Testimony

of

GREGG M. GIASSON, PE

before the

PUBLIC UTILITIES COMMISSION

for

PROVIDENCE WATER

DOCKET# _____

May 16, 2016

Q. Please state your name and your position.

A. My name is Gregg M. Giasson and I am the Deputy General Manager of Operations/Executive Engineer for the Providence Water Supply Board. I have general oversight of the Engineering, Water Supply and Transmission & Distribution Departments.

Q. Please describe your educational background and work experience.

A. I obtained a Masters of Science in Environmental Engineering from Worcester Polytechnic Institute in 2001 and a Bachelor of Science in Civil Engineering from Tufts University in 1992. I have worked for the Providence Water Supply Board for three and a half years, the first two years as the Senior Director of Operations and the last year and a half as the Deputy General Manager of Operations/Executive Engineer. From 2008 to 2012, I worked for the Pawtucket Water Supply Board as the Assistant Chief Engineer/Chief of Operations. Prior to Pawtucket, I worked at the consulting firm Camp, Dresser & McKee for 12 years where I worked on a variety of drinking water projects as both a project engineer and project manager. I am a Registered Professional Engineer in the State of Rhode Island.

Q. What items are being addressed in this testimony?

A. My testimony will cover the following:

(a) Infrastructure and Capital Improvement Plans;

(b) Transmission versus distribution mains;

(c) Additional staffing needs.

(d) Chemical and Sludge Maintenance Fund

Infrastructure (IFR) and Capital Improvement (CIP) Plans

Q. What are the requirements of the IFR Plan?

A. In accordance with Rhode Island General Law (RIGL) 46-15.6 and the Rhode Island Department of Health's (RIDOH) Rules and Regulations for Clean Water Infrastructure Plans, all water utilities that sell more than 50 million gallons per year shall prepare an IFR Plan. The IFR Plan shall be updated every five (5) years and shall be sufficient in scope to ensure the proper operation of the water utility. In addition, the IFR Plan shall provide a funding mechanism for all the recommended improvements in the IFR Plan.

The IFR Plan is to be submitted to and approved by the RIDOH. In addition, "The Rhode Island Public Utilities Commission, as to water suppliers within its jurisdiction, shall permit an increase for just and reasonable infrastructure replacement in the portion of the water suppliers' rate structure to comply with this chapter and shall allow the water supplier to add this required funding to its rate base in accordance with this chapter." (RIGL 46-15.6-6(5))

Q. Has Providence Water submitted an updated IFR Plan to the RIDOH?

A. Yes. In December of 2015, Providence Water submitted the required 5 year update of the IFR Plan to the RIDOH.

Q. Has the IFR Plan been approved by the RIDOH?

A. To date, Providence Water has not received formal (in writing) approval from the RIDOH. In accordance with RIGL 46-15.6-5, the RIDOH has 8 months to provide approval of the IFR Plan. If nothing is received within the 8 month review period, that shall constitute approval of the IFR Plan by the RIDOH. Please note that Providence Water has not received a formal (in writing) approval from the RIDOH since the 2005 IFR plan submittal.

Q. What are the highlights of the IFR Plan?

A. The IFR Plan provides a 5 year expenditure plan for fiscal years 2016 through 2020 (see schedule **SS NEP-12C-1**) and a 15 year expenditure plan for fiscal years 2021 through 2035 (see **Exhibit GMG-1**). The plan proposes just over $158 million of IFR spending in the first 5 years and just over $621 million of IFR spending in the next 15 years.

5-year plan

The majority of the spending in the first five years of the IFR plan is focused on: (a) perpetual water main rehabilitation; (b) completion of the filtration system improvements and plant influent projects at the water treatment plant (WTP); (c) inspection/repairs of the 78-inch/102-inch and 90-inch transmission mains; and (d) preliminary design work for the improvements to the clarification system at the WTP.

15-year plan

For the following 15-year period, the majority of spending is focused on; (a) perpetual water main rehabilitation, (b) improvements to the clarification system at the WTP, and (c) rehabilitation/inspection of the 78-inch/102-inch and 90-inch transmission mains.

Q. Is there a difference between the expenditure plan provided in the IFR and the exhibits provided in this rate filing?

A. Yes. Because of the magnitude and disparity in the eventual project cost for the clarification process improvements, only design and baseline costs were included in the 5 year plan. These baseline costs would be incurred regardless of what clarification process was chosen. It is anticipated that Providence Water will file another rate filing prior to embarking on the clarification process improvement project and the project costs will be known and measurable at that time. More information is provided on the clarification improvement project later on in this testimony.

Q. How many miles of main does Providence Water plan on rehabilitating each year?

A. Since 1997, Providence Water has rehabilitated approximately 47 miles of water main in our distribution system (See **Exhibit GMG-2**). The amount of main rehabilitated per year increased significantly as part of the Consent Agreement made with the RIDOH in 2013. In addition, a good portion of the water main in our distribution system is either at or beyond its useful life. Consequently, on a perpetual basis, Providence Water will attempt to rehabilitate

a minimum of 10 miles of water main per year. As shown in **Exhibit GMG-2**, the cost per foot to rehabilitate water main varies. This is due to several factors, including but not limited to the following:

(1) the type of rehabilitation (replacement versus cleaning and lining);

(2) the amount of other utilities in the roadway;

(3) the amount of pavement restoration and police details;

(4) contractor availability and current economic conditions;

(5) the location of the work (urban area versus rural area); and

(6) the amount and type of services (copper versus lead).

As part of the design process, Providence Water analyzes the area where the main rehabilitation is taking place and determines the best method for minimizing the cost per foot. As of FY2015 (see **Exhibit GMG-2**), the average cost per foot for main rehabilitation was approximately $232/foot. Therefore, if this cost applies in FY2018, Providence Water will accomplish ~14 miles of main rehab in FY2018. If the cost per foot is more, less main will be rehabilitated, and vice versa.

Q. Is Providence Water still under a Consent Agreement with the RIDOH?

A. No. Providence Water had previously entered into a Consent Agreement with RIDOH because of Providence Water's non-compliance with the Lead and Copper Rule (LCR). However, Providence Water was below the Lead Action Limit (LAL) of 15 parts per billion

(ppb) for two consecutive 6-month semesters (January through June of 2015 and July through December of 2015). As a result, Providence Water was in compliance with the LCR and was not required to enter into a Consent Agreement with RIDOH.

Q. Will not being under a Consent Agreement with RIDOH result in a cost savings for Providence Water?

A. No. The requirements of the Consent Agreement are best management practices for minimizing the lead at our customers tap. We believe it is in the best interest of our customers to continue and enhance the requirements of the Consent Agreement. The requirements include public education and outreach, main rehabilitation, water main flushing and evaluation and possible enhancement of our corrosion control strategy.

Q. Is Providence Water still working with the expert panel?

A. Yes. Providence Water meets with the expert panel as needed to provide guidance on our corrosion control and lead reduction efforts. The expert panel is comprised of; Mike Schock – USEPA, Marc Edwards – Virginia Tech, Abagail Cantor – Process Research Solutions, Inc., Dan Giammar – Washington University, and Stephen Estes-Smargiassi – MWRA.

Q. What is the status of the Filter System and Influent Improvement projects?

A. The Filter System Improvements are scheduled to be substantially complete in July 0f 2016 and the Influent Improvements are scheduled to be substantially by the end of 2016.

Q. Why is Providence Water proposing to spend approximately $184 million on inspection and rehabilitation of the major transmission mains?

A. There are two major transmission lines that deliver water from the WTP to our retail and wholesale customers, the 90-inch aqueduct and the 78-inch/102-inch (78/102) aqueducts. The 90-inch aqueduct is mostly a bedrock tunnel that requires relatively minimal inspection and rehabilitation. On the other hand, the 78/102 was built in the 1960s and is constructed mostly of prestressed concrete cylinder pipe (PCCP) and requires a great deal of inspection and maintenance. In 1996, Providence Water had a major failure of the 102-inch on Oaklawn Avenue in Cranston. As a result of the 1996 break, Providence Water has installed a fiber optic monitoring system and inspects the pipeline every 5 years. Many utilities throughout the country struggle with pipes of this type and vintage. The last two inspections of the 78/102 have revealed several issues: (1) the shutdown and reactivation of the pipeline is artificially aging the pipeline; and (2) the pipeline is deteriorating at a pace quicker than expected. As such, Providence Water has been evaluating different repair methods and replacement options to provide a long term solution for the 78/102. Providence Water anticipates some major repairs and renovations to the 78/102 in the latter half of the 20 year IFR plan.

Q. Why is Providence Water proposing to spend approximately $146 million on improvements to the clarification system?

A. After the Filtration and Influent Improvements projects are completed, the other major component of the WTP that needs to be replaced is the clarification system.

The current clarification process involves the addition of a coagulant (ferric sulfate) and pH adjustment (lime) to destabilize particles. The particles are mostly sediment and naturally occurring organic matter (NOM). The destabilized particles then pass through the tangential mixer to create larger particles that are heavier and more likely to settle. From the tangential mixer, the water enters the sedimentation basins where the larger particles are removed via settling. The clarification process is where the majority of large particles and NOM are removed. The NOM is a precursor to disinfection byproducts (DBP) such as trihalomethanes (THM) and haloacetic acids (HAA). Water from the clarification process is then delivered to the filtration process.

The existing clarification process is from the original construction in the 1920's and is approaching the end of its useful life. In addition, Providence Water is concerned that the existing sedimentation basins may not be able to handle future regulatory water quality requirements.

Providence Water has commissioned a pilot plant study to evaluate alternative treatment processes to replace the existing sedimentation basins. Preliminary cost estimates from this study have indicated that the cost for replacement could range anywhere between $90 million to $146 million. These costs are for alternative methods, and do not include a cost to repair

and/or replace the existing basins in kind. The option to utilize the existing clarification process is still a possibility and a cost for this option is currently being developed.

The pilot study is scheduled to be completed by the end of calendar year 2017. At that point a process will be chosen and design will begin. It is anticipated that the design of the clarification improvements will begin in FY2018.

Q. Does Providence Water have a plan for spending the funds in the restricted Capital Fund?

A. A listing of the proposed spending for the CIP is included with Nancy Parrillo's testimony as **SS NEP-12A-1.**

Q. Can you provide the highlights of the CIP Plan?

A. A summary of the major spending items, other than the Central Operation Facility (COF), is summarized below.

Renewable Energy/Feasibility Study

Providence Water has commissioned a study to evaluate use of solar power to reduce long term operating costs. Providence Water has identified several sites that may be utilized for solar panels. The evaluation will investigate the benefits of either a Power Purchase Agreement (PPA) or outright purchase of solar panels. Preliminary results of the evaluation indicate that the best option is the outright purchase of solar panels and utilize them at the

COF at 125 Dupont Drive. The estimate for purchase and installation of the solar panels is approximately $2,500,000.

Asset Management and Work Order System

Providence Water's existing asset management/work order (AM/WO) system is over ten (10) years old and is both outdated and no longer supported by Hansen, who is the manufacturer of our current software. The AM/WO system is the backbone of Providence Water's operation and is crucial for the planning of our daily operations and long term capital planning. The cost for the purchase and installation of new AM/WO software is estimated to be $2,000,000. Providence Water has received bids for the replacement of the AM/WO system and is currently in the bid evaluation phase of this project.

Orthophosphate System

As part of the Consent Agreement with the RIDOH, Providence Water has been required to conduct pipe loop studies to evaluate alternative corrosion control chemicals. The pipe loop studies have shown that the addition of orthophosphate helps mitigate lead spikes in the warmer months. After discussions with our expert panel, Providence Water has been advised to evaluate utilizing orthophosphate on a full scale. As such, Providence Water is investigating the possibility of doing a full scale pilot test to evaluate the effectiveness and dosing of the orthophosphate. If effective, Providence Water would proceed with the design and implementation of an orthophosphate storage and feed system. The design and construction of the full scale chemical feed system is estimated to cost $1,350,000.

Water Main Tie-ins

Due to the way the distribution system was built out, there are a lot of dead-ends in our system. Dead end mains are mains that are not looped and receive a supply of water from only one source. Because these mains are not looped, the flow velocities for these mains are sometimes low, and water in these mains can be stagnant which can lead to these mains having a greater amount of water quality complaints and flow issues than mains that are looped.

Providence Water estimates that we have approximately 5,100 dead-ends in our distribution system. Not all of the 5,100 dead-ends can be connected due to hydraulic and physical constraints. There are approximately 350 dead end mains in our distribution system that can potentially be connected. It is estimated that, on average, it would require ~ 170' of pipe to connect each dead end at a cost of approximately $250/linear foot. As such, if Providence Water connected 350 dead end mains, it would cost approximately $15,000,000. At this time, Providence Water proposes to do $1,000,000 in tie ins and then evaluate the effectiveness of this program.

Cybersecurity

As summarized in the February 2013 Presidential Executive Order 13636

"*Repeated cyber intrusions into critical infrastructure demonstrate the need for improved cybersecurity. The cyber threat to critical infrastructure continues to grow and represents one of the most serious national security challenges we must confront. The national and economic security of the United States depends on the reliable functioning of the Nation's critical infrastructure in the face of such threats. It is the policy of the United States to*

enhance the security and resilience of the Nation's critical infrastructure and to maintain a cyber environment that encourages efficiency, innovation, and economic prosperity while promoting safety, security, business confidentiality, privacy, and civil liberties. We can achieve these goals through a partnership with the owners and operators of critical infrastructure to improve cybersecurity information sharing and collaboratively develop and implement risk-based standards."

To this end, Providence Water has conducted a preliminary study to evaluate our cybersecurity needs. Preliminary cost estimates range from $1 to $1.5 million to properly protect Providence Water's critical infrastructure.

Transmission versus distribution mains

Q. How does Providence Water plan to allocate transmission and distribution mains?

A. Providence Water will allocate 12-inch mains and below as distribution mains and 16-inch mains and above as transmission mains. As stated in Docket 4406, 12-inch mains and below do provide support to our transmission mains depending on the demand patterns within our transmission/distribution system. However, for ease of rate making, Providence Water has chosen to allocate transmission and distribution mains as stated above.

Additional Staffing needs

Q. What additional staffing is Providence Water proposing?

A. The additional staffing needs fall under four categories; (1) Flushing, (2) Security, (3) Information Technology and (4) East Smithfield.

Flushing

As outlined in Docket 4406, Providence Water was developing a Unidirectional Flushing (UDF) program to strategically flush our entire distribution system. Providence Water embarked on our flushing program in 2013. The UDF program has become critical to our operation and provided the following benefits: (1) maintaining water quality within the distribution system by removing stagnant water and accumulated sediment; (2) extending the life of older mains that need to remain in service until they can be rehabilitated; and (3) relief of temporary water quality issues due to distribution system disruptions (i.e. flow reversals due to hydrant operations, and main shutdowns). As a result, Providence Water has created a dedicated flushing division. After 2 plus years of conducting the flushing program, Providence Water has determined that the optimal staffing level for the flushing division is 12 employees. This would include two (2) three person crews, and a supervisor, that conduct the majority of the flushing at night. In addition, a four person crew, with a supervisor, working during the day to conduct temporary flushes to provide water quality relief and to prepare valves for the upcoming night flush. Providence Water has reallocated resources to get the number of dedicated flushing employees up to 9. The additional five employees would increase the dedicated flushing employees to 12 and replenish the reallocated resources from the Transmission & Distribution department. The 12 dedicated flushing employees will allow Providence Water to achieve our goal of flushing one quarter (or approximately 200 miles of water main) of our distribution system each year.

Security

Providence Water has over 92 square miles of watershed area, the WTP, miles of cross country transmission mains, and 16 pumping and storage facilities that are critical to providing water to our customers. With the exception of the treatment plant, the majority of these facilities are unmanned. It is critical that we provide as much coverage of these facilities as possible. Given the amount of security concerns that surround critical infrastructure such as water, it is imperative that Providence Water has the appropriate levels of staffing to provide the necessary security for our critical resources. Currently, Providence Water has 8 Watershed Inspectors that provide security from 8 a.m. to 11 p.m. seven days a week. As such, Providence Water cannot provide the level of inspection and the presence needed in our system. Providence Water is requesting four additional watershed inspectors to supplement our current staffing. The additional staff will man the new guard shack at the WTP and provide thorough and more routine inspection of our assets.

Information Technology

Our current, undermanned Information Technology (IT) Department has a staff of six employees who have the responsibility for maintaining: (1) approximately 30 servers, (2) approximately 200 desktops, laptops and mobile devices, (3) network architecture for three facilities and multiple pump stations, and (4) ongoing cybersecurity of our IT infrastructure. In addition to the day-to-day operations, the IT staff needs to stay on top of rapidly changing technology and constantly evolving threats to operations. To that end, Providence Water is requesting that we add a high level Director of IT position so that we have some level of expertise in house to navigate us through the difficult IT waters. In addition, we are

requesting a technical writer/administrator to develop software and IT service request for proposals.

East Smithfield Water District

East Smithfield currently has three full time employees. Providence Water is requesting three additional positions for these employees to help provide service to the additional retail area. These employees would help ensure a successful acquisition of East Smithfield by Providence Water. The employees extensive knowledge of the East Smithfield customer base, billing software, meter reading software, and infrastructure will allow Providence Water to continue to serve the current East Smithfield service area in an efficient and cost effective manner. After the transition, the employees can then be a part of the Providence Water team. It is anticipated that one employee will be utilized in the Customer Service Department, one employee will be utilized in the Engineering Department and one employee will be utilized in the Transmission & Distribution Department. If these employees were not employed by Providence Water, this would provide a larger than normal burden on existing staff due to the lack of system experience. For instance, if there were a main break within the current East Smithfield service area, the shut down and repair time could potentially be a lot longer due to lack of knowledge of valve locations and system interconnectivity.

Chemical and Sludge Maintenance Fund

Q. Can you explain the reduction of chemical usage?

A. Yes. Back in 2011, Providence Water had higher than usual turbidity and Total Organic Carbon (TOC) in the raw water. Consequently, the WTP utilized additional ferric sulfate and

quicklime to address the elevated levels of turbidity and TOC. This chemical utilization was the basis for the level of funding in Docket 4406. In addition, Providence Water has been evaluating the current coagulation chemistry to maximize TOC removal while minimizing the effect on turbidity. As a result, Providence Water is projecting lower chemical usage for the rate year.

As stated in Nancy Parrillo's testimony, Providence Water is still under contract with Synagro through 2021 for the removal and ultimate disposal of the treatment residuals that result from the sedimentation and filtration processes.

Q. Mr. Giasson, does that conclude your testimony?

A. Yes it does

Exhibit GMG-1

Providence Water

15 Year IFR Expenditure Plan

Fiscal Years 2021 through 2035

	PROJECTS	Total 2021-2035	2021	2022	2023	2024	2025	2021-2025	2026	2027	2028	2029	2030	2026-2030	2031	2032	2033	2034	2035	2031-2035	Total 2021-2035
	Raw Water Supply																				
1	Scituate Reservoir - Gainer Dam spillway	403,000				403,000		403,000						0						0	403,000
2	Regulating Reservoir	1,673,000						0			836,500	836,500		1,673,000						0	1,673,000
3	Various Large Dam Improvements	300,000	20,000	20,000	20,000	20,000	20,000	100,000	20,000	20,000	20,000	20,000	20,000	100,000	20,000	20,000	20,000	20,000	20,000	100,000	300,000
4	Secondary Dam Improvements	150,000	10,000	10,000	10,000	10,000	10,000	50,000	10,000	10,000	10,000	10,000	10,000	50,000	10,000	10,000	10,000	10,000	10,000	50,000	150,000
5	Harrisdale/Peeptoad, Jordan Pond	1,116,000			1,116,000			1,116,000						0						0	1,116,000
6	Raw Water Booster Pump Station	600,000			600,000			600,000						0						0	600,000
7	Gainer Dam Gatehouse	1,524,000				1,524,000		1,524,000						0						0	1,524,000
8	60" Influent Conduits (internal inspection in 2028)	150,000			16,000			16,000			117,000			117,000			17,000			17,000	150,000
9	90" Influent Conduit	100,000						0						0			100,000			100,000	100,000
10	2 Raw Water - 60" north and south aqueduct valves	391,000		391,000				391,000						0						0	391,000
11	36" blowoff meter chamber valve	51,000	51,000					51,000						0						0	51,000
12	Watershed Fence and Road Rehabilitation	300,000	20,000	20,000	20,000	20,000	20,000	100,000	20,000	20,000	20,000	20,000	20,000	100,000	20,000	20,000	20,000	20,000	20,000	100,000	300,000
	Total	$6,758,000	101,000	441,000	1,782,000	1,977,000	50,000	$4,351,000	50,000	50,000	1,003,500	886,500	50,000	$2,040,000	50,000	50,000	167,000	50,000	50,000	$367,000	$6,758,000
	Treatment Plant																				
13	Central Control System (SCADA) Upgrades	300,000	20,000	20,000	20,000	20,000	20,000	100,000	20,000	20,000	20,000	20,000	20,000	100,000	20,000	20,000	20,000	20,000	20,000	100,000	300,000
14	Conduits	20,000						0					20,000	20,000						0	20,000
15	Inspect Washwater Tank	30,000					10,000	10,000					10,000	10,000					10,000	10,000	30,000
16	Replace Washwater Tank Pumps	146,000						0		146,000				146,000						0	146,000
17	Inspect Service Water Tank	30,000					10,000	10,000					10,000	10,000					10,000	10,000	30,000
18	Rehabilitate Service Water Tank and Replace Pumps	158,000						0		158,000				158,000						0	158,000
19	Inspect Clearwell	30,000					10,000	10,000					10,000	10,000					10,000	10,000	30,000
20	Clarification system improvements	106,200,000	56,000,000	50,200,000				106,200,000						0						0	106,200,000
21	Chlorine Storage / Transfer / Feed System	18,400						0		18,400				18,400						0	18,400
22	Ferric Storage / Transfer / Feed System	123,400	8,800					8,800	9,900					9,900	104,700					104,700	123,400
23	Fluoride Storage / Transfer / Feed System	60,800					21,752	21,752					11,248	11,248					27,803	27,803	60,800
24	Lime Storage / Transfer / Feed System	79,100	12,600					12,600	31,000					31,000	16,200	19,300				35,500	79,100
25	Filters – Improvements	3,570,000						0						0					3,570,000	3,570,000	3,570,000
26	Treatment Plant Laboratory Improvements	300,000	20,000	20,000	20,000	20,000	20,000	100,000	20,000	20,000	20,000	20,000	20,000	100,000	20,000	20,000	20,000	20,000	20,000	100,000	300,000
27	Treatment Plant roofs	128,000		128,000				128,000						0						0	128,000
28	Treatment Plant Building Improvements	7,492,000	484,000	6,748,000	20,000	20,000	20,000	7,292,000	20,000	20,000	20,000	20,000	20,000	100,000	20,000	20,000	20,000	20,000	20,000	100,000	7,492,000
	Total	$118,685,700	56,545,400	57,116,000	60,000	60,000	111,752	$113,893,152	100,900	382,400	60,000	60,000	121,248	$724,548	180,900	79,300	60,000	60,000	3,687,803	$4,068,003	$118,685,700
	Pumping and Storage																				
29	Ashby Street Pump Station - VFD drive pumps	20,600					20,600	20,600						0						0	20,600
30	Bath Street P.S. - VFD drive pumps and generator	1,132,000						0						0				1,132,000		1,132,000	1,132,000
31	Neutaconkanut P.S. - VFD drive pumps and generator	1,278,000						0						0					1,278,000	1,278,000	1,278,000
32	Various Pump Station Improvements	300,000	20,000	20,000	20,000	20,000	20,000	100,000	20,000	20,000	20,000	20,000	20,000	100,000	20,000	20,000	20,000	20,000	20,000	100,000	300,000
33	Aqueduct Reservoir and Gatehouse	150,000					50,000	50,000					50,000	50,000					50,000	50,000	150,000
34	Neutaconkanut Reservoir and Gatehouse	150,000		50,000				50,000		50,000				50,000		50,000				50,000	150,000
35	Longview Reservoir and Gatehouse	150,000		50,000				50,000		50,000				50,000		50,000				50,000	150,000
36	Ridge Road Reservoir	75,000			25,000			25,000			25,000			25,000			25,000			25,000	75,000
37	Lawton Hill Reservoir	75,000			25,000			25,000			25,000			25,000			25,000			25,000	75,000
	Total	$3,330,600	20,000	120,000	70,000	20,000	90,600	$320,600	20,000	120,000	70,000	20,000	70,000	$300,000	20,000	120,000	70,000	1,152,000	1,348,000	$2,710,000	$3,330,600

Exhibit GMG-1

Providence Water

15 Year IFR Expenditure Plan

Fiscal Years 2021 through 2035

	PROJECTS	Total 2021-2035	2021	2022	2023	2024	2025	2021-2025	2026	2027	2028	2029	2030	2026-2030	2031	2032	2033	2034	2035	2031-2035	Total 2021-2035
	Transmission																				
38	102" Aqueduct Inspection	6,300,000	2,000,000					2,000,000	2,100,000					2,100,000	2,200,000					2,200,000	6,300,000
39	78" Aqueduct Inspection	5,700,000		1,800,000				1,800,000		1,900,000				1,900,000		2,000,000				2,000,000	5,700,000
40	90" Aqueduct rehabilitation	7,000,000		7,000,000				7,000,000						0						0	7,000,000
41	90" Aqueduct Inspection	2,000,000						0				1,000,000		1,000,000				1,000,000		1,000,000	2,000,000
42	102" fiber optic monitoring	2,175,000	125,000	125,000	125,000	125,000	125,000	625,000	145,000	145,000	145,000	145,000	145,000	725,000	165,000	165,000	165,000	165,000	165,000	825,000	2,175,000
43	Slip lining / replacement of 102" and 78" aqueducts	155,000,000						0					10,000,000	10,000,000	29,000,000	29,000,000	29,000,000	29,000,000	29,000,000	145,000,000	155,000,000
44	Condition assessment transmission mains	1,500,000	100,000	100,000	100,000	100,000	100,000	500,000	100,000	100,000	100,000	100,000	100,000	500,000	100,000	100,000	100,000	100,000	100,000	500,000	1,500,000
45	16" and Larger Valve Replacements	5,000,000	200,000	200,000	200,000	200,000	200,000	1,000,000	200,000	200,000	200,000	200,000	200,000	1,000,000	200,000	1,200,000	1,200,000	200,000	200,000	3,000,000	5,000,000
	Total	$184,675,000	2,425,000	9,225,000	425,000	425,000	425,000	$12,925,000	2,545,000	2,345,000	445,000	1,445,000	10,445,000	$17,225,000	31,665,000	32,465,000	30,465,000	30,465,000	29,465,000	$154,525,000	$184,675,000
	Distribution																				
46	Distribution Main Upgrades	290,000,000	18,000,000	18,000,000	18,000,000	19,000,000	19,000,000	92,000,000	19,000,000	19,000,000	20,000,000	20,000,000	20,000,000	98,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	100,000,000	290,000,000
47	Distribution Valve Replacements	3,000,000	200,000	200,000	200,000	200,000	200,000	1,000,000	200,000	200,000	200,000	200,000	200,000	1,000,000	200,000	200,000	200,000	200,000	200,000	1,000,000	3,000,000
48	Lead Service Replacements	7,500,000	500,000	500,000	500,000	500,000	500,000	2,500,000	500,000	500,000	500,000	500,000	500,000	2,500,000	500,000	500,000	500,000	500,000	500,000	2,500,000	7,500,000
49	Hydrant Replacements	4,500,000	300,000	300,000	300,000	300,000	300,000	1,500,000	300,000	300,000	300,000	300,000	300,000	1,500,000	300,000	300,000	300,000	300,000	300,000	1,500,000	4,500,000
50	Blowoff Replacements	1,500,000	100,000	100,000	100,000	100,000	100,000	500,000	100,000	100,000	100,000	100,000	100,000	500,000	100,000	100,000	100,000	100,000	100,000	500,000	1,500,000
51	Leak Detection	200,000						0	200,000					200,000						0	200,000
	Total	$306,700,000	19,100,000	19,100,000	19,100,000	20,100,000	20,100,000	$97,500,000	20,300,000	20,100,000	21,100,000	21,100,000	21,100,000	$103,700,000	21,100,000	21,100,000	21,100,000	21,100,000	21,100,000	$105,500,000	$306,700,000
	Support Systems																				
52	Building and Facilities Improvements	375,000	25,000	25,000	25,000	25,000	25,000	125,000	25,000	25,000	25,000	25,000	25,000	125,000	25,000	25,000	25,000	25,000	25,000	125,000	375,000
53	Records Management (GIS) Upgrades	300,000	20,000	20,000	20,000	20,000	20,000	100,000	20,000	20,000	20,000	20,000	20,000	100,000	20,000	20,000	20,000	20,000	20,000	100,000	300,000
54	Facility Fence and Road Rehabilitation	300,000	20,000	20,000	20,000	20,000	20,000	100,000	20,000	20,000	20,000	20,000	20,000	100,000	20,000	20,000	20,000	20,000	20,000	100,000	300,000
	Total	$975,000	65,000	65,000	65,000	65,000	65,000	$325,000	65,000	65,000	65,000	65,000	65,000	$325,000	65,000	65,000	65,000	65,000	65,000	$325,000	$975,000
	Total	$621,124,300	76,256,400	86,067,000	21,502,000	22,647,000	20,842,352	$229,314,752	23,080,900	23,062,400	22,743,500	23,576,500	31,851,245	$124,314,545	53,080,900	53,879,300	51,927,000	52,692,000	55,715,803	$267,495,003	$621,124,300

Exhibit GMG-2
Main Rehabilitation FY1997 through FY2015

Fiscal Year	Total Main Rehabilitation Cost	Total Main Replaced (Feet)	Total Main Replaced (Miles)	Cost per foot
1997	$770,100	7,700	1.5	$100
1998	$2,061,231	16,963	3.2	$122
1999				
2000				
2001	$365,998	1,759	0.3	$208
2002	$188,352	2,063	0.4	$91
2003				
2004				
2005	$225,521	2,943	0.6	$77
2006	$1,198,643	4,938	0.9	$243
2007				
2008	$1,132,446	4,417	0.8	$256
2009	$1,141,087	6,825	1.3	$167
2010	$1,449,485	7,330	1.4	$198
2011	$8,603,842	39,141	7.4	$220
2012	$6,732,891	19,499	3.7	$345
2013	$8,690,291	35,275	6.7	$246
2014	$13,929,440	45,553	8.6	$306
2015	$11,430,705	55,102	10.4	$207
Totals	***$57,920,031***	***249,508***	***47***	***$232***