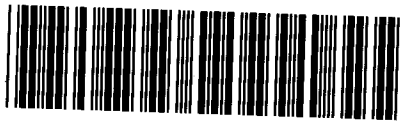

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SOAH DOCKET NO. 473-14-5138
PUC DOCKET NO. 42857



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| PETITION OF NORTH AUSTIN MUNICIPAL UTILITY DISTRICT NO. 1, NORTHTOWN MUNICIPAL UTILITY DISTRICT, TRAVIS COUNTY WATER CONTROL AND IMPROVEMENT DISTRICT NO. 10 AND WELLS BRANCH MUNICIPAL UTILITY DISTRICT FROM THE RATEMAKING ACTIONS OF THE CITY OF AUSTIN AND REQUEST FOR INTERIM RATES IN WILLIAMSON AND TRAVIS COUNTIES | § | BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS |

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# DIRECT TESTIMONY

OF

THOMAS C. ARNDT

ON BEHALF OF PETITIONERS
OCTOBER 17, 2014



65

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**OF THOMAS C. ARNDT, WITNESS FOR**
**PETITIONERS**

## I. QUALIFICATIONS

Q. **PLEASE STATE YOUR NAME.**

A. My name is Thomas C. Arndt, P.E.

Q. **PLEASE EXPLAIN YOUR EDUCATIONAL EXPERIENCE AND ANY DEGREES OBTAINED SINCE HIGH SCHOOL.**

A. I earned a Bachelor of Science Degree in Civil Engineering from Colorado State University in 1980.

Q. **PLEASE STATE YOUR PRESENT EMPLOYER AND TITLE WITH THAT EMPLOYER.**

A. I am President of Dannenbaum Engineering Company – Austin, LLC.

Q. **PLEASE EXPLAIN ANY RELEVANT EMPLOYMENT HISTORY, LISTING EMPLOYER'S NAME AND POSITION HELD WITH EACH RESPECTIVE EMPLOYER.**

A. Dannenbaum Engineering Corporation, Austin Texas, September 1985 to Present

Partner, January 2000

Austin Division Office Manager, 1993 to present

Project Manager, 1989 to present

Project Engineer, 1985 to 1989

Q. **PLEASE DESCRIBE BRIEFLY YOUR WORK EXPERIENCE.**

A. From 1980 to 1985, I worked for Kansas Department of Transportation (KDOT) as an EIT, receiving my Kansas PE in 1985. I focused on transportation and drainage infrastructure. I spent the first nine months as a construction representative in Wichita

Kansas on roadway and bridge projects. I subsequently moved to the headquarters in Topeka to the design section. I prepared roadway and drainage plans and reviewed consultant plans on a variety of projects.

Since 1985 to the present, I have been at Dannenbaum Engineering working on transportation, water and wastewater projects. I've had an extensive amount of experience with water and wastewater system planning, design and construction. I have been the WCID 10 Engineer of Record since 1993 and have modeled, planned, designed and implemented construction of all District financed infrastructure during this time. In addition, I have been the project manager and designer for lift stations, pump stations, water transmission and distribution lines, along with wastewater collectors and interceptors.

**Q. WOULD YOU PLEASE SUMMARIZE YOUR WORK EXPERIENCE AND EXPERTISE FOR THE JUDGE?**

A. Yes, in summary, over the last 34 years, I have been involved in the engineering design of numerous projects on behalf of both public and private entities located throughout Texas. These projects have involved all aspects of water and wastewater design, development, regulatory assessments and processing, contract preparations, and evaluations. A copy of my professional resume is attached as Exhibit TCA-1.

## II. PURPOSE OF TESTIMONY

**Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?**

A. The purpose of my testimony is to provide a technical and historical perspective of Travis County Water Control & Improvement District No. 10 ("WCID 10" or the "District") with respect to service and cost of service to WCID 10.

**Q. WHAT DOCUMENTS, ITEMS, CALCULATIONS, OR LITERATURE HAVE YOU REVIEWED IN PREPARATION OF YOUR REPORT OR OPINIONS IN THIS MATTER?**

A. I have reviewed Travis County WCID 10 Maps, City of Austin water grid and intersection maps, WCID 10 pumping and storage data, and the testimony of Teresa Lutz.

**Q. HAVE YOU PREPARED ANY EXHIBITS IN SUPPORT OF YOUR TESTIMONY?**

A. Other than my resume, no.

## III. TRAVIS COUNTY WCID NO. 10

**Q. WHAT IS THE SCOPE OF YOUR INVOLVEMENT WITH THE PETITIONERS WHOLESALE RATE APPEAL?**

A. Technical information.

**Q. PLEASE DESCRIBE THE TRAVIS COUNTY WCID NO. 10 WATER SYSTEM?**

A. WCID 10 buys treated potable water from the City of Austin, which is received directly from the Ulrich Water Treatment Plant. The City has a short transmission main that brings water across Red Bud Trail to the WCID Red Bud Trail pump station, which is literally located across the street from the plant. This WCID 10 pump station pumps water to the lower pressure plane and to the WCID 10 McConnell Pump Station and Storage Tank. The McConnell Pump Station pumps water to 3 storage tanks in the upper pressure plane. The District provides all pumping, storage, transmission and distribution to approximately 2900 WCID customers. The District's pipe system includes approximately: 1,900' of 20" pipe, 10,000' of 16" pipe, 3,500' of 14" pipe, 87,000' of 8" pipe and 43 miles of 6" pipe.

**Q. WHAT STATE STANDARDS OR RULES FOR PROVIDING AN ADEQUATE SUPPLY OF WATER TO CUSTOMERS APPLY TO THE DISTRICT?**

A. All Texas Commission on Environmental Quality ("TCEQ") standards and rules are met or exceeded with any new project. In addition, all TCEQ storage and pumping requirements are met or exceeded. All City of Austin rules and standards regarding construction are also met or exceeded with any new project.

**Q. WHAT DOES THE DISTRICT DO IN ORDER TO ENSURE THAT IT MEETS STATE STANDARDS FOR WATER SYSTEMS?**

A. From time to time, the TCEQ rules are reviewed to ensure that all pumping and storage requirements are met. In addition, any new project is subject to TCEQ rules, and the plans are sent to TCEQ for review.

**Q. HOW DOES THE DISTRICT OBTAIN ITS WATER SUPPLY?**

A. WCID 10 receives all of its treated water from the City of Austin Ulrich Water Treatment Plant. As I mentioned previously, the City has a very short transmission main to the WCID Red Bud Trail Pump Station... literally across the street from the treatment plant. The City operates and maintains a master meter on this site.

**Q. WHAT AUSTIN FACILITIES ARE USED TO PROVIDE WATER TO THE DISTRICT?**

A. The Ulrich Water Treatment Plant, a medium-service pump station at the plant, and the short transmission main across Red Bud Trail to the WCID Red Bud Trail Pump Station.

**Q. WHAT IS YOUR OPINION ABOUT THE ADEQUACY OF THE WATER SUPPLY PROVIDED BY AUSTIN WITH RESPECT TO THE DISTRICT MEETING THE STATE STANDARDS?**

A. At times, the City does not provide the State minimum pressure to the Red Bud Pump Station, and the station has automatically shut down when the pressure from the City dropped below 12 psi. Since this pump station serves the entire District, low pressure can be a concern. This issue was brought to the attention of the City in 2012. This is an

ongoing concern. For example, low pressure caused the pump station to shut down five separate times in April and May 2014.

**Q. WHAT IMPROVEMENTS HAS THE DISTRICT CONSTRUCTED TO ENSURE STATE STANDARDS ARE MAINTAINED WITHIN THE DISTRICT?**

A. The District has constructed an additional 1 million gallon reservoir and added pumping capacity.

**Q. HOW DOES THE CITY ENSURE THAT THE STATE STORAGE AND PRESSURE REQUIREMENTS ARE MET WITHIN THE DISTRICT?**

A. The City doesn't. The District provides all of its own storage and pressure infrastructure to ensure that the District meets the State standards.

**Q. SO, DOES THE CITY PROVIDE ANY FACILITIES TO MEET THE DISTRICT'S PEAK DEMAND?**

A. No.

**Q. DOES THE CITY PROVIDE THE DISTRICT'S WITH ANY FACILITIES TO MEET THE STATE REQUIREMENT FOR STORAGE?**

A. No.

**Q. WHAT IS THE STATE DESIGN CRITERIA FOR STORAGE?**

A. 200 gallons per connection.

**Q. HOW DOES THE DISTRICT MEET THE STATE REQUIREMENT FOR STORAGE?**

A. The District has four ground storage tanks with a total capacity of 2.5 million gallons.

**Q. WHAT IS THE STATE DESIGN CRITERIA FOR ELEVATED STORAGE?**

A. 100 gallons per connection.

**Q. DOES THE CITY PROVIDE THE DISTRICT WITH ANY FACILITIES TO MEET THE STATE REQUIREMENT FOR ELEVATED STORAGE?**

A. No.

**Q. HOW DOES THE DISTRICT PROVIDE ELEVATED STORAGE?**

A. The District has 2.2 million gallons of storage in the upper pressure plane that acts as elevated storage along with pressure tanks and pumps that meet the State's elevated storage requirement.

**Q. WHAT IS THE STATE DESIGN CRITERIA FOR SERVICE PUMPS?**

A. 2.0 gallons per minute ("gpm") per connection.

**Q. DOES THE CITY PROVIDE THE DISTRICT WITH ANY FACILITIES TO MEET THE STATE REQUIREMENT FOR SERVICE PUMPS?**

A. No.

**Q. HOW DOES THE DISTRICT PROVIDE SERVICE PUMPING?**

A. The District has two main pumping stations. The Red Bud facility has a pumping capacity of 7,000 gpm, and the McConnell facility has a capacity of 3,500 gpm.

**Q. DOES THE CITY PROVIDE THE DISTRICT WITH ANY FACILITIES TO MEET THE FIRE FLOW DEMAND WITHIN THE DISTRICT?**

A. No.

**Q. HOW DOES THE DISTRICT PROVIDE FIRE FLOW?**

A. Pumping, storage, pipelines and fire hydrants.

**Q. HOW DOES THE DISTRICT MEET THE STATE REQUIREMENT FOR FIRE FLOW?**

A. The State's fire flow requirement is 250 gpm. The District exceeds this requirement throughout the District's service area with the District's storage and pressure tanks and

pumping facilities, but it is considering constructing additional improvements to the District's system.

**Q. WHAT IS THE DISTRICT CONSIDERING CONSTRUCTING TO INCREASE FIRE FLOW?**

A. The District may construct additional pumping, transmission, and storage capacity.

**Q. WHY IS THE DISTRICT PROPOSING THESE IMPROVEMENTS?**

A. To ensure that the District can provide additional water for fighting a structure fire so that the probability of the fire spreading is reduced. This is particularly a concern since the District is heavily vegetated and the potential of the weather conditions that occurred during the catastrophic Bastrop fire is a possibility.

**Q. HOW MUCH IS THAT ANTICIPATED TO COST?**

A. The total amount for all of the improvements is $80 million. The first phase is projected to be in the $30 million range.

**Q. HOW WILL THE DISTRICT PAY FOR THESE IMPROVEMENTS?**

A. The District is anticipating a bond election in May 2015. District property owners will pay back the general obligation bonds through ad valorem taxes.

**Q. HOW MUCH IS THE CITY GOING TO REIMBURSE THE DISTRICT FOR MAKING THESE IMPROVEMENTS?**

A. Nothing.

**Q. WHAT OTHER ISSUES DO YOU THINK ARE RELEVANT TO AN ANALYSIS OF THE COSTS THAT AUSTIN INCURS TO PROVIDE WATER TO THE DISTRICT?**

A. Reading, calibrating, and maintaining the master meter, the meter on Stratford Drive, and the new meter on Ridgewood Road.

**Q. WHAT IS YOUR OPINION OF THE PEAKING FACTORS AUSTIN UTILIZES FOR WATER RATE DETERMINATION?**

A. The City does not supply the District with elevated storage or other methods for meeting peak demands. As I understand it, the City has a medium service pump station at the Ulrich plant that provides water through a 14-inch line to the District and a 16-inch and 48-inch line to other areas of the City. As mentioned previously, the pressure from this pump station does not always meet State requirements. The District provides and maintains its own infrastructure for providing peak flows. From the City of Austin billing records for fiscal year 2013, I calculated that the maximum day peak factor is 1.53 as opposed to the City's factor of 1.89. As far as peak hour, I do not possess the data to calculate it or determine how the City derived it. However, the City only provides the water and not the infrastructure to pump and store the peak hour demand.

## IV. WATER TREATMENT PLANT NO. 4 NOT USED AND USEFUL TO DISTRICT

**Q. DO YOU BELIEVE THAT WCID 10 WILL BENEFIT FROM CONSTRUCTION AND OPERATION OF THE CITY OF AUSTIN'S WATER TREATMENT PLANT NO. 4?**

A. No. The District is over ninety-five percent built out based on developable land and the quantity of water needed to service the remaining development is negligible.

I am unaware of any proposal to extend a pipeline under Lake Austin to bring water from Water Treatment Plant No. 4 to the District. Furthermore, Water Treatment Plant No. 4 lacks capacity to replace the existing capacity of the Uhlrich Plant. In her testimony, Ms. Lutes states that the existing capacity of the Uhlrich and Davis Water Treatment Plants is much greater than the highest one-day peak water usages of the City of Austin.

WCID 10 occasionally has issues with inadequate pressure from the Uhlrich Plant, not a water supply or quantity problem. The City is only addressing water quantity issues for future customers with the Water Treatment Plant No. 4 project. With the construction of

Water Treatment Plant No. 4, the City is not proposing to address the District's pressure issues.

**Q. THE CITY CLAIMS IT HAS TO BUILD THE $500 MILLION WATER TREATMENT PLANT NO. 4 SO THAT THE CITY CAN REPAIR THE DAVIS PLANT. WHAT SOUND ENGINEERING RULE OR CRITERIA NECESSITATES THE CONSTRUCTION OF A NEW WTP TO FACILITATE REPAIRS TO AN EXISTING PLANT?**

A. None. Repairs could be made without removing the entire plant from service. The Davis Water Treatment Plant has parallel treatment units that can be taken down without disrupting all of the flow through the plant. If necessary, temporary facilities could be brought onsite to alleviate any capacity or flow issues. Repairs could be made during low-flow winter months. Project management to ensure capacity is available during the repair of major treatment plants is a normal industry practice.

It is important to note that if the City had kept another water plant, the Green Water Treatment Plant, in service, then that plant could have been used to make up any treatment shortfall of the Davis plant during repairs.

Also, keep in mind that Water Treatment Plant No. 4 only has a capacity of 50 Million Gallons per Day. The Davis plant has a capacity of 118 MGD, so Water Treatment Plant No. 4 cannot be used to shut down the Davis plant for repairs. Industry-standard project management techniques could be used to make repairs, not the construction of a new water plant that is not used or useful to the City's ratepayers.

Finally, even if the City takes down the Davis plant completely, it should have no bearing on the water supply to WCID 10, as the District receives all of its water from another plant, the Uhlrich Water Treatment Plant.

**Q. WHAT IS THE BENEFIT OF WATER TREATMENT PLANT 4 ON THE DISTRICT?**

A. Water Treatment Plant No. 4 provides no benefit to the District. Since approximately 1968, when the Ulrich Plant was brought online, WCID 10 has received its water from this plant. Since the Ulrich plant is across the street from District's pump station, I do not see this changing. A catastrophic failure of the entire Ulrich plant is unlikely, a hazardous spill or hurricane causing water quality issues has the same likelihood on Lake Travis as on Lake Austin, and in my opinion that argument in the Teresa Lutz testimony is irrelevant. As for the water treatment capacity argument in her testimony, the Ulrich and Davis plants are currently meeting the peak day water demand, and the peak demand is actually decreasing. Therefore, I do not see the benefit of constructing a new plant costing over $500 million, when the existing plants could be repaired and upgraded for significantly less.

**Q. HAVE YOU REVIEWED MS. LUTE'S CLAIM THAT WATER TREATMENT PLANT NO. 4 IS NECESSARY TO PROVIDE AN ALTERNATIVE WATER SUPPLY IN CASE OF AN ACT OF TERRORISM?**

A. Yes.

**Q. WOULD YOU AGREE THAT WATER TREATMENT PLANT NO.4 PROVIDES THAT ALTERNATIVE SUPPLY?**

A. No.

**Q. WHY NOT?**

A. Water Treatment Plant No. 4 is a surface water plant that takes water out of the same river basin. Moreover, it is more likely that a fuel spill will occur from one of the dozen or so marinas on Lake Travis before a gasoline tanker would fall off the Penneybacker Bridge.

An actual alternative water supply would have been a groundwater project that brought groundwater from east of the City of Austin, which I understand the City is currently exploring.

## V. CONCLUSION

**Q. DOES THIS CONCLUDE YOUR TESTIMONY?**

A. For the time being, yes. However, the City of Austin continues to slowly provide responses to discovery requests. Furthermore, additional discovery through deposition may occur between now and the hearing on the merits. I reserve the right to amend, modify, or supplement my testimony if additional data becomes available.

## THOMAS C. ARNDT, P.E.
**Office/Project Manager**

Bachelor of Science in Civil Engineering (1980)
Colorado State University

*Professional Registration:*

P.E., Professional Engineer, State of KS, #10063
P.E., Professional Engineer, State of TX, #59135
P.E., Professional Engineer, State of AZ, #22544

**Associations:** American Society of Civil Engineers (ASCE), National & Texas Society of Professional Engineers (NSPE/TSPE), American Water Works Association (AWWA), American Council of Engineering Companies (ACEC), Greater Austin Contractors & Engineers Association (ACEA), Austin Chamber of Commerce

*Employment History:*

**Dannenbaum Engineering Corporation, Austin Texas, September 1985 to Present**

- Partner, 2000 to present
- Austin Division Office Manager, 1993 to present
- Project Manager, 1989 to present
- Project Engineer, 1985 to 1989

**Kansas Department of Transportation, June 1980 to August 1985**

*Professional Experience*

Mr. Arndt has 34 years of engineering experience with over 29 years in municipal utility design including water distribution systems, water storage facilities, water pump stations, wastewater collection systems and wastewater lift station design. In addition, Mr. Arndt has a variety of project experience in highways & streets, airports, drainage and land development.

*WATER*

**Travis County WCID No. 10, District Engineer**

Retained as the WCID No. 10 District Engineer for the past 21 years. Responsible for providing various engineering services to Travis County WCID No. 10 consistent with developing a Master Water Plan; conducting studies; performing design services; and preparing construction plans for all water system facilities within the District including pumping, storage, transmission and distribution facilities. System modeling is performed to assure the development of an economical water system, and various engineering studies have been performed, including annexation studies, emergency flow studies and updates of system maps to serve over 2,200 customers. These facilities are continuously reviewed and expanded as needed in order to meet the needs of the District.

**Travis County WCID No. 10, Ridgewood Village Waterline Improvements, Project Manager**

In May 2012, WC&ID 10 annexed a private water system in a single family subdivision in response to requests by the City of West Lake Hills, City of Austin, Texas Commission on Environmental Quality (TCEQ) and the owner. The system consisted of 4" to 6" waterlines fed from a well which was being over pumped. Dannenbaum prepared 15 alternatives for improvements to the system in order to bring it up to current design criteria and provide fire flow capabilities. This project included the design for the replacement of 4,200 feet of waterline with 8 inch lines throughout the Ridgewood Village subdivision. The new system included pressure reducing valves, an additional master meter, additional fire hydrants and 94 service connections. Dannenbaum was responsible for the design, bidding and construction administration. Dannenbaum obtained approvals from the Austin Water Utility, City of West Lake Hills, West Lake Fire Department, City of Austin Planning & Development Review Department (Site Development Permit) and TCEQ.

**Travis County WCID No. 10, Kings Row Waterline, Project Manager**

This project included the design of the replacement of 600 feet of 2 ¼ - inch waterline with an 8-inch waterline in order to provide better domestic service and fire flow. The project was challenging in that Kings Row is a narrow roadway with limited right-of way, along with the proximity of large healthy trees and the requirement to maintain access to residences and businesses. Dannenbaum was responsible for the design and construction administration. Dannenbaum obtained approvals from the Austin Water Utility, Travis County, West Lake Fire Department and TxDOT.

**Travis County WCID No. 10, RM 2244 Waterline, Project Manager**

Managed the design for the relocation of 1,600' of 12" water line along Bee Caves Road (RM 2244) in conjunction with the roadway widening project by TxDOT that involved conducting the acquisition of an easement for approximately half of the project's length. Project challenges involved limited ROW, coordination with numerous utilities, proximity of large healthy trees, and the requirement to continuously provide water service to businesses. Mr. Arndt was instrumental in obtaining approvals for the Austin Water Utility and TxDOT.

**Travis County WCID No. 10, Red Bud Pump Station Improvements, Project Manager**

Dannenbaum provided design & construction administration services for the rehabilitation/ expansion of Travis County WCID 10 Pump Station No. 1 to 10 MGD firm pumping capacity, requiring the addition of one new 2250 GPM vertical turbine pump, adding variable speed motors to two pumps allowing for the removal of three small pumps, and replacement of the entire electrical system to meet current codes and to serve the District during periods of low flow. Work included a new electrical/PLC building that allowed for a future SCADA system, an additional 12-inch water discharge line, and renovation of the existing pump building.

**South 1st Street Water Line Replacement, Austin Texas, Project Manager**

This project includes the replacement of 2,800 LF of 8-inch water line along with 30 water services. The project is located south of downtown Austin and is complicated by the number of existing utilities and the need to maintain traffic on this major arterial.

**Travis County WCID No. 10, Eanes ISD Waterline, Project Manager**

Design services for approximately 6500 linear feet of 12-inch water transmission main to increase Fire Flow to 2 elementary schools and a High School. The project was designed, bid and constructed within 1 year to enable the schools to open the new school year without construction activity occurring.

**Rob Roy Water Storage Facility, Travis County, Texas, Project Manager**

Design of a 1 million-gallon water storage tank to increase the water supply for the 1080-pressure plane. Construction plans included site preparation and steel tank with telemetry controls to Pump Station No. 2. The storage tank was part of an overall capital improvements program to provide increased pressure, water availability, and fire flow.

**Bee Caves Road (RM 2244) Water Line Relocation, Travis County, Texas, Project Manager**

Design of 7,500 linear feet of 8-inch and 12-inch water lines necessitated by the roadway widening to be performed by TxDOT.

**Rob Roy Subdivision Water Line Upgrade, Travis County, Texas, Project Manager**

This project included design of 11,700 linear feet of 12-inch to 20-inch diameter parallel water transmission mains in the 250-connection Rob Roy Subdivision. These mains were necessary in order to maintain sufficient pressure during the dry summer months when water use is at a peak.

**Camelot Subdivision Water Line Upgrade, Travis County, Texas, Project Manager**

Design of 3,700 linear feet of 6 and 8-inch diameter line that replaced the existing 2.25 and 4-inch diameter lines. These mains were necessary to insure sufficient domestic and fire flow for both the Upper and Lower Camelot Subdivisions.

**Rob Roy Water Master Plan, Travis County, Texas, Project Manager**

Retained to prepare a water master plan for the Rob Roy subdivision, an upscale development with 250 connections. The existing system of 6 and 8-inch lines proved to be inadequate due to the amount of residential irrigation demands, which are over 500,000 gallons per month for some of the connections. The irrigation demands led to low pressures at certain locations, leading to concerns of the available fire protection. Utilized the Kentucky Pipe Model (KYPIPE) to extensively analyze the system for the residential domestic and irrigation demands, the future commercial requirements and the fire flow requirements. The initial project added 12, 16 and 20-inch transmission mains. Subsequent projects will be constructed by developers and will complete the looped system for this subdivision.

**Travis County WC&ID No. 10 Water Master Plan, Travis County, Texas, Project Manager**

This water master plan was prepared in order to establish the District's 10-year upgrade requirements and was subsequently incorporated into a $3,000,000 bond application submitted to Texas Natural Resources Conservation Commission. Extensive Kentucky Pipe Modeling (KYPIPE) modeling was performed to identify the projects required to maintain sufficient domestic and fire protection flows. The plan recommend 3 major transmission main projects, the construction of an additional 1,000,000-gallon storage facility and the addition of 4,000 gpm of pumping capacity. The capital improvement program is ongoing with the transmission and storage facilities completed. Responsible for design, permitting and construction phase services for this program.

**Riske Pump Station, Travis County, Texas, Project Engineer**

This project involved the design of a booster pump station to serve a low-pressure area.

**990 Water Transmission Main, Travis County, Texas, Project Engineer**

This project included the design of approximately 2,900 linear feet of 12-inch water transmission main to increase the transmission capacity to the northern half of the District. The additional capacity was required to provide fire flow capabilities in this portion of the District.

*WASTEWATER*

**Seaholm Wastewater Line, Austin Texas, Project Manager**

Dannenbaum provided design services which included 2,000 feet of 24 and 30-inch wastewater line facilities necessary to intercept wastewater flows discharging into the Shoal Creek Lift Station to be decommissioned. The new wastewater interceptor reversed flows toward the west, conveying the flows parallel to Cesar Chavez Street, discharging into the Downtown Wastewater Tunnel, just west of Lamar Boulevard. The project included eight shafts for deep manholes, two of which were vortex structures, and crossed park land, requiring approval by the Parks Board and City Council. The project also involved coordination with the Gables at Park Plaza, Seaholm Power Plant, Green Water Treatment Plant, and the Seaholm Redevelopment District.

**South 1st Street Wastewater Line Replacement, Austin Texas, Project Manager**

This project includes the replacement of 3,700 LF of 8 and 12-inch wastewater lines along with nearly 80 wastewater services. The project is located south of downtown Austin and is complicated by the number of existing utilities and the need to maintain traffic on this major arterial.

**Spring Lake Lift Station, Austin, Texas, Project Manager**

The wet/dry well lift station will pump 1100 gpm to a relief line or 600 gpm to the Tech-Hydro WWTP and includes a back-up generator, odor control, and SCADA. This project took place in an existing subdivision on a lot adjacent to homes and involved environmental and aesthetic issues.

**Balcones Village Wastewater & Reuse Lines, Austin, Texas, Project Manager**

The project was for the design and construction of wastewater, reuse water, and water improvements for the existing 800-lot Balcones Village subdivision that currently had individual septic systems. The work involved the design of a reuse water supply distribution system for residential irrigation. It was a pilot program designed to reduce potable water usage in residential areas with reuse irrigation water. Included were 39,000 linear-feet of 8-inch to 18-inch gravity wastewater lines; 7,000 linear-feet of 8-inch to 12-inch force mains; and 39,000 linear feet of 6-inch to 12-inch water reuse lines with services to each lot.

**Austin Annexed Area Water & Wastewater Master Plan, Austin, Texas, Project Manager**

This project included the master planning and a preliminary engineering study to determine the water and wastewater improvements necessary to provide service for a 20-square-mile area northwest of Austin that was annexed by the City. This area includes seven municipal utility districts with and without water and/or wastewater systems. The study included water/wastewater systems data collection and review including preparation of rate analysis; data development including the evaluation of condition and usefulness of existing water and wastewater facilities; elimination of lift stations, rerouting wastewater interceptors; evaluation of the use of wastewater effluent for golf course irrigation purposes; evaluation of the potential for alternate wastewater collection and treatment systems for portions of the study area; and evaluation of the development of a water factory using wastewater treatment plant effluent and processing it to a high quality in order to provide a secondary use water system for residential irrigation.

**West Bouldin Interceptor Wastewater, Austin, Texas, Project Manager**

This project included a preliminary engineering study for 3.4 miles of wastewater interceptor 8 inches to 30 inches in diameter. The need for this investigation was due to the deficiencies in the sizing, overflow and existing line conditions. This study included flow monitoring, condition surveys and the analysis of alternative alignments. Phase A included 8,500 feet of interceptor from the south side of Barton Springs Road running north to Cumberland Road. Due to the environmental sensitivity of West Bouldin Creek and the depth of portions of the line, the contractor was given the option of boring and jacking or microtunneling in these locations. In addition, bank stabilization, sealed manholes and concrete caps above the wastewater line were required where the interceptor crosses or runs along the creek.