1103 to develop the revenue requirement for the GRP Division for the ten years, FY 2020 through FY 2029. The revenue requirements include a list of repair and replacement items for the next 10-Year period. Also included are operations and maintenance costs, debt service, reserves, and coverage requirements.

The objective of the water financial plan is to ensure the financial sustainability of the GRP Division and to support its customers over the next five fiscal years. To ensure financial sustainability, revenues must be set at a level that will cover all applicable costs, or revenue requirements. The accompanying financial model combined with the five-year planning period allows the GRP to forecast different revenue and cost scenarios into the future.

To develop a five-year forecast the following steps are required:

- Forecast groundwater and surface water consumption
- Enter the correct O&M budget to inflate costs into the future
- Determine the current and future debt service requirements
- Determine funding level of reserves

The current 5-year planning forecast uses the FY 2019 and FY 2020 budgets to project O&M costs into the future.

5.2. Existing Rates

Table 1 provides a summary of the existing FY 2019 water rates, which were effective on September 1, 2018. The GRP Division provides treated surface water to seven (7) Participants, which it charges a Surface Water Fee. The GRP also receives revenue from Groundwater Pumpage Fees from all Participants. Combined, treated surface water revenue and groundwater pumpage revenue provide the vast majority of the GRP's annual revenue. Interest and miscellaneous revenue make up a very small amount of the remaining revenue.

Table 1 Existing Rates

Rate	Rate (per 1,000 gallons)
Surface Water Fee	$2.83
Groundwater Fee	$2.64

5.3. Forecasted Water Demand

Based on consultation with GRP staff and results from the Risk Assessment Memo in **Appendix A**, the scenario used in FY 2020 through FY 2024, applies an annual average of 12 MGD for surface water demand and a 38.9 MGD for groundwater demand.

The water consumption forecasts are a component of the level of revenue throughout the forecast period, FY 2020 through FY 2024. Logically, the more accurate forecasted consumption is, the more accurate forecasted revenues will be. As stated in **Section 4.2**, the Risk Assessment Memo attached in the **Appendix A**, greatly assisted in the development of the water consumption forecast.

The GRP staff will continue to closely monitor demand trends and input that data into the model to determine impacts on finances. **Table 2** shows the FY 2019 and FY 2020 consumption forecast. **Figure 1** shows the past three years of water demand and the water demand forecast until 2024.

Table 2 Forecast Water Demand

Consumption Class	FY 19 (MGD)	FY 20-FY24 (MGD)
Surface Water	12.0	12.0
Groundwater	40.0	38.9

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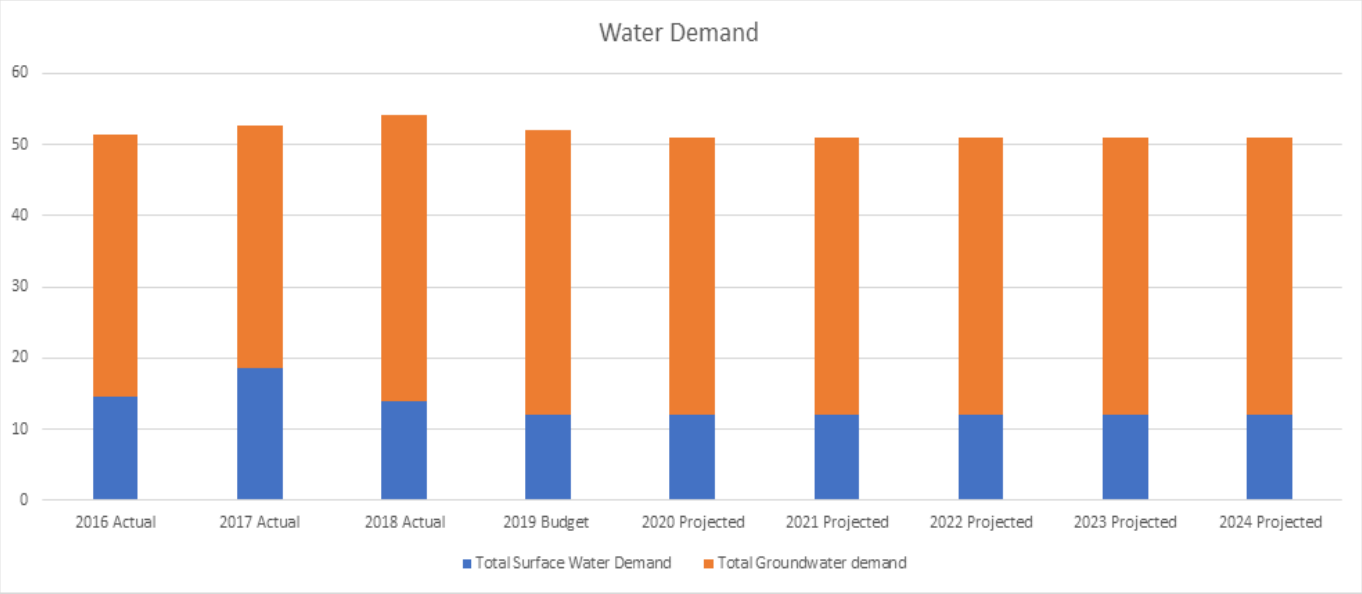
Figure 1 Historical and Forecasted Water Demand



5.4. Operations and Maintenance Expenses

The FY 2019 and FY 2020 operating budgets for the GRP are included in the model. Costs beyond FY 2020 are projected using the FY 2020 budget, plus applicable inflation cost increases.

Operations and maintenance expenses in the model reflect the FY 2020 budget. **Table 3** displays a breakdown of the GRP's FY 2019 and FY 2020 budgeted O&M expenses. **Figure 2** displays the projected O&M until 2024.

Table 3 FY 2019 Budgeted and FY 2020 Budgeted O&M Expenses

Operating Expenses	FY 2019	FY 2020
Payroll and Employee Benefits	$5,140,369	$4,544,712
General & Administrative	$553,734	$476,390
Maintenance, Repairs, Parts, and Rentals	$992,800	$1,061,750
Purchased & Contracted Services	$326,102	$274,306
Supplies, Materials & Utilities	$9,364,431	$9,109,820
Professional Fees	$1,178,350	$901,500
Minor Capital Outlay	$73,075	$62,820

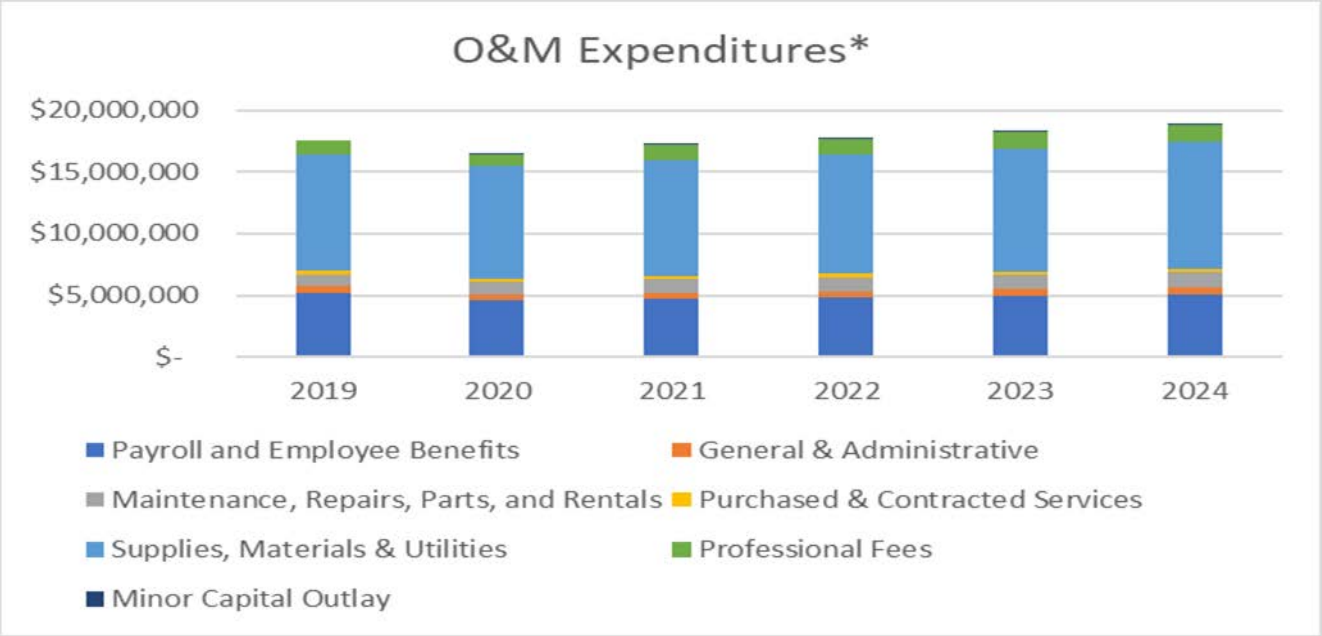
Key drivers of the variable costs are power, chemicals, and raw water. A difference between the FY 2020 and subsequent budgets is the number of Granular Activated Carbon (GAC) change-outs. The FY 2020 budget includes three (3) GAC change-outs. Starting in FY 2021, the model assumes four (4) GAC change-outs per fiscal year.

O&M projections include the assumption that staffing will remain constant throughout the study period. General & Administration ("G&A") services provided to GRP include services such as; Accounting, Human Resources, Risk Management, Purchasing, Information Technology, Administrative Services, SCADA/I&C, Technical Services,

and Senior Management. The cost of these services is allocated to the GRP Division. G&A costs represent expenditures that have been allocated to the GRP from SJRA's G&A support services.

To address ongoing litigation, legal costs are included in the FY 2020 budget and beyond. In FY 2020 legal services are budgeted at $750,000 and thereafter are budgeted at $600,000 per fiscal year. Staff will monitor and update the estimated legal costs accordingly.

Figure 2 Projected O&M Expenditures



*Includes 3% inflation

5.5. Inflation Factors

To estimate future Operations and Maintenance (O&M) expenses the model uses inflation factors. Through consultation with GRP staff it was determined to set inflation factors at 3%. GRP staff will closely monitor future expense trends to determine where to set inflation expectations in the future.

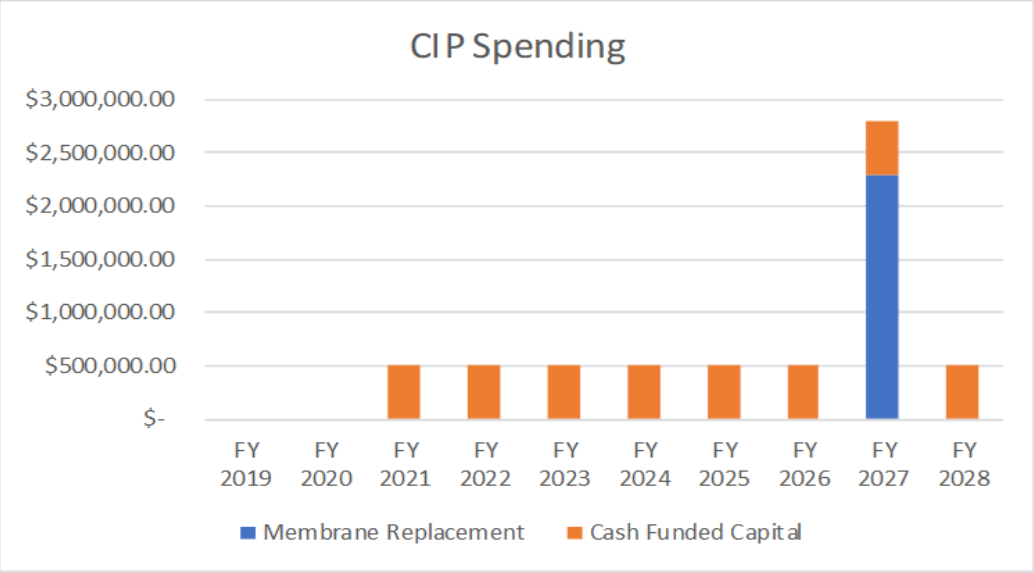
5.6. Capitalized Expenditures

This 10-Year study does not anticipate any expansion or future phases of the current facilities that were commissioned in September of 2015. Accordingly, the GRP will not issue any additional debt.

Currently, the only applicable CIP project is the SWTP membrane cartridge replacement. This is projected to occur in FY 2027 and is planned to be cash funded with the Repair & Replacement Fund (as described in **Section 4.3**). The membrane cartridge replacement ensures that the surface water plant may continue to effectively filter and treat surface water from Lake Conroe. **Figure 3** displays the projected CIP spending with the projected cash funded capital spending. For FY 2021 through FY 2028, capitalized expenditures such as vehicle, equipment, and hardware replacements are included at approximately $500k per year.

The GRP does plan on replacing a large raw water pump with a small raw water pump, utilizing unused bond proceeds from a previous issue, which would have no impact on projected rates.

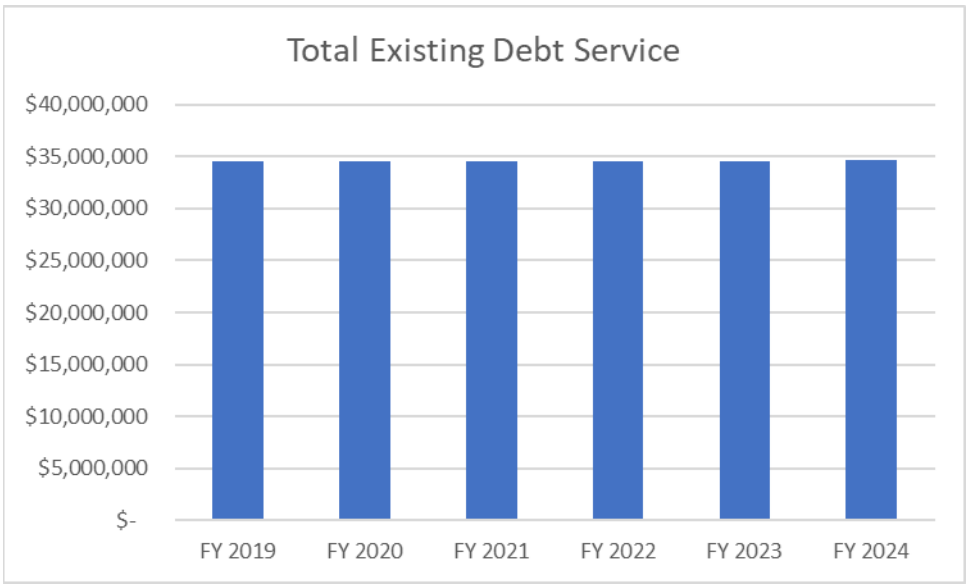
Figure 3 CIP Spending



5.7. Debt Service

The GRP's existing debt service relates to the previous efforts associated with the planning, permitting, design, property acquisition, financing, and construction of the existing (SWTP), transmission lines and ancillary facilities. This debt service is approximately $34.5 million annually. As stated above it is currently forecasted that the GRP will not need to issue any additional debt during this study period. **Figure 4** displays the projected debt service for the next five years.

Figure 4 Total Existing Debt Service



5.8. Reserve Funds

Currently, the GRP operates three reserve funds: a Multi-Purpose Operating Reserve Fund, a Renewal and Replacement (R&R) Reserve Fund, and a Capital Reserve Fund. The Multi-Purpose Operating Reserve Fund allows the GRP to use money for any situation. The Renewal and Replacement Reserve Fund is designed to hold money for regularly scheduled capital maintenance projects, like membrane cartridge replacement. The Capital Reserve funds any capital projects. Presently, none of the reserve funds have any money. The reserves have not received funding in the past couple fiscal years, due to unfavorable variances in revenue.

Based on the Benchmarking Analysis, Raftelis recommends that the GRP amend its current reserve policy and modify the reserve fund structure, target fund balances, and sequence of funding. Raftelis' detailed reserve fund recommendations are listed below.

5.8.1. RESERVE FUND STRUCTURE & USE OF FUNDS

Based on the Series 2009 Bond Resolution, the following funds are required:

- **Debt Service Reserve Fund** should equal the average annual payment of principal and interest of all remaining bonds outstanding.
- Operations and Maintenance expenses should be paid from the **GRP General Fund**. Per the GRP Resolution establishing Reserve Funds, the **GRP General Fund Minimum Balance** target shall be equal to forty-five (45) days of annual O&M expenses.
- Any net revenues available at the end of a fiscal year can be deposited to the **Surplus Revenue Fund**. Any funds in the Surplus Revenue Fund can be used for any lawful purpose.

Based upon the benchmarking and risk analysis related to this rate study update, the following funds are recommended in addition to the above-required funds:

- **Operating & Rate Stabilization Reserve Fund** should equal to 90 days of the annual O&M budget for a total three (3) months. Based on the 2020 budget this total of the **GRP General Fund Minimum Balance** and the **Operating and Rate Stabilization Reserve Fund** is approximately $4.6 million. The Operating Reserve allows the GRP to respond to any overage in expenses that it may face. By building and maintaining this reserve the GRP may respond to any unforeseen expenses and/or better respond to unforeseen drops in demand.
- **Emergency Reserve Fund** should equal $2 million, which represents the approximate cost of a water line break. This fund may be used if an unexpected event occurs, like a line break.
- **Repair & Replacement (R&R) Fund** should equal the amount equivalent to the 10-year R&R plan. This plan lays out planned repair and replacement projects over the next ten years. The fund may be used to fund these recurring capital items, such as the membrane replacement project.

5.8.2. TARGET FUND BALANCES

- **Debt Service Reserve Fund** – Target Fund Balance for the Debt Service Reserve Fund is about $33 million and is based on the average annual amount of the outstanding debt.
- **GRP General Fund Minimum Balance** – Target Fund Balance for General Fund Minimum Balance shall equal forty-five (45) days of budgeted Operations and Maintenance Expenses.
- **Operating and Rate Stabilization Reserve Fund** – Target Fund Balance for the Operating and Rate Stabilization Reserve Fund shall equal ninety (90) days of budgeted Operation and Maintenance Expenses.
- **Emergency Reserve Fund** – For the Fiscal Year 2020, beginning September 1, 2019, the Target Fund Balance for the Emergency Reserve Fund shall equal $2 million. For each Fiscal Year thereafter, the Target Fund Balance for the Emergency Reserve Fund shall equal the Target Fund Balance for the prior Fiscal Year

plus an increment equal to the Engineering News Record Construction Price Index for Construction Costs for such prior Fiscal Year times the Target Fund Balance for such prior Fiscal Year.

- **Repair & Replacement Fund** – The target Fund Balance for the Repair & Replacement Fund each Fiscal Year such that amounts are accrued in the Repair & Replacement Fund as necessary to meet forecasted expenditures from the Repair & Replacement Fund over time and without the need for short-term rate adjustments. This equals to $3.4 million. This assists the GRP in not having to visit the debt markets regularly.

5.8.3. FLOW OF FUNDS

The model funds the reserves in cascading order, to the extent that excess funds are available. Gross Revenues received by the Authority shall be deposited into the GRP General Fund and, together with any balance in the GRP General Fund, shall be applied as follows on a monthly basis:

1. Operation and Maintenance Expenses shall be paid directly from the GRP General Fund.
2. After payment of Operations and Maintenance Expenses in accordance with the above, remaining Net Revenues in the GRP General Fund shall be transferred to the Debt Service Fund in accordance with the Series 2009 Bond Resolution.
3. After the above transfer of Net Revenues, remaining Net Revenues in the GRP General Fund shall then be transferred to the Debt Service Reserve Fund in accordance with the Series 2009 Bond Resolution.
4. After the above transfer of Net Revenues, any remaining Net Revenues in the GRP General Fund in excesses of the targeted GRP General Fund Minimum Balance shall then be transferred to the Operating & Rate Stabilization Reserve Fund until the amount in such fund equals the applicable Target Fund Balance.
5. After the above transfer of Net Revenues, any remaining Net Revenues in the GRP General Fund in excesses of the targeted GRP General Fund Minimum Balance shall then be transferred to the Emergency Reserve Fund until the amount in such fund equals the applicable Target Fund Balance.
6. After the above transfer of Net Revenues, any remaining Net Revenues in the GRP General Fund in excesses of the targeted GRP General Fund Minimum Balance shall then be transferred to the Repair & Replacement Fund until the amount in such fund equals the applicable Target Fund Balance.
7. After the above transfer of Net Revenues, any remaining Net Revenues in the GRP General Fund in excesses of the GRP General Fund Minimum Balance shall be transferred to the Operating & Rate Stabilization Reserve Fund.

5.9. Uncollected Revenues

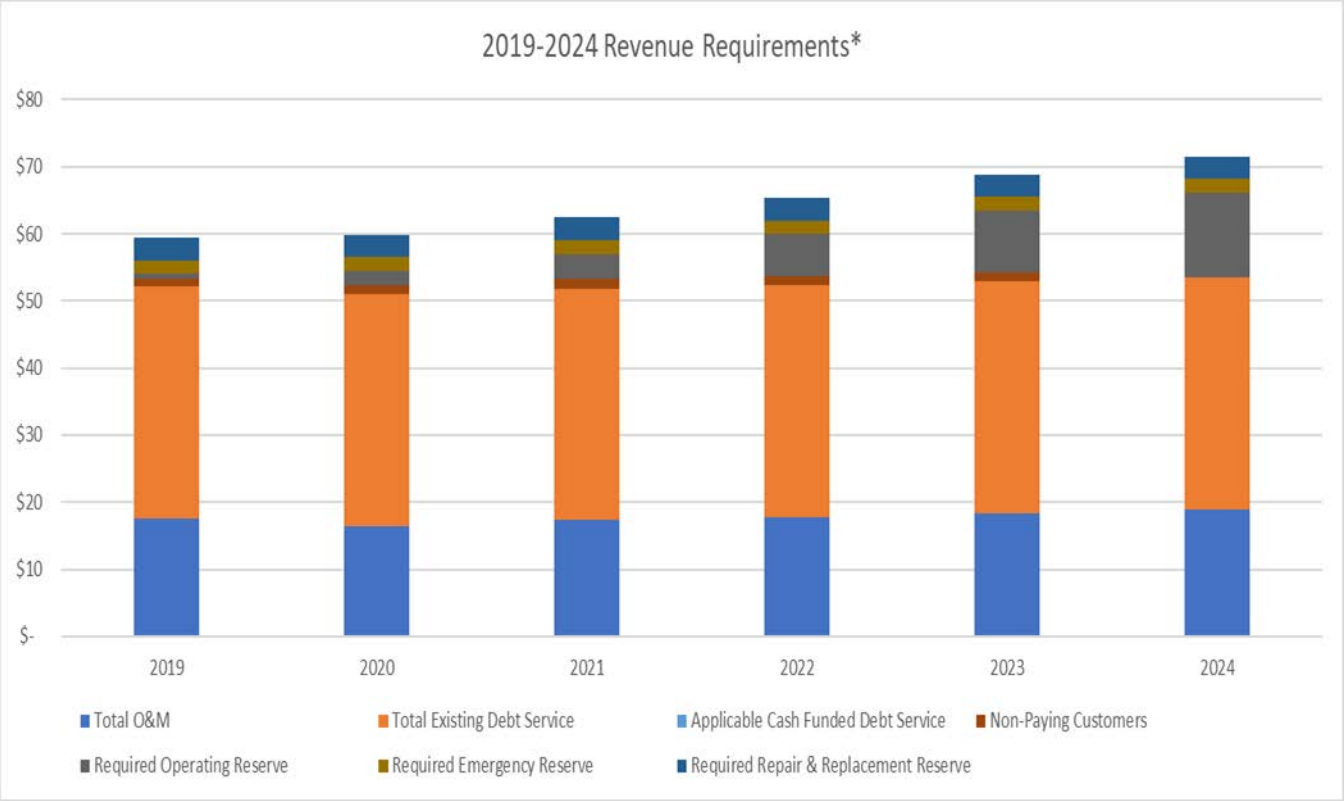
Certain Participants are continuing to pay the GRP Division based on the FY 2016 rates. In the model and for forecasting purposes, it is assumed these Participants will continue to pay the FY 2016 rates. This uncollected revenue generates a shortfall between the actual rate and the rate that the non-paying Participant pays. This differential in cash collection must be made up by the other Participants. The model tracks the cash collection shortfall and adds the cash shortfall to the cash flow. The total of the cash shortfall most accurately reflects the cash flow generation of the utility. Rates consider the overall shortfall in the current year.

5.10. Total Revenue Requirements

Sections 5.4, 5.5, 5.6, 5.7, 5.8 and 5.9 combine to form the revenue requirements for the GRP Division. The revenue requirements represent the revenue that must be generated by the GRP to fully support itself. The timing of fully funding all of the reserve funds represent a large uncertainty in near term revenue requirements. If the reserves are funded quickly then revenue requirements will be higher for the next few years. If the reserves are funded over a longer period of time, then revenue requirements will be lower for that time period. If reserves are not funded quickly enough then the GRP runs the risk of not having the reserves at a time of need.

Figure 5 provides a forecast of the revenue requirements until FY 2024, including the reserve fund requirements.

Figure 5 Revenue Requirements



*Includes 3% Inflation

6. Rate Design

6.1. Rate Differential

Please see **Appendix D** for the details of the rate differential analysis.

6.2. Rate Calculation

To calculate the rate, the total revenue requirement is divided by total demand and considers the rate differential.

6.3. Forecast of Revenues

The GRP generates revenue from surface water fees, groundwater pumpage fees, and miscellaneous other revenue. The Other revenue category includes building rent, certain revenue contributions, and other miscellaneous revenue. Other revenue typically contributes less than 1% of total revenue. In the forecast period it is assumed that Other revenue grows at a 3% growth rate. In the rate calculation the Other revenue is used to lower the revenue requirement.

6.3.1. EXISTING REVENUE AT EXISTING RATES

At existing FY 2019 rates, the revenue generated is around $53 million. **Table 5** displays FY 2020 revenue if held constant.

Table 4 Forecast of FY 2020 Revenues

	FY 2020
Rate Revenue	$50,903,119
Other Revenue	$23,688
LSGCD Revenue (Pass-Through)	$1,490,913
Total Revenue	$52,417,720

6.3.2. REVENUE ADJUSTMENTS AND CASH FLOW FORECAST

The GRP must generate sufficient revenue to recover the anticipated revenue requirements **(Figure 5)**. To meet these revenue requirements the GRP must adjust the rates to cover the forecasted revenue requirements. The revenues will ensure that the GRP meets its financial plan needs.

The GRP's financial planning needs include:

- Recover budgeted O&M costs
- Recover debt expenses
- Begin buildup of needed reserves

Table 5 reflects the rate required to meet the FY 2020 revenue requirements. These rates are set with the assumption of no funding of reserves.

Table 5 Proposed FY 2020 Rates

Rate Class	Existing Rate (per 1,000 gallons)	FY 2020 Rate (per 1,000 gallons)
Surface Water	$2.83	$3.15
Groundwater	$2.64	$2.73

Beyond FY 2020 Raftelis has developed a range of rates. These rates always maintain the $0.42 differential between groundwater and surface water but vary based on the assumptions made within the model. Many factors affect the forecast of rates. As the rate forecasts goes out further the uncertainty increases. The areas of largest uncertainty are the consumption forecasts, timing of reserve contributions, and resolution of contract disputes. Currently, the model assumes that the GRP will operate at the lowest possible consumption level. Increases in consumption forecasts will in general help the GRP. The reserve contributions will cause the timing of the rate increases to change.

6.4. Scenarios

The GRP Division staff instructed Raftelis to prepare two Scenarios A and B. Each scenario is based on 12 MGD of surface water demand. Any increase to this demand will result in a higher rate due to increased production costs. Scenario A represents funding all reserves within five years. This equates to reserve funding of roughly $2.5 million per year. Scenario B funds all reserve targets within 10 years. Scenario B reserve funding equates to roughly $1.1 million per year. **Figures 6 and 7** display a forecast of rates for the next five years.

Figure 6 Groundwater Fee Forecast

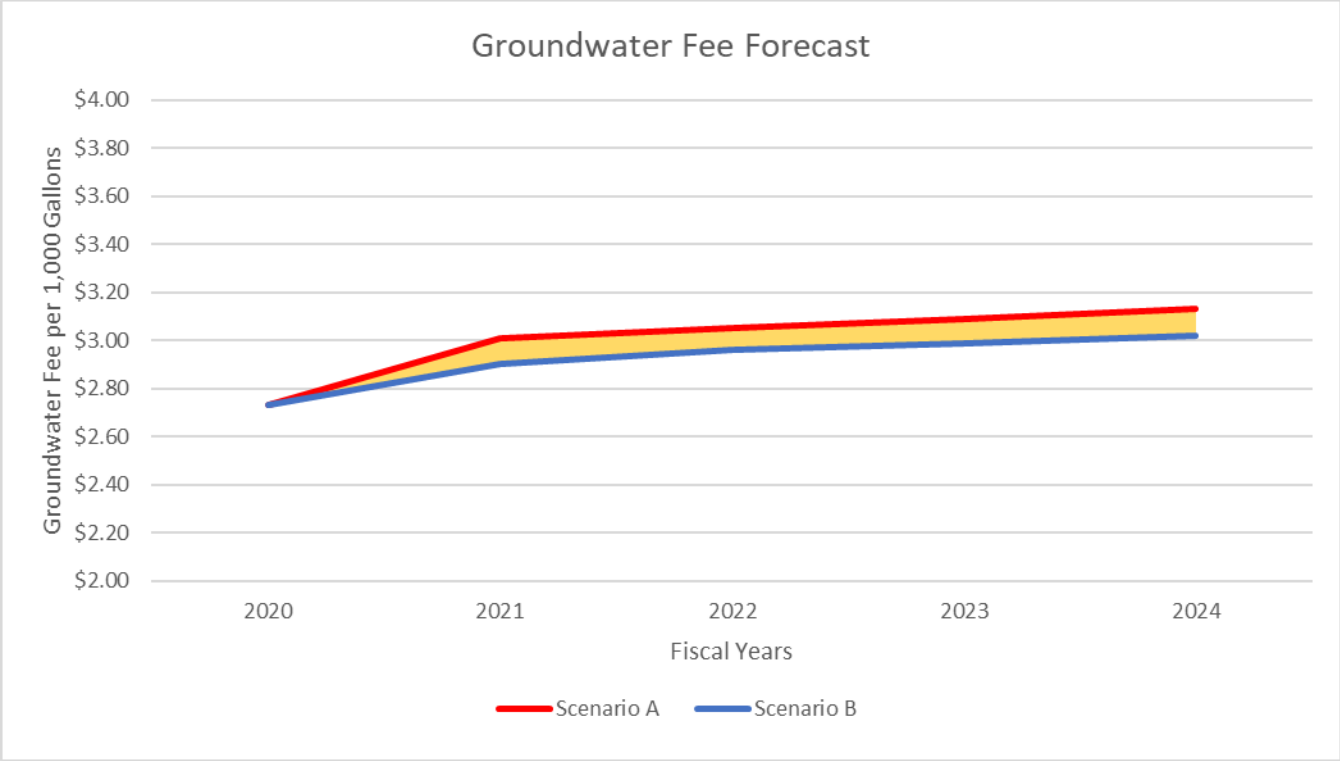
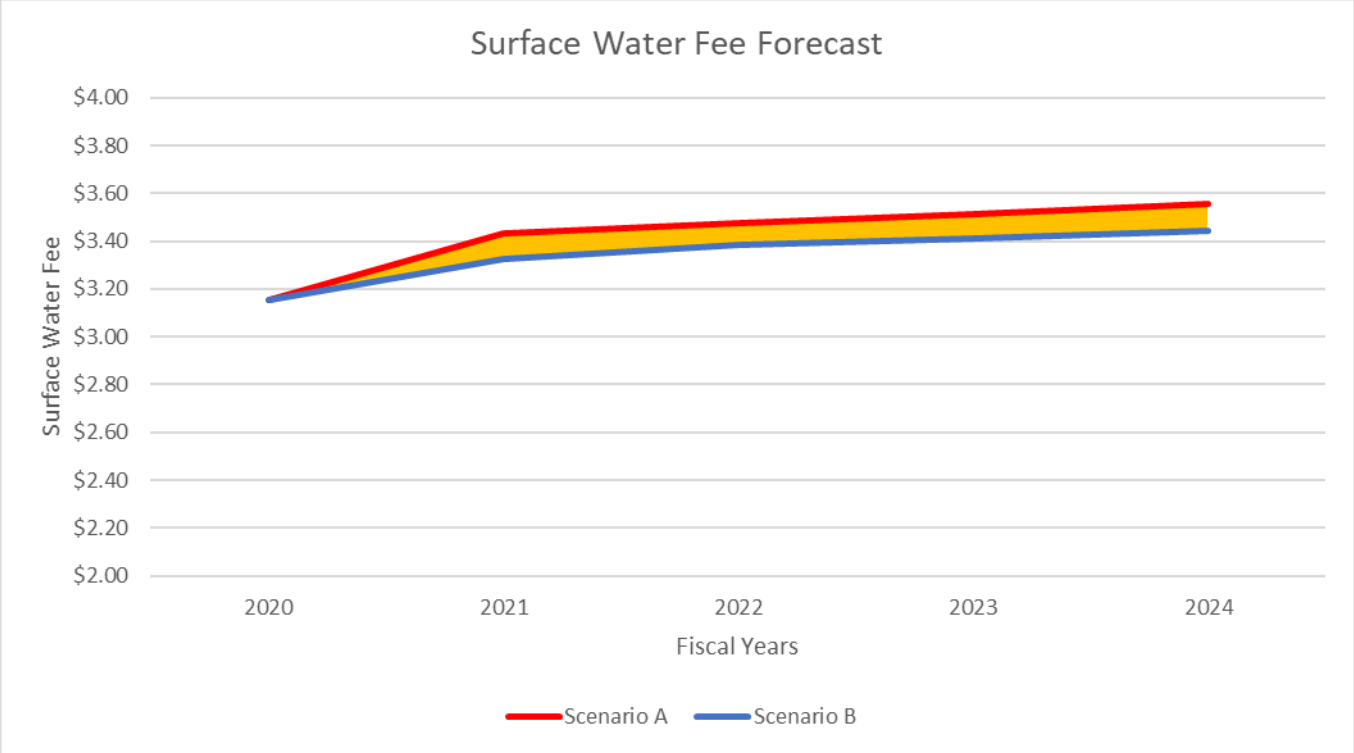


Figure 7 Surface Water Fee Forecast



7. Reports and Presentations

Raftelis made presentations to the GRP Review Committee and SJRA Board of Directors concerning some of the topics covered in this report. The following are the dates and the topics that were presented.

GRP Review Committee:
December 10, 2018 – Review of Reserve Recommendations (included results of Benchmarking and Risk Assessment Analysis)
January 22, 2019 – Final Direction of Reserve Funding
April 22, 2019 – Rate Differential Presentation
May 20, 2019 – Rate and Budget Presentation

SJRA Board Meeting:
April 25, 2019 – Rate Differential Presentation
May 23, 2019 – Rate and Budget Presentation

In addition to the presentations outlined above, Raftelis provided the memos in the appendices of this report.

APPENDIX A:
RISK ASSESSMENT ANALYSIS

MEMO

To: San Jacinto River Authority, GRP Division
From: Raftelis Financial Consultants
Date: November 27, 2018 (original/draft); July 12, 2019 (final)
Re: SJRA GRP Rate Study – Risk Assessment

Background

The Groundwater Reduction Plan (GRP) Division is one of five operations divisions within the San Jacinto River Authority (SJRA). The Division includes Management, Operations & Maintenance and Customer Service & Compliance as well as Administrative Support. Like all SJRA operations divisions, the GRP is a separate enterprise and solely independent in generating its own revenue. Furthermore, subsidies between Divisions are generally prohibited by contract and/or practice, requiring each Division to plan for and be prepared to address the risk of revenue and expense volatility through financial policies such as reserves.

The GRP Division provides surface water to its contract customers, which will reduce future groundwater usage from the Gulf Coast Aquifers by ensuring a reliable, long-term diversified portfolio of alternative water supply sources.

The GRP Division encourages a number of alternative water strategies, including surface water from Lake Conroe, conservation, reuse of treated wastewater effluent, and groundwater from all Gulf Coast Aquifers including the Catahoula Aquifer.

The primary strategy of the GRP includes the operation, maintenance, and administration of a water treatment plant and transmission lines that treat raw surface water meeting or exceeding drinking water standards and deliver it to a number of cities and utilities, among other Participants as defined below, to offset groundwater consumption in the most cost-effective manner.

The SJRA has entered into contracts (the "GRP Contracts") with the certain groundwater users to reduce groundwater usage. The GRP Division's costs are funded through groundwater pumpage and surface water fees collected from the Participants in the GRP in accordance with the GRP Contracts. All of the GRP's Participants equitably share in the cost by paying a fee for their water usage.

The SJRA completed a rates and financial planning model study with a report issued in April 2014 for the GRP Division. At the time of this study, the GRP was a newly formed operating division, so historical data related to Participant consumption and resulting revenues, operating expenses, and volatility in operations at large was limited. The GRP Division began delivering water to certain Participants in September 2015. Today, after three years of operations, projections and recommendations from the 2014 Rate Study can be revisited and assessed for appropriateness. This memo provides a summary of analysis conducted on historical actual results along with updated recommendations related to reserve targets.

Current GRP Financial Policies

The current GRP Division reserve policies as recommended in the 2014 GRP Rate Study report dated April 11, 2014 consider the following reserve targets:

- A Multi-Purpose Operating Reserve Fund equal to 180 days.
- A Renewal and Replacement Reserve Fund funded with annual transfers equal to approximately $500,000.
- A Capital Reserve funded with available sources after funding the operating and repair and replacement reserves.

Currently the target reserves are funded in cascading order. For example, the operating reserve is funded first, the repair and replacement reserve second, and the capital reserve third. Due to lower than anticipated operating revenue, the GRP Division has not been able to fund the multi-purpose operating reserve to the target level of 180 days, and therefore the repair and replacement and capital reserves are not funded.

Industry Best Practices

There are various sources in the water utility industry that provide guidelines for risk management. Among these are industry organizations such as the American Water Works Association (AWWA) and Government Finance Officers Association (GFOA), and rating agencies that assign credit ratings for issuers of debt obligations. The three primary rating agencies are Standard & Poor's (S&P), Moody's, and Fitch. While there is no one-size-fits all, the consensus among industry leaders is that cash reserves are the key instrument for water agencies to utilize to minimize risk.

While cash reserves are generally accepted as the key measure of a utility's risk tolerance, the questions remain, what types of reserves, and how much should a utility maintain in reserves? Reserves can generally be broken out between restricted and unrestricted, and further between operating and capital-related. Restricted reserves, such as a debt service reserve, are not typically included in calculations of a utility's liquidity as they are required by a legal covenant and/or are restricted for a specific purpose. Alternatively, unrestricted reserves such as working capital or operating reserves, are generally maintained at or above general targets established in policies, are available for a variety of purposes.

The leading industry associations and rating agencies both assess reserves using financial metrics that measure the utility's liquidity, or financial flexibility to pay term debt. The primary liquidity metrics, along with their formula, include:

1) *Days Cash on Hand (DCOH):*

$$DCOH = \frac{Unrestricted\ cash\ and\ liquid\ investments}{Opertating\ and\ maintenance\ expenses\ less\ depreciation} \times 365$$

2) *Days Working Capital (DWC):*

$$DWC = \frac{Current\ assets - Current\ liabilities}{Operating\ and\ maintenance\ expense} \times 365$$

These liquidity metrics calculate the ability of a utility to meet their financial obligations.

Industry Associations

Two key industry associations that provide guidelines for effective utility management include the American Water Works Association (AWWA) and Government Finance Officers Association (GFOA). The AWWA is dedicated to providing water utility specific insights, whereas the GFOA is focused on providing resources for public finance officials, including enterprise fund, or water utility, specific guidelines. The following publications provide reserve target guidelines that are applicable for the GRP Division's consideration:

> *AWWA Guidelines:*
> *American Water Works Association. AWWA Rates & Charges Committee Whitepaper: Cash Reserve Policy Guidelines, 2018.*
>
> *GFOA Guidelines:*
> *Government Finance Officers Association. Best Practice: Working Capital Targets for Enterprise Funds, February 2011.*

Both the AWWA and GFOA emphasize the importance of reserves to mitigate utility risks. Additionally, they define the different types of reserves a water utility, or enterprise fund, should consider. The GFOA specifically recommends that capital intensive enterprise funds, such as water utilities, should consider designating operating and capital reserves separately. The AWWA also advocates for segregation of reserves based on a utility's specific risks. Regardless of the specific reserve types and targets adopted by a utility, both the GFOA and AWWA advocate for clear financial policies that articulate the purpose of the reserves, how they are calculated, and how they should be used.

Rating Agencies

Rating agencies' primary purpose is to assign bond credit ratings that represent the credit worthiness of corporate or government bonds, which is a measure of the likelihood of the debt getting repaid. The three primary rating agencies, S&P[1], Moody's[2], and Fitch[3], each publish rating scorecards specific to water utilities that they use to assess and ultimately rate utility bonds. These scorecards include financial and non-financial related criteria that measure the credit worthiness of the utility. While the scorecards are used to rate utility bond's credit worthiness, they in turn are also a primary source of industry best practices related to financial metric targets and are used by utility management across the country to assess their risk profile. The scorecards, as detailed in **Table 1** below, provide ranges for days cash on hand that correlate with stronger to weaker financial strength.

Rating agencies assess the financial liquidity strength of water utilities based on the days cash on hand (DCOH) metric. Furthermore, they recognize the value in segregating reserves for specific purposes based on the utility's risk profile. Rating agencies will even consider adjusting up a rating to reflect qualitative measures such as a utility's strong financial management proficiency, which may include identification of and policies related to necessary reserve types.

[1] S&P: Standard & Poor's Rating Services; McGraw Hill Financial. U.S. Public Finance Waterworks, Sanitary Sewer, And Drainage Utility Systems: Rating Methodology and Assumptions. January 19, 2016.
[2] Moody's Investors Service. US Municipal Utility Revenue Debt. Report Number: 1095545. October 19, 2017.
[3] Fitch Ratings. U.S. Water and Sewer Rating Criteria. November 30, 2017.

Examples of this are prevalent in the rating agency scorecard detail. S&P recognizes equally in their calculation of DCOH reserves designated for capital-related purposes such as renewal and replacement, emergency and contingency funds, and other purposes such as a rate stabilization reserve. Moody's states that "cash is the paramount resource utilities have to meet expenses, cope with emergencies, and navigate business interruptions". In defining their DCOH calculation, Moody's stipulates that they only include unrestricted reserves, not those restricted for purposes such as a debt service reserve, unspent bond proceeds, or cash restricted for capital. This could be interpreted as a slightly more conservative calculation. Lastly, Fitch continues the theme of the importance of reserves when assessing a water utility's financial strength. Fitch considers current unrestricted assets in their DCOH and days of working capital metric calculations. They clarify that these can include restricted reserves if they are available for general purposes at the discretion of the governing body.

While rating agencies recognize that utility management may have appropriate reasons for establishing separate reserves, from a bond rating perspective, they are generally most interested in combined unrestricted reserves and the resulting days cash on hand metric. **Table 1** below summarizes each rating agency's DCOH scorecard range from stronger to weaker. It is important to note that this is only one factor that is part of a larger picture of other financial and non-financial assessments considered when assigning a final rating.

Table 1: Days Cash on Hand Scorecard Comparisons

Rating Agency	Stronger - AAA	Midrange – AA	Weaker – A or Below
S&P	> 150	150 – 60	< 60
Moody's	> 250	250 – 150	< 150
Fitch	> 120	75	< 60

Operating Reserves

The purpose of an operating reserve is to provide the ability to absorb cashflow fluctuations due to variability in revenues throughout the year which are more pronounced than similar seasonal fluctuations in O&M expenses. The size of the reserve also recognizes the delay from when service is provided to a customer and expenses are incurred to when the utility can expect to be reimbursed for that service. As way of explanation, the operating reserve is similar to a business checking account, in which the owner tries to maintain sufficient funds in their account to cover day to day operating expenses like payroll or rent payments. Operating reserves can also be important when addressing emergency repairs, droughts, wet weather, and other unforeseen economic circumstances.

The following table lists considerations for setting an operating reserve target identified in the AWWA whitepaper that are relevant to the GRP Division. The far-right column, GRP Relevance, indicates whether the factor in question is a high, low, or neutral risk to the GRP Division. A high relevance indicates the need for a higher operating reserve targets may be warranted.

Table 2: AWWA Target Operating Reserve Level Considerations

Factor	Description	GRP Relevance
Usage Variability	Changes in billed consumption due to weather, conservation, or other factors.	**High**
Rate structure	Percent of fixed vs. variable revenue recovery. Higher variable revenue is reason for a higher reserve target.	**High**
Nonutility resources	Availability of other sources in times of emergency, for instance from a general fund. If no other sources are available, a higher operating reserve target may be warranted.	**High**
Availability of other reserves	Availability of other non-operating reserves, such as capital, debt service, and/or rate stabilization reserves. If other reserves are established, a lower operating reserve target may be acceptable.	**Neutral**
Use of contingencies	If contingency line items are built into a utility's budget, operating reserve target may be lowered.	**High**
Seasonality of cash flow	Higher seasonality may warrant larger operating reserve target.	**High**

Some utility risk factors can either be addressed in the operating fund reserve or may warrant a separate reserve with funds dedicated to mitigating a specific risk. For example, rate stabilization reserves are common within the water industry and are intended to mitigate impacts of occasional revenue shortfalls which can be due to several factors, including usage variability due to wet weather and/or conservation. Sometimes a rate stabilization reserve is required in a bond indenture that stipulates depositing surplus revenues over coverage requirement into this reserve for future use to meet coverage requirements in years of revenue shortfalls. This type of reserve can help stabilize rates over the long run.

The decision on whether a rate stabilization reserve is warranted for a utility may depend on revenue and expenditure volatility. Other considerations include the availability of other reserves, such as the unrestricted operating reserve, to cover revenue volatility. Identifying the right level of rate stabilization reserve is a matter of judgement but is often based on a percentage of O&M, revenue, or debt service. The application of a rate stabilization reserve for the GRP Division is further explored in the recommendations section of this memo.

Capital Reserves

Because of the capital nature of water utilities, designated capital reserves are commonplace in the industry. Capital reserves are established to provide a utility with sufficient funds to meet unanticipated capital needs, such as an infrastructure failure or unexpected capital project costs. Capital reserve targets can be defined in a number of ways given that capital expenditures generally fluctuate more than operating costs on a year-to-year basis. Utilities tend to choose targets they find reasonably easy to administer, and that differ depending on where the utilities are in their infrastructure lifecycle. For example, one utility may have not experienced major growth for years and has largely depreciated its assets, while another may have more recently constructed facilities, while yet another utility may be rapidly growing and have just built a new treatment plant.

A common capital reserve is a repair and replacement reserve that mitigates risk in a similar fashion to unrestricted operating reserves but are intended to fund capital-related fluctuations in cash flow. Repair and replacement reserves are often set based on a percentage of the replacement cost of the system, often 2% - 5%[4], or based on a percentage of expected capital expenditures in the financial plan.

Emergency capital reserves are also common in the industry and are intended to cover unforeseen major capital expenditures. These reserves allow a utility to react quickly to repair critical assets in the event of a natural disaster or system failure.

Assessment of Historical GRP Fund Results

A key benefit in this rate study update is the availability of historical actual consumption, and resulting revenue, and expenses for the past four fiscal years.

Recent Consumption Trends

Operating revenue in the Groundwater Reduction Plan (GRP) Division is solely determined by consumption. Participants pay a volumetric surface water (SW) and/or a groundwater (GW) fee. These two fees pay for almost all costs associated with the GRP. The complete reliance on volumetric revenue is materially different from many other utilities/entities. The following tables summarize the total consumption broken out by surface water and groundwater, and the resulting ration of supply for the past three fiscal years.

Table 3: Historical Billed Average Consumption (mgd)

Source	FY 2016	FY 2017	FY 2018	3-Year Average
Groundwater	37.0	34.2	40.3	37.2
Surface Water	14.5	18.5	13.9	15.6
Total	51.5	52.7	54.2	52.8
% Change		*2.3%*	*2.8%*	

Table 4: Historical Source of Supply

Source	FY 2016	FY 2017	FY 2018	3-Year Average
Groundwater	71.8%	64.9%	74.4%	70.4%
Surface Water	28.2%	35.1%	25.6%	29.6%
Total	100%	100%	100%	100%

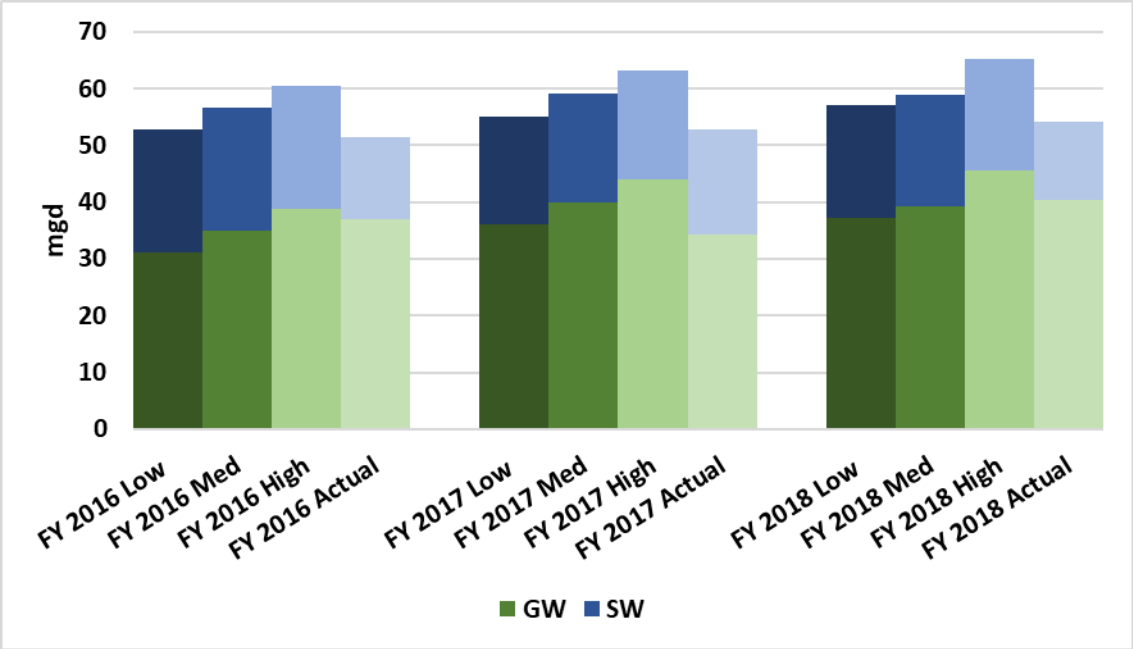
Regular city owned utilities usually rely on stable revenue sources, such as fixed meter charges, for significant portions of their revenue. The fixed meter charges give the utility greater revenue stability. However, the GRP Division is a wholesale supplier and is not able to access fixed meter charges. For

[4] Guar, S., Cruz, J., Atwater, D. 2014. American Water Works Association. Journal AWWA. November 2014. Why Water Agencies Need Reserves.

utilities that rely solely on volumetric revenue, revenue instability is a major risk. The prior rate model for the GRP realized this consumption risk but did not have any historical actual billed consumption data on which to base estimates. The rate model utilized estimates of high, medium, and low consumption scenarios. Since the projections were not based on any historical billed consumption, results could differ greatly from actuals. With this rate model we now have three years of historical billed consumption. This consumption data may be used to more accurately forecast revenue.

The selection of the low, medium or high scenario in the current rate model determines the billed revenue. The projected consumption is very important for the model and its determination of rates, and ultimately the financial viability of the utility. If actual consumption is significantly higher or lower than projected, then the resulting variance in actual to projected revenue is off. From a financial perspective, the risk of actual consumption, and therefore revenue, being significantly lower than projected is a more significant concern. **Figure 1** compares fiscal years 2016 through 2018 actual billed consumption to model consumption estimates. The figure shows that each fiscal year the total actual consumption was below the lowest scenario estimate.

Figure 1: FY 2016 – 2018 Projected High, Medium, Low Consumption versus Actual

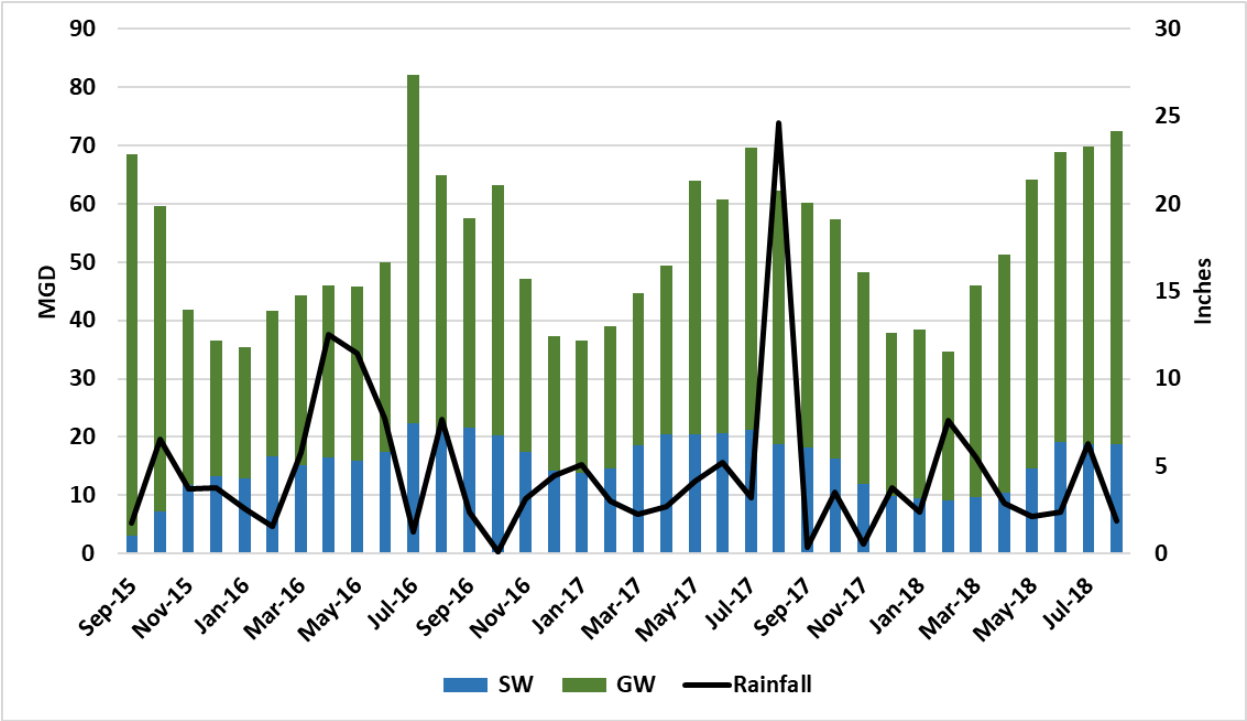


With actual billed consumption consistently below the lowest scenarios, the GRP Division should reassess the consumption scenarios. The average daily consumption over the past three fiscal years for groundwater is 37.2 MGD, the average for surface water is 15.6 MGD. The average daily low scenario for groundwater is 34.8 MGD and 20.1 MGD for surface water. By resetting the consumption scenarios to a lower baseline, i.e. the most recent fiscal year or the last three-year average, the revenue forecast may be closer to actual.

To help determine a more accurate consumption Raftelis compared historical rainfall versus billed consumption. With only three years of data and the first year (FY 2016) being the first year of operation, trends are difficult to ascertain. **Figure 2** displays actual monthly rainfall and consumption

for fiscal years 2016 through 2018. Monthly rainfall data is from the Conroe North Houston Regional Airport.

Figure 2: FY 2016 – FY 2018 Monthly Consumption versus Rainfall



The historical rainfall actuals show that variation in consumption does occur based on rainfall. The impact is more pronounced in summer months during the high outdoor irrigation season. For instance, the low rainfall in July 2016 coincided with the largest consumption month in the past three fiscal years. The spike in rainfall in August 2017 coincides with Hurricane Harvey which impacted significant portions of the Houston area. Although the rainfall from the hurricane occurred in fiscal year 2017, the effects lingered into the early months of fiscal year 2018. Fiscal year 2018 summer consumption recovered to higher levels with lower rainfall.

Figure 1 shows that historical estimates have been higher than actuals. **Figure 2** shows that rainfall in summer months can have an impact on consumption. Combined, Raftelis suggests that the GRP dial back the consumption estimates and base the medium scenario for FY 2019 on either the 3-year historical, or FY 2018, actuals. It is understood that the updated FY 2019 projections are based on actual consumption from FY 2018.

Financial Impact

It is understood that the GRP Division has undertaken some operating system enhancements to help address the shortfall in revenue resulting from lower actual consumption compared to estimates.

The GRP budget's largest expenses are the fixed costs related to debt service and payroll. The variable costs include supplies, materials and utilities (operating costs).

In this fiscal year, the GRP Division proposes to reduce the budgeted production rate from the current 7.2 billion gallons per year (19.7 MGD) to 4.4 billion gallons per year (12.1 MGD). This will help to reduce expenses and also allow some recovery of the GRP's lagging operating fund balance, or reserves.

The proposed surface water reduction will reduce operating expenses by an estimated $4 million dollars per year. The reduction in production rate reduces the amount of raw water purchased, power consumption and chemicals used in water treatment.

The proposed reduction in treated surface water will cause a reduction in revenue of approximately $500,000 due to reduced surface water sales. Additional groundwater pumpage fees make up part of the reduced surface water revenue.

We should also note that legal costs are unusually high at this time due to litigation related to the defense of the GRP contract challenged by some of the GRP's Participants. In addition to the litigation expenses, two of the GRP's Participants are continuing to withhold payment of two previous rate increases. The operating costs make up approximately 21% of the GRP budget. Operating costs are related to the rate of treated surface water. The GRP identified an opportunity to reduce GRP expenses by managing the surface water production rate.

Recommendations

Establishing reserve targets and maintaining reserves are the primary measure of a utility's aversion to risk. Since the publication of the original 2014 GRP Rate Study Report, industry best practices related to reserve balances have remained relatively consistent. In addition to the existing funds in the 2009 Bond Resolution, Raftelis recommends the GRP Division adopt similar reserves as identified in the previous report with a formal policy that more clearly defines reserve targets and their calculations as follows:

1) **Operating and Rate Stabilization Reserve Fund** equal to ninety (90) days of operating and maintenance expense. Based on the FY 2020 Budget this total of the GRP General Fund Minimum Balance and the Operating and Rate Stabilization Reserve Fund is approximately $4.6 million. **Table 5** calculates normalized historical GRP revenue stated in FY 2018 dollars, adjusted for growth and rate increases, for the past three years. The variance between the lowest normalized revenue year, FY 2018, and the highest normalized revenue year, FY 2018, and the highest normalized revenue year, FY 2016, equal approximately $4.6 million.

Table 5: Rate Stabilization Reserve Calculation

Line No.	Description	FY 2016	FY 2017	FY 2018
	Historical Revenues			
1	Groundwater Revenue	$31,535,107	$31,387,159	$38,661,813
2	Surface Water Revenue	$13,234,667	$18,183,641	$12,682,971
3	Total	$44,769,774	$49,570,800	$51,344,784
	Revenue Normalization - Rate Increases *(1)*			
4	Recalculated GW Revenue @ 2018 Rates	$35,618,392	$32,942,927	$38,661,813
5	Recalculated SW Revenue @ 2018 Rates	$14,952,679	$19,130,002	$12,682,971
6	Recalculated Total Revenue @ 2018 Rates	$50,571,071	$52,072,929	$51,344,784
7	Revenue Normalization - Rate Increases (Line 7 - Line 4)	$5,801,297	$2,502,129	$0
	Revenue Normalization - Growth *(2)*			
8	Annual Growth		2.8%	2.8%
9	Cumulative Growth		2.8%	5.7%
10	% Revenue Adjustment to Account for Growth *(3)*	5.7%	2.8%	0.0%
11	Revenue Normalization - Growth (Line 7 x Line 11)	$3,048,588	$1,487,289	$0
	Summary			
12	Historical Revenue	$44,769,774	$49,570,800	$51,344,784
13	Revenues Normalization - Rate Increases	$5,801,297	$2,502,129	$0
14	Revenues Normalization - Growth	$3,048,588	$1,487,289	$0
15	Normalized Historical Revenues	$53,619,658	$53,560,218	$51,344,784
16	Revenue Variability (Rounded) *(4)*	= $53,700,000 - $51,300,000		
17	Rate Stabilization Reserve Target	$2,300,000		

Footnotes:
(1) Historical revenues normalized to FY 2018 dollars by recalculating historical revenue assuming FY 2018 rates were in effect.
(2) Historical revenues normalized to FY 2018 dollars by recalculating historical revenue assuming FY 2018 population.
(3) Equal to annual % growth rates of SJRA partners per FY 2016 and FY 2017 CAFR. FY 2018 annual growth assumed to be equal to average of FY 2016 and FY 2017 growth rates.
(4) Maximum minus minimum normalized revenue stated in FY 2018 terms for the past three fiscal years.

This reserve is intended to provide cash flow for daily financial needs in addition to unforeseen operating expenses and fluctuation in revenues. This reserve should never fall below the 90-day threshold. As way of explanation, the operating reserve is similar to a business checking account, in which the owner tries to maintain sufficient funds in their account to cover day to day operating expenses like payroll or rent payments. In addition, because the GRP Division is fully dependent on variable rate revenue from Participants, and the fact that weather in theory impacts customer demands, a rate stabilization reserve will help mitigate occasional revenue shortfalls. The AWWA recommends in their Cash Reserve Policies Guidelines calculating an

appropriate rate stabilization reserve equal to the difference in revenue between a low and high consumption historical year.

Rates should be set to fully fund this reserve over the next two years. In years subsequent to utilizing rate stabilization reserves to account for lower than anticipated realized revenue, the GRP Division should add the necessary funds needed to replenish the reserve to the following year's revenue requirements.

In addition to the operating reserves, Raftelis recommends the GRP Division target the eventual funding of the various capital related reserves that would be used to ensure sustainable funding of renewal and replacement assets, and emergency repairs, and other unanticipated capital related costs. Given the relatively new infrastructure of the system, these reserves can be targeted and funded from fiscal years 3 - 5, after the operating related reserves are fully funded.

2) **Emergency Reserve Fund** should equal $2 million, which represents the approximate cost of a water line break. Because the infrastructure of the GRP Division system is relatively new, a large capital reserve is not as vital as prioritizing a fully funded operating and rate stabilization reserve at this time. Raftelis recommends establishing a capital reserve equal to the approximate cost of repairing a water line break – $1.5 to $2.0 million – available to address emergencies. Each year, this reserve should be reassessed based on system failures and aging infrastructure needs.

   Failure to fully fund this reserve will hinder the Division's ability to quickly respond to capital emergencies in the future. If emergency capital reserves are not available, the GRP Division will be forced to issue bonds to pay for unforeseen capital projects, and in turn will pay interest on the debt over the life of the bonds. Alternatively, if the GRP Division is not able to issue bonds due to financial shortfalls, it may have to borrow from another SJRA Division, against the intent of Division independence.

   Repair and Replacement Fund should equal the amount equivalent to the 10-year repair and replacement plan. Repair and replacement funds are intended to be used towards the replacement of assets with relatively small useful lives. In the short-term, the Division will have to balance rate increases with debt issuances to fund repair and replacement related capital. Ultimately, the utility should strive to maintain a repair and replacement reserve equal to 2% of the estimated replacement cost of the GRP system. The current estimated replacement cost of the system is $171 million[5], 2% of which equates to approximately $3,400,000.

   Failure to fund the repair and replacement reserve, and ultimately incorporate repair and replacement related capital into the annual revenue requirements of the utility will be unsustainable in the long-run. Repair and replacement costs are ideally funded through cash, or PAYGO, as opposed to funding through debt issuances.

Table 6 provides a summary of the recommended reserves, along with the basis of the target reserve level, and approximate FY 2019 fully funded reserve balance.

[5] San Jacinto River Authority. GRP Division Asset Management Plan. October 2019, Version 1.0.

Table 6: Summary of Additional Recommended Reserves

Line No	Reserve	Basis of Target Reserve Level	Approximate FY 2019 Amount (Fully Funded)
2	**Operating & Rate Stabilization**	Ninety (90) Days of annual O&M. Difference in high and low historical normalized revenue.	$4,600,000
3	**Emergency Capital**	Approximate cost of water line break repair costs.	$2,000,000
4	**Repair & Replacement**	2% of the replacement cost valuation of the GRP Division's surface water plant, surface water transmission system, and water receiving facilities.	$3,400,000
5	Total		$10,000,000

The current District financial policies dictate that the reserve balances be funded in a cascading order, with each subsequent reserve remaining unfunded until the prior is fully funded. Raftelis recommends updating this cascading approach as follows:

1. Operation and Maintenance Expenses shall be paid directly from the GRP General Fund.
2. After payment of Operations and Maintenance Expenses in accordance with the above, remaining Net Revenues in the GRP General Fund shall be transferred to the Debt Service Fund in accordance with the Series 2009 Bond Resolution.
3. After the above transfer of Net Revenues, remaining Net Revenues in the GRP General Fund shall then be transferred to the Debt Service Reserve Fund in accordance with the Series 2009 Bond Resolution.
4. After the above transfer of Net Revenues, any remaining Net Revenues in the GRP General Fund in excesses of the targeted GRP General Fund Minimum Balance shall then be transferred to the Operating & Rate Stabilization Reserve Fund until the amount in such fund equals the applicable Target Fund Balance.
5. After the above transfer of Net Revenues, any remaining Net Revenues in the GRP General Fund in excesses of the targeted GRP General Fund Minimum Balance shall then be transferred to the Emergency Reserve Fund until the amount in such fund equals the applicable Target Fund Balance.
6. After the above transfer of Net Revenues, any remaining Net Revenues in the GRP General Fund in excesses of the targeted GRP General Fund Minimum Balance shall then be transferred to the Repair & Replacement Fund until the amount in such fund equals the applicable Target Fund Balance.
7. After the above transfer of Net Revenues, any remaining Net Revenues in the GRP General Fund in excesses of the GRP General Fund Minimum Balance shall be transferred to the Operating & Rate Stabilization Reserve Fund.

Figure 3 below breaks out the recommended reserve funding hierarchy described above.

Figure 3: Reserve Funding Hierarchy

In summary, all reserves play a significant role in addressing challenges facing the utility, including revenue volatility. The key is to balance the Division's financial viability and need for reserves with the philosophical consideration of using customer dollars to build reserve funds. Different utilities will see the ideal target reserve balance differently, there is no "one-size-fits-all" when it comes to reserves.

Regardless of philosophy driving the Division, clearly defined policies and targets need to be established related to reserves.

APPENDIX B:
BENCHMARKING ANALYSIS

MEMO

To: San Jacinto River Authority, GRP Division
From: Raftelis Financial Consultants
Date: November 28, 2018 (original/draft); July 12, 2019 (final)
Re: SJRA GRP Rate Study – Benchmarking Analysis

Background

Since the development of the initial San Jacinto River Authority's (SJRA) Groundwater Reduction Plan (GRP) rate, model and reserve policies, the GRP has faced some challenges in relation to revenue stabilization. Challenges range from weather to the failure of certain participants to abide by contract terms and conditions. Raftelis Financial Consultants (Raftelis) has prepared this memo in accordance with Task 2 of the GRP Rate Study scope of services, which includes a risk assessment of the GRP revenues to determine and assess any other risks that may impact revenues. A key component of this assessment is a benchmarking analysis of similar agencies to determine how they address revenue volatility, specifically through their financial reserve policies. This memo summarizes the approach and findings of this benchmarking analysis.

Approach

All water utilities face the inherent industry risk related to revenue volatility. Some agencies experience a higher level of revenue uncertainty depending on their distribution of fixed versus variable rate revenue. In the GRP Division's case, all service revenues are volume-based contracts with member utilities, meaning the member utilities only pay for the volume of groundwater they pump and/or surface water they have delivered to them. This contract agreement results in the potential for volatility in rate revenue from year to year, as revenue is directly correlated to total demand of member utilities. Given that revenue volatility risk is inherent to the industry and especially relevant to the GRP Division given their contract agreements, benchmarking financial policies that address risk tolerance against other similar Texas agencies will serve as a valuable tool when considering financial policies going forward.

In addition to benchmarking the financial policies of other local Texas agencies, Raftelis reviewed regional and national utility benchmarking surveys published by American Water Works Association (AWWA) in 2017. This additional data can help frame the financial strength of the GRP Division on a scale outside the state of Texas.

Lastly, Raftelis reviewed industry best practices related to utility financial strength. A key source of industry best practices related to financial metrics are bond rating agency criteria scorecards. The three primary bond rating agencies include Moody's, Fitch, and Standard and Poor's (S&P). Each rating agency publishes rating criteria or scorecards used specifically for rating water and wastewater utilities.

In addition to the bond rating agencies, the Government Finance Officers Association (GFOA) publishes best practices in the government management sector.

Key Financial Policies and Metrics

The financial policies implemented by utilities are intended to mitigate risk and drive decision making that is at the core of a utility's operations. Reserves are the core measure of a utility's aversion to risk; they provide protection from uncertainty and unforeseen financial events.

Establishing and maintaining reserves is an important part of utility financial management. Historically, operating reserves have been the primary means for utilities to account for any lag between expenses incurred and revenues received. Other common reserves include capital/construction/depreciation reserves and bond reserves. Emerging trends in the water industry include additional reserves to address revenue stability concerns. Many water utilities in the country are facing decreasing consumption demands due to lower per capita use and supply shortages, often caused by voluntary and mandatory usage reductions. Even utilities that are coming out of mandatory reductions due to drought restrictions are not seeing per capita usage return to pre-drought levels. Lower consumption results in lower revenue from volumetric rates. The amount of reserves maintained by a water utility to address revenue instability should correlate to the potential volatility of rate revenues. It is important to note, that if a governing board elects to fund such a reserve, in years where the reserve is tapped to cover any shortfall in revenues, rates would need to be adjusted in the following rate setting period to restore the reserve with contributions. This reserve is sometimes referred to as a revenue stabilization fund, which allows the utility to draw on the fund balance in years when revenue is lower than projected due to lower consumption.

When assessing a utility's financial health, and specifically its ability to handle revenue volatility and meet current obligations, the reserve levels, and their corresponding liquidity ratios, are the best measure of financial strength. Liquidity can be measured by a utility's level of unrestricted cash available to fund operating, capital, and other expenses including unforeseen or emergency spending. Industry associations and rating agencies measure the financial strength of utilities based on liquidity metrics, including days cash on hand and days working capital. Both metrics assess the utility's liquidity, or financial flexibility to pay term debt. Specifically, days cash on hand is a measurement of the number of days the utility could continue to operate if it were to suddenly cease collection of revenues. The measure of working capital indicates the relatively liquid portion of the utility's capital, which constitutes a margin or buffer for meeting obligation. The formulas for each metric are as follows:

3) *Days Cash on Hand (DCOH):*

$$DCOH = \frac{Unrestricted\ cash\ and\ liquid\ investments}{Opertating\ and\ maintenance\ expenses\ less\ depreciation} \times 365$$

4) *Days Working Capital (DWC):*

$$DWC = \frac{Current\ assets - Current\ liabilities}{Operating\ and\ maintenance\ expense} \times 365$$

The recommended reserve types and levels for SJRA's GRP Division to consider will be addressed in more detail in the Risk Assessment Memo. The balance of this memo will assess other agencies' targets as they are related to liquidity ratios and reserve balances, and a review of industry best practices.

Utility Benchmarking Results

Local Texas Agencies

Based on discussions with GRP staff, nine Texas agencies were selected for the benchmarking analysis. These utilities were chosen based on various factors including regional proximity, size, and similarity in operation. The agencies chosen for consideration include:

- City of Sugar Land
- North Fort Bend Water Authority
- City of Missouri City
- City of Conroe
- City of Houston
- Gulf Coast Water Authority
- North Harris County Regional Water Authority
- Baytown Area Water Authority
- Trinity River Authority

Raftelis gathered available information from all the candidates. **Appendix A** contains the detailed responses from each agency including a description of the services provided by the agency, whether they provide a groundwater reduction service, published water rates, rate setting process, outstanding debt, annual capital budgets, reserve targets, and bond ratings. The body of this memo focuses on the reserve targets of each agency for purposes of addressing the risk of revenue volatility.

Utilities use financial policies and standards to guide short-term and long-term goals. The goals/standards ensure long-term stability, so that the utility does not alter operations when unexpected problems arise. The policies and standards can be short-term oriented, such as cash conservation, or long-term oriented, such as rate stabilization funds. When combined, these policies allow for utilities to respond to unexpected shocks to their system in a deliberate, thoughtful way; the policies allow utilities to not have to rush a decision during a difficult time.

Financial planning and rate setting vary from utility to utility due to each utilities' operations. Some utilities have easy access to water and long-term customers, while other utilities may have more expensive water sources and/or customers that have large variances in demand each year. Therefore, for some utilities it is more acceptable to have larger reserves, since operations may be affected by forces outside of their control. The reserves may influence rating agency decisions, since rating agencies want to see an uninterrupted stream of revenue for debt service. Setting too high of a reserve may harm current customers because that reserve will not be acting for the improvement of operations and may just be considered excess working capital.

The following table summarizes the reserve targets reported from each agency.

Texas Benchmarking Summary – Reserve Targets		
Agency	**Operating Reserve**	**Capital Reserve**
City of Sugar Land Surface Water	50% of current year's budgeted expenses less any debt service reserve requirements.	No Capital Reserve
City of Missouri City	6-month Operating Reserve (180 days of operating expenses)	$3 million
City of Houston	Maintain operating reserves of at least 425 days of O&M	Maintain capital reserves at minimum of 2.5% of total outstanding bond principal of water and wastewater system
North Harris County Regional Water Authority	Coverage Fund- 25% of max annual debt service Coverage- 1.2x Improvement Fund- Excess cash flows into this fund and is used in adjusted coverage test	Fund capital improvements fund with excess cash if available
North Fort Bend Water Authority	No Response	Reserve if a line breaks
City of Conroe	Maintain a fund balance of 25% of O&M (90 days)	No Capital Reserve
Gulf Coast Water Authority	No Response	No Response
Baytown Area Water Authority	No Response	No Response
Trinity River Authority	Maintain 2 months working capital reserve for each division (60 days)	Goal of 25% variable rate debt to long-term debt

For reference, the recommendations from the prior GRP Rate Study Report dated April 11, 2014 recommended that the GRP Division consider the following reserve targets related to operating and capital:

- A Multi-Purpose Operating Reserve Fund equal to 23 months in 2015, 9 months in 2016, and 6 months thereafter.
- A Renewal and Replacement Reserve, funded with annual transfers equal to approximately $500,000 beginning in 2016.
- A Capital Reserve Fund funded with available sources after funding the operating and repair and replacement reserves.

Currently the target reserves are funded in cascading order. Specifically, the Multi-Purpose Operating Reserve Fund is funded first, the Renewal and Replacement Reserve Fund is funded second, and the Capital Reserve Fund is funded third. Due to lower than projected revenues, the GRP has not been able to fully fund the target Multi-Purpose Operating Reserve Fund, therefore the Renewal and Replacement and Capital Reserves have remained unfunded.

The current GRP financial plan targets a Multi-Purpose Operating Reserve Fund equal to 180 days, or 6 months, of operating expenses. The actual fiscal year-end days cash on hand for the past three fiscal years are summarized in the following table.

Historical Days Cash on Hand vs. Target			
Fiscal Year	**Actual**	**Target**	**Over (Under) Target**
FY 2016	135	270	(135)
FY 2017	65	180	(115)
FY 2018	72	180	(108)

2017 AWWA Water Utility Benchmarking

The AWWA publishes an annual benchmarking survey[1] containing key metrics for utilities to gauge how they compare to industry norms. Included in this benchmarking survey are business operations performance metrics such as days cash on hand and days working capital, as recorded at end of year. Days cash on hand is measured as unrestricted cash over total operating expenses less depreciation. This ratio indicates how long an enterprise may continue to pay its operating expenses only with available cash. Days of working capital are measured as current assets minus current liabilities. This ratio gives an indication about the cash conversion cycle. The table below summarize the median, as well as the 75th and 25th percentiles of these liquidity metrics for water utilities across the country and in the AWWA Region IV. In addition to Texas, Region IV includes the states of: AR, AZ, CO, ID, KS, LA, MO, NE, NM, OK, UT, and WY.

2017 AWWA Benchmarking - Water Utilities						
	All Water Utilities			Region IV		
Financial Target	**75th**	**Median**	**25th**	**75th**	**Median**	**25th**
Days cash on hand	485	292	191	323	234	112
Days of working capital	400	192	139	442	181	63

Industry Best Practices

A key consideration in the development of financial targets and policies for use in the multi-year financial plan is industry best practices. Two sources of financial best practices in the water and wastewater utility industry come from bond rating criteria scorecards and the GFOA. Each best practice source is discussed in detail below.

Bond Rating Agency Scorecards

Rating agencies recognize the significant risk inherent to water and wastewater utilities. As Fitch states[2], "numerous factors can cause financial volatility, including variations in water supply, weather related demand and economic cycles. Highly rated utilities set goals for appropriate margins, including debt service coverage, debt affordability, and reserve funding (rate stabilization, R&R, operating), and set rates that comply with these goals. Utilities operating in areas especially prone to rainfall volatility that consider the effect of such variability on their revenues and establish financial cushions or rate

[1] American Water Works Association. 2017 Utility AWWA Benchmarking.
[2] Fitch Ratings. U.S. Water and Sewer Rating Criteria, November 30, 2017

structures to deal with potential weather events are considered stronger than those that do not consider such risks."

The rating agencies quantify liquidity for local government utilities by comparing available cash (excluding debt service reserve amounts) to annual cash O&M expenses, or days cash on hand. Additionally, S&P reviews the actual cash balance when assessing a utility's risk profile, recognizing the economy of scale benefits recognized by larger utilities.

The following three tables summarize the three rating agency liquidity scorecard metrics - days cash on hand and actual cash balance.

Moody's Rating Scorecard						
Financial Target	**Aaa**	**Aa**	**A**	**Baa**	**Ba**	**B and below**
Days Cash on Hand	> 250	250 - 150	150 - 35	35 - 15	15 - 7	< 7

Fitch Rating Scorecard			
Financial Target	**Stonger**	**Midrange**	**Weaker**
Rating	*(AAA)*	*(AA)*	*(A and Below)*
Days cash on hand	> 120	75	< 60

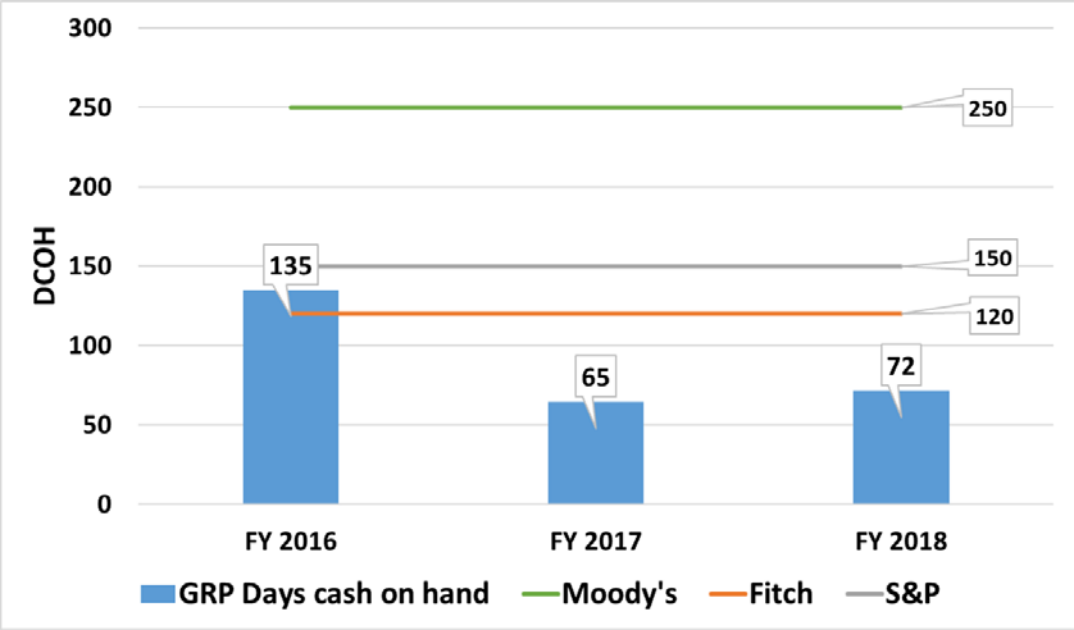
S&P Rating Scorecard						
Financial Target	**1**	**2**	**3**	**4**	**5**	**6**
Days cash on hand	> 150	150 - 90	90 - 60	60 - 30	30 - 15	< 15
Cash Balance	> $75 MM	$75 - $20 MM	$20 - $5 MM	$5 - $1 MM	$1 - $0.5 MM	< $0.5 MM

The ratings agency thresholds for the strongest score vary from 120 to 250 days of cash on hand. The days cash on hand is just one factor of many that go into determining a utility's bond rating but is nevertheless useful for establishing reserve best practices. The average of the three strongest thresholds equals approximately 180 days.

The rating agencies rate utilities so that utilities may issue debt. The rating agencies complete due diligence on utilities across the U.S. The rating agencies' recommendations are designed for credit investors, but their guidelines are used across the utility industry as a benchmark. Both utilities that plan on issuing debt and those that do not plan on issuing debt use these standards to guide their financial decision making. Utilities that do not plan on issuing debt must rely more heavily on cash financing. The highly rated credit recommendations emphasis high cash reserve levels, which relate directly to utilities that most rely on cash financing.

The graph below compares the GRP Division's actual year-end days cash on hand from FY 2016 through FY 2018 to the three rating agencies' highest rating thresholds.

Days Cash on Hand –
GRP Historical Actuals vs. Rating Agency Highest Rating Threshold



Government Finance Officers Association

The GFOA's published best practice of working capital targets for enterprise funds is relevant to the GRP Division. An enterprise fund in governmental accounting is a fund that provides goods or services to the public for a fee that makes the entity self-supporting, meaning no subsidization from a general fund. The GRP Division operates an enterprise fund operating without access to the SJRA General Fund. GFOA recommends that governments adopt a working capital target for enterprise funds. A working capital target is a measure of an enterprise fund's liquidity and ability to meet obligations. The calculation is equal to current assets minus current liabilities, expressed in days of operating expenses. This measurement is specifically applicable to the GRP Division, as it represents the agency's ability to mitigate current and future risks, including revenue volatility.

Specific considerations for calculating working capital include the utility's collection process, and only current assets that are anticipated to be realized in cash in the next year should be included in the calculation.

GFOA recommends starting with a baseline working capital target of ninety (90) days of annual operating expenses (which includes depreciation expense) and adjust based on characteristics of the utility. As an absolute minimum, GFOA recommends forty-five (45) days of working capital. Additionally, GFOA best practices suggest segregating reserves for specific purposes, especially for capital intensive enterprise funds such as the GRP Division.

The following table summarizes the GRP Division's actual days of working capital over the past three years as measured at the end of the fiscal year.

Historical Working Capital vs. GFOA Baseline			
Fiscal Year	Actual	GFOA Baseline	Over (Under)
FY 2016	215	90	125
FY 2017	128	90	38
FY 2018	160	90	70

The GFOA lists the following considerations for adjusting the ninety (90) days working capital target:

- Support from local government
  - If the enterprise fund is supported by taxes or transfers from general government, the target may be adjusted down. The GRP Division is not supported by any government fund.
- Transfers out
  - If the enterprise fund is expected to make transfers to general government, higher levels of working capital may be warranted. The GRP Division will not transfer any money to any government fund.
- Cash cycles
  - Volatile cash position throughout the year may warrant higher working capital targets. Water utilities are used as an example in the GFOA best practices standard, pointing out that they may have higher cash positions in the summer compared to winter, when higher consumption volumes result in higher revenue in summer months. These higher summer revenue months are in turn when the utility is at the most risk for revenue volatility, as high rainfall can drive down outdoor irrigation consumption. Also, the length of the billing cycle may warrant an adjustment in working capital.
- Demand for services
  - The level of volatility in demand. While water is relatively stable as customers will always be necessary, the amount however can fluctuate greatly from year to year.
- Control over rates and revenue
  - More revenue constrained enterprise funds, such as the GRP Division, may need higher levels of working capital.
  - The ability and ease of the utility to raise charges when needed, which the GRP does not have, may warrant low levels of working capital.
- Asset age and condition
  - Enterprise funds with newer and/or well-maintained assets may be able to adjust working capital target down but will still need capital emergency reserves.
- Volatility of expenses
  - The more stable expenses, the lower working capital target can be.
- Control over expenses
  - High fixed costs, such as the GRP's annual debt service expenses, warrant a higher working capital target.

- Management plans for working capital
    - If there are internally restricted funds, even though they may be reported as unrestricted on balance sheet, a utility may want to adjust these values out of the calculation to be conservative.
- Separate targets for operating and capital needs
    - Highly capital intense enterprise funds should consider designating operating and capital reserves separately.
- Debt position
    - Highly leveraged enterprise funds with variable debt service payments may warrant higher working capital targets.

Summary

In summary, recommendations for reserves and working capital have not significantly changed over the years. Having reserves and cash on hand that are needed to maintain the financial soundness of the agency remain important. Industry-standards provide a framework for meeting the goals of the Authority. The results of this benchmarking will be used in the development of the GRP rate study and risk assessment.

APPENDIX A

	Sugar Land	Missouri City
Entity Description	Operates a Water/Sewer Utility and a Surface Water Utility. Each utility operates as a separate enterprise fund.	Operates a Regional Surface Water Plant
GRP	Yes (in regard to Surface Water)	Yes
Policies		
Rate Setting	Cost of service; based on yearly budget	Budget and rates are sent to customers yearly
Rates	$1.75/1,000 Gallons- Surface Water $1.88/1,000 Gallons- (Surface Water + 7% Water Loss)- Groundwater	$1.72/ 1,000 gallons- Surface Water
Debt	$194,295,000- 2017 Outstanding Utility and Surface Water Debt New revenue bonds can only be issued when revenue is 125% of average annual debt service	$2,990,750- 2019 Debt Service $51,295,750- 2019 Total Outstanding Debt
Reserves	Surface Water- 50% of current year's budgeted expenses less any debt service reserve requirements. (Funds are unrestricted, may be used for debt, capital expenditure, etc.)	Operating Reserve- 6 months Debt Service Reserve- 1 year of debt service Capital Reserve (Designed to pay for emergency repairs, loss of revenue, etc.)- $3 million
CIP	$5,970,000- 2019 Surface Water CIP	$25,167,302- 2019 CIP
Bond Rating	Fitch (Surface Water)- AA+	Moody's- Aa2
Ratings Drivers[1,2]	Debt levels grew rapidly as a result of the surface water conversion project. System debt ratios are very high with debt to funds available for debt service of 7.5x and debt to net plant of 57%. Outstanding debt per customer is high at $3,250, compared to Fitch's 'AA' category median of $1,823. With the ensuing annexation of the municipal utility districts that will add approximately 10,000 connections to the system, the total projected debt per customer is expected to decrease to a more moderate $2,500 per customer in 2021. Debt amortization at 45% and 86% in 10 and 20 years, respectively, aligns to the 'AA' category median. Fitch	FACTORS THAT COULD LEAD TO AN UPGRADE - Moderation of debt profile - Significant tax base expansion - Substantial growth of reserves from a trend of operating surpluses FACTORS THAT COULD LEAD TO A DOWNGRADE - Prolonged or significant tax base contraction - Erosion of reserves - Additional debt issuance absent tax base growth Moody's

	Houston	North Harris County Regional Water Authority
Entity Description	Operates Water and Sewer System; both systems are under Public Works department. City looks at Public Works department as one entity.	Proves surface water to wholesale customers
GRP	No	Yes
Policies		
Rate Setting	Based on cost of service studies	Based on annual budgets
Rates	Rates based on Customer Class	$3.40/ 1,000 Gallons- Water pumped from non-exempt well $3.85/ 1,000 Gallons- Authority water
Debt	$6.7 billion- 2018 outstanding debt (Combined Utility) $240 million- 2018 water debt service	$29,682,333- 2018 Debt Service $1,239,328,310- 2018 Principal Outstanding
Reserves	Combined Utility system- maintain operating reserves at least 425 days of O&M for water Combined utility (water and wastewater)- maintain capital reserves at minimum of 2.5% of total outstanding bond principal	Debt Service Reserve Fund- Maximum annual debt service payment Coverage Fund- 25% of the max annual debt service Coverage test- 1.2 times coverage (counts cash balance in calculation)
CIP	870 million - 2015-2019 Water CIP	No Response
Bond Rating	Fitch- AA Moody's- Aa2	Fitch- A+ Moody's- A1
Ratings Drivers[1]	Management began implementing a series of rate increases to support its growing capital plan in fiscal 2010. These annual rate increases have enabled the system to sustain healthy financial metrics. Fitch calculated all-in DSC has ranged between 1.5x to 1.6x in four of the last five years through fiscal 2017. Although these coverage levels are weaker than the 2.1x median all-in DSC for 'AA' category rated credits, the substantial liquidity that the city has built-up helps to offset the lower coverage. At the close of fiscal 2017, the system maintained nearly 1,000 days cash on hand compared with the 572 'AA' category median. The robust cash reserves are facilitated	The authority has posted coverage ranging from 1.3x to 1.5x in the last five years, allowing it to build substantial liquidity and maintain healthy reserves. Liquidity at Dec. 31, 2017 was robust with unrestricted cash at $180 million (more than eight years of operations and maintenance [O&M] spending). Fitch

	by flow of funds that end with the accumulation of monies after all obligations are satisfied in the general purpose fund (GPF). The use of the GPF is restricted for system improvements and a limited portion for city drainage purposes. At the close of fiscal 2017, the GPF had an available balance for debt service of $751.8 million, more than three times the amount available prior to the system's implementation of annual rate increases. Fitch	

APPENDIX C:
WEATHER DERIVATIVES MEMO

MEMO

To: San Jacinto River Authority, GRP Division
From: Raftelis Financial Consultants
Date: November 9, 2018 (original/draft); July 12, 2019 (final)
Re: SJRA GRP Rate Study – Weather Derivatives Review

Weather Derivatives Background

Weather derivatives are products that various industries have utilized as a risk management tool to hedge against weather-related revenue instability. Financial institutions and investors are interested in these products because they provide uncorrelated market returns and are therefore a means for them to diversify their investment portfolio.

The primary industries that have historically utilized weather derivatives as a risk management strategy include energy and power utilities, agriculture, and shipping companies. The weather derivatives are intended to hedge against volume risks, not necessarily price risk, for these industries. Typically, the adverse weather conditions do not impact a unit price of product sold, but instead impact the demand for the product, therefore impacting revenue. In industries where weather also creates a price risk, other financial instruments such as commodity derivatives can also be utilized.

Technical Details

Weather derivatives are typically based on certain measurable triggers, usually temperature. Because it is a relatively new market, especially in the water utility industry, other triggers could be explored that may be more correlated with revenues such as precipitation levels or actual customer usage. Financial institutions will analyze historical actuals and trends to determine the appropriate trigger point. When the trigger point is exceeded, payouts are typically based on a dollar amount per unit above the established trigger value, up to a maximum payout amount.

The primary benefit of weather derivatives in the water utility industry is to minimize economic uncertainty due to weather, particularly in the short-term. Due to the high fixed cost nature of the industry, there is minimal flexibility for utilities to cut expenses to offset any under-recovery of revenue. The weather derivative payouts in lower revenue years could help offset this risk.

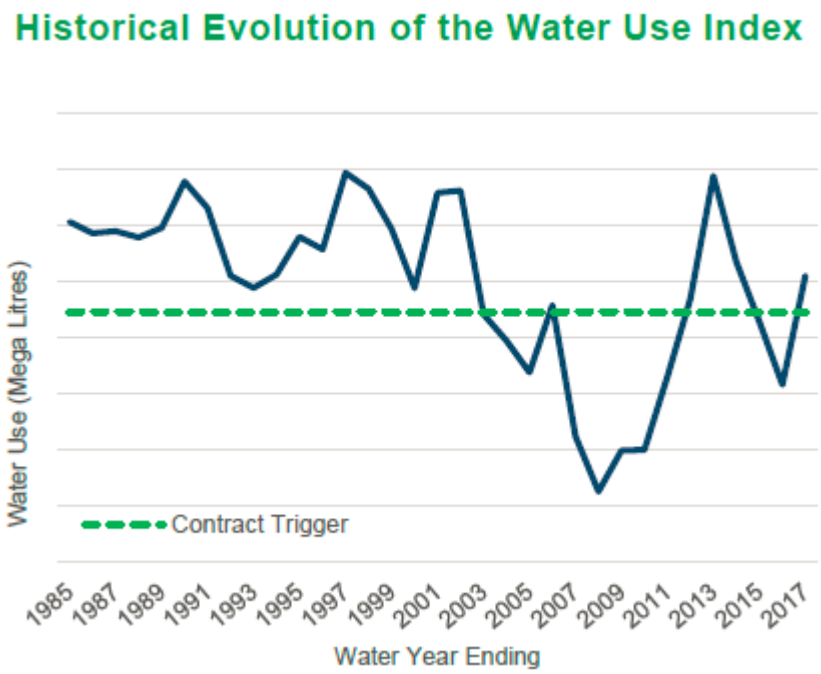
There are however disadvantages to weather derivatives which is likely why they are not common. First, the premium payment on the weather derivative will result in an immediate addition to a utility's revenue requirement, possibly necessitating a rate adjustment. Secondly, from a financial viewpoint the law of averages suggests that in the long-run the cost of the financial instrument will exceed the benefits received.

Use in Water Utility Industry

The appeal for weather derivatives in the water industry is that they can be used to stabilize a utility's revenue stream. Water utilities typically have all or a part of revenues based on variable water rates.

Weather can have a major impact on the actual consumption of water, resulting in revenue volatility. However, weather derivatives are not commonplace in the industry.

One example of weather derivatives being utilized in the water industry is an Australian firm. Nephila Climate offered this product to help the utility hedge against low water use by customers due to drought restrictions. In this case, a 3-year term was negotiated with a level of actual customer water use established as the trigger for payouts. The trigger is based on an analysis of historical average water use of the utility. The following chart[1] summarizes the contract trigger evaluation:



When water use falls below the negotiated trigger value, the water utility receives a payment from Nephila Climate. The published contract cost for this product was 54,000,000 AUD.

While Raftelis is not aware of any other water utilities that have purchased weather derivatives, some Colorado water utilities considered them following the historical floods in 2013. In this case, high rainfall caused significant damage to infrastructure, resulting in large unexpected capital outlays.

GRP Division Applicability

Weather is an inherent risk to the water utility industry. The GRP Division is especially prone to this risk since all rate revenues are based on actual consumption.

The GRP Division now has four years, FY 2015 through FY 2018, of historical actual Participant usage data. In order to compare rate revenue between the four years, Raftelis normalized revenue to bring each year to 2018 dollars. Two adjustments were made to actual revenue in FY 2015 – 2017 to normalize, or make comparable, to 2018 figures. First, rates have increased annually, each year's revenue was recalculated assuming 2018 rates were in effect. Second, annual growth in population,

[1] Sourced from "Risk Transfer for Municipal Water Services" presentation by Nephila Climate dated February 2018.

and resulting customer base, has averaged approximately 3% in the District area the past three years, as presented in the table below.

Population per CAFR			
	2015	2016	2017
Barrett	3,199	3,199	4,720
Baytown	76,172	76,335	75,992
Crosby	5,899	5,977	5,977
Grimes County	27,172	27,512	27,671
Highlands	7,522	7,522	7,515
Liberty County	78,117	79,654	81,704
Montgomery County	518,947	537,559	556,203
San Jacinto County	27,099	27,413	27,707
Waller County	46,820	48,656	50,115
Walker County	68,789	70,699	71,484
Total	859,736	884,526	909,088
Percentage Change		*2.9%*	*2.8%*

Total consumption for each year was adjusted by the 3% annual growth factor to bring it in line with FY 2018 consumption. The following table summarizes the results of normalized rate revenue, or the previous four years of revenue, restated in FY 2018 figures.

Historical Revenue Normalization in 2018 Dollars				
Description	**2015**	**2016**	**2017**	**2018**
Historical Revenues				
GW Revenue	$38,529,534	$31,535,107	$31,387,159	$38,661,813
SW Revenue	$0	$13,234,667	$18,183,641	$12,682,971
Total	$38,529,534	$44,769,774	$49,570,800	$51,344,784
Revenues Normalization - Growth	$4,669,273	$3,279,500	$1,610,503	$0
Revenues Normalization - Rate Increases	$6,749,036	$6,008,143	$2,693,334	$0
Normalized Historical Revenues	$49,947,844	$54,057,417	$53,874,637	$51,344,784

From an absolute value dollar perspective GRP rate revenue has fluctuated between a low of $38.5 million in FY 2015 to $51.3 million in FY 2018, a difference of $12.8 million. However, after adjusting historical revenue for rate increases and growth to bring them into a comparable FY 2018 value, revenues have fluctuated from a low of $50.0 million in FY 2015 to a high of $54.1 million in FY 2016, a difference of $4.1 million.

In addition to fluctuations in rate revenue, Raftelis also reviewed the historical operating and maintenance (O&M) expenses. The following table summarizes the variances in budgeted versus actual O&M and total revenue each year, and the resulting net surplus or deficit.

Actual vs. Budgeted O&M and Total Revenue Variances					
Description	**2015**	**2016**	**2017**	**2018**	**Total**
Budgeted O&M	$14,969,873	$21,903,329	$21,143,909	$22,130,548	
Actual O&M	7,846,865	16,162,791	19,627,646	17,690,466	
Variance	7,123,008	5,740,538	1,516,263	4,440,082	
Budgeted Revenue	49,589,333	50,686,645	56,290,072	59,768,608	
Actual Revenue	38,529,534	47,082,590	50,751,231	55,842,624	
Variance	(11,059,799)	(3,604,055)	(5,538,841)	(3,925,984)	
Net Surplus / (Deficit)	($3,936,791)	$2,136,483	($4,022,578)	$514,098	($5,308,788)

Based on this review, the GRP Divisions has experienced historical variances in budgeted versus actual in both O&M expenses and total revenues (driven by rate revenues). Expenses have historically been over-projected resulting in a positive variance, while revenues have been over-projected resulting in a negative variance. The net effect each year has varied, with some years resulting in a net surplus, others in a net deficit.

Recommendations

Based on limited use in the industry, Raftelis does not recommend the GRP Division purchase weather derivative products today. Instead, the GRP Division should continue to monitor weather patterns and their effect on revenue for a few more years, at which time it may be worth reassessing.

In the meantime, other more common industry approaches to address revenue volatility risk that Division should consider include:

1) Establishing a Rate Stabilization Reserves
    - Rate stabilization reserves are much more common in the water utility industry. They are reserves set aside to cover shortfalls of revenue in low consumption years and replenished after their use or in years of higher than anticipated consumption.
    - A target reserve value for the Division is equal to $4.0 million dollars, or the approximate difference between a normalized high and low revenue year, calculated based on historical actual results.
    - This is a better long-term solution compared to weather derivatives. In the long-run, the law of averages suggests weather derivatives are more expensive.
2) Revision of revenue forecasting based on historical actual results.
3) Revision of expense forecasting. A review of historical projected expenses versus actuals shows more volatility on the expense side than the revenue side.
4) If legally defensible, many utilities implement a monthly base charge to customers. This provides for a guaranteed stream of revenue to help minimize swings in revenue due to consumption.
5) Wet weather surcharge.
6) Rate adjustments in years following lower than anticipated consumption that results in lower revenue.

APPENDIX D:
RATE DIFFERENTIAL MEMO

RAFTELIS

MEMO

To: Matt Corley
From: Angie Flores
Date: April 15, 2019 (original/draft); July 12, 2019 (final)
Re: Groundwater Rate Differential (Avoided Groundwater Pumping Cost)

Summary
The Groundwater Reduction Plan (GRP) Division derives revenue from a surface water fee and groundwater fee. The difference between the rates is driven by the rate differential. The rate differential represents the costs that surface water Participants would have incurred had they continued pumping groundwater. This adjustment recognizes avoided costs by Participants using surface water and is intended to produce an equitable per 1,000-gallon surface water fee and groundwater fee for Participants. The existing rate differential was determined by calculating the estimated weighted average of groundwater pumping avoided costs of servicing the groundwater wells as provided by a few participants of the GRP. In the previous rate study, the rate differential was calculated to be $0.19/1,000 gallons.

The GRP Division is updating its rates and financial planning model. As part of this update, the rate differential calculation is being reviewed. To update the calculation, the GRP contacted its seven (7) participants that currently purchase surface water. The groundwater costs incurred by these participants should reflect the groundwater costs that have been avoided by its reduction in groundwater usage. Of the seven (7) participants, three (3) participants provided groundwater costs. The years considered are FY 2016 – FY 2018, which these reflect the years that these participants have taken surface water.

This memo describes calculation update of the rate differential for the FY 2020 GRP Rate Study.

FY 2020 GRP Rate Study – Rate Differential Calculation

In this update of the GRP rate study, the rate differential is recalculated based on updated well costs from the City of Conroe, Southern Montgomery County MUD, and the Woodlands division of SJRA. Each entity included expenses only applicable to well operations. The expenses provided include fixed and variable costs related to well operations. **Tables 1-3** display the total costs and pumpage that the cities used in their well operation. The three participants also provided the amount of groundwater pumped for the same time periods in which the costs were incurred.

Table 1 City of Conroe Costs

Account Description	Well O&M costs		
	FY16	FY17	FY18
Labor Costs (including benefits)	$ 346,403	$ 421,826	$ 439,234
Auto and Truck maintenance (fuel, repair, etc.)	$ 76,846	$ 74,366	$ 79,813
Utilities (power, natural gas, wireless service)	$ 629,135	$ 576,879	$ 907,001
Chlorination (chlorine and chlorinators)	$ 35,639	$ 28,016	$ 36,910
Other Chemicals (flouride, lub,polyphosphates, etc.)	$ 53,041	$ 37,478	$ 25,801
Laboratory expenses	$ 24,084	$ 45,956	$ 79,312
Well maintenance and repairs	$ 426,794	$ 322,596	$ 124,293
TCEQ Fees	$ 54,853	$ 62,365	$ 62,365
Lone Star Groundwater Conservation Fees	$ 29,030	$ 29,030	$ 29,030
SJRA Qrtrly Allocation Fees	$ 94,248	$ 124,349	$ 207,079
Uniforms, Travel, Training	$ 29,546	$ 21,753	$ 23,810
Generator Contract	$ 32,388	$ 33,317	$ 47,435
Total	**$ 1,832,007**	**$ 1,777,931**	**$ 2,062,084**
Annual Groundwater Volume (million gallons)	**2,387**	**1,841**	**2,609**

Table 2 Southern Montgomery County MUD Costs

Account Description	Well O&M costs		
	FY16	FY17	FY18
Laboratory Expense	$ 7,885	$ 7,229	
Water Plant M&R	$ 54,610	$ 74,752	$ 70,625
Fuel & Lubricants	$ 2,819	$ 5,749	$ 282
Chemicals	$ 10,645	$ 12,842	$ 15,002
Water Well Performance Testing	$ 4,750	$ 5,000	
Telephone Expense	$ 820	$ 1,301	
Utilities	$ 108,214	$ 110,916	$ 73,549
Total	**$ 189,744**	**$ 217,788**	**$ 159,458**
Annual Groundwater Volume (million gallons)	**198**	**188**	**251**

Table 3 Woodland Costs

Account Description	Well O&M costs		
	FY16	FY17	FY18
Labor Costs - Direct	$ 411,779	$ 464,631	$ 497,517
Labor Costs - Executive	$ 1,014	$ 846	$ 878
Labor Costs- Technical Services	$ 2,346	$ 2,756	$ 2,558
Labor Costs - SCADA	$ 52,844	$ 51,981	$ 52,447
Benefits - Direct	$ 182,139	$ 212,740	$ 245,216
Benefits - Executive	$ 275	$ 228	$ 240
Benefits - Technical Services	$ 846	$ 1,040	$ 990
Benefits - SCADA	$ 19,809	$ 21,941	$ 22,961
Auto and Truck maintenance	$ 8,334	$ 8,572	$ 10,039
Fuel	$ 8,476	$ 8,564	$ 12,876
Utilities-Gas	$ 2,533	$ 3,077	$ 3,673
Utilities-Electric	$ 697,586	$ 673,616	$ 762,782
Chlorine	$ 18,177	$ 18,780	$ 25,146
Chlorinators	$ 13,917	$ 10,918	$ 9,474
Well Lubrication	$ -	$ -	$ -
Other Chemicals	$ -	$ -	$ -
Chemicals	$ -	$ -	$ -
Laboratory expenses-Lab Equipment	$ -	$ -	$ -
Supplies Lab	$ -	$ -	$ -
Chemicals-Lab	$ -	$ -	$ -
Well maintenance and repairs	$ 20,472	$ 4,311	$ 3,715
Well Rehab	$ 94,447	$ 120,762	$ 393,123
Auxiliary power costs (equipment maint., fuel, etc.)	$ 3,026	$ 2,070	$ 18,187
Instrumentation (repairs, calibration)	$ 51	$ 298	$ 27
Electrical	$ 12,373	$ 10,061	$ 28,870
Pumps & Motors	$ 1,673	$ 3,252	$ 6,875
Tanks	$ -	$ -	$ -
Lines & Valves/Pipes	$ -	$ -	$ -
Engineering (Well Operations Plan)-KIT PROFESSIONALS	$ -	$ -	$ -
Total	**$ 1,552,117**	**$ 1,620,445**	**$ 2,097,593**
Annual Groundwater Volume (million gallons)	**2,677**	**2,202**	**3,222**

In considering the costs and the nature of the costs, it was decided that fixed costs not be included in the calculation of the rate differential. Fixed costs will not fluctuate based on reduced pumping and will therefore remain steady. Variable costs on the other hand will fall as groundwater pumping is decreased. Cost savings will be recognized through the avoided variable costs; therefore, the rate differential should be calculated using the variable costs. **Tables 4-6** display the variable costs that are included in the calculation.

Table 4 City of Conroe Variable Costs

Account Description	Well O&M Costs FY16	FY17	FY18
Utilities (power, natural gas, wireless service)	$ 629,135	$ 576,879	$ 907,001
Chlorination (chlorine and chlorinators)	$ 35,639	$ 28,016	$ 36,910
Other Chemicals (flouride, lube, polyphosphates, etc.)	$ 53,041	$ 37,478	$ 25,801
Well Maintenance & Repairs	$ 426,794	$ 322,596	$ 124,293
Total	**$ 1,144,609**	**$ 964,969**	**$ 1,094,005**
Annual Groundwater Volume (million gallons)	**2,387**	**1,841**	**2,609**

Table 5 Southern Montgomery County MUD Variable Costs

Account Description	Well O&M Costs FY16	FY17	FY18
Water Plant M&R	$ 38,227	$ 43,317	$ 70,625
Fuel & Lubricants	$ 282	$ 575	$ 282
Chemicals	$ 10,113	$ 12,200	$ 15,002
Utilities	$ 75,750	$ 77,641	$ 73,549
Total	**$ 124,371**	**$ 133,733**	**$ 159,459**
Annual Groundwater Volume (million gallons)	**198**	**188**	**251**

Table 6 Woodlands-SJRA Variable Costs

Account Description	Well O&M Costs FY16	FY17	FY18
Utilities-Gas	$ 2,533	$ 3,077	$ 3,673
Utilities-Electric	$ 697,586	$ 673,616	$ 762,782
Utilities-Fuel	$ 8,564	$ 8,476	$ 12,876
Chlorine	$ 18,177	$ 18,780	$ 25,146
Chlorinators	$ 13,917	$ 10,918	$ 9,474
Well Maintenance & Repair	$ 20,472	$ 4,311	$ 3,715
Well Rehab	$ 94,447	$ 120,762	$ 393,123
Auxiliary Power Costs (equipment maint., fuel, etc.)	$ 3,026	$ 2,070	$ 18,187
Total	$ 858,722	$ 842,010	$ 1,228,976
Annual Groundwater Volume (million gallons)	**2,677**	**2,202**	**3,222**

A weighted average cost per 1,000 gallons was then calculated using the numbers for each of the three participants above. By using a weighted average, the calculation gives more weighting to the larger participants which have a lower per unit cost. **Table 7** displays the calculations.

Table 7 Unit Cost Calculations

Total Expenses	2016	2017	2018
Conroe	$ 1,144,609	$ 964,969	$ 1,094,005
Southern Montgomery County MUD	$ 124,371	$ 133,733	$ 159,459
Woodlands-SJRA	$ 858,722	$ 842,010	$ 1,228,976
Total	**$ 2,127,702**	**$ 1,940,712**	**$ 2,482,440**
Groundwater Pumpage (MG)			
Conroe	2,387	1,841	2,609
Southern Montgomery County MUD	198	188	251
Woodlands-SJRA	2,677	2,202	3,222
Total	**5,262**	**4,231**	**6,082**
Cost/1,000 Gallons of Groundwater Pumpage			
Conroe	$ 0.48	$ 0.52	$ 0.42
Southern Montgomery County MUD	$ 0.63	$ 0.71	$ 0.64
Woodlands-SJRA	$ 0.32	$ 0.38	$ 0.38
Weighted Average Cost	$ 0.40	$ 0.46	$ 0.41

The average cost from FY 2016- FY 2018 is $0.42/1,000 gallons. A discount for surface water recipients to address alkalinity issues considered in the 2014 Rate Study is not considered in this study due to reducing blended ratio to 35% surface water and 65% groundwater, which virtually removes the impact of treated surface water on wastewater.

Conclusion

The GRP Division recommends implementing a cost differential of $0.42/1,000 gallons.